

The Digital-Making Curriculum:
the Learning Trajectories of Frequent Digital-
Makers in a London College

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November 2017

Abstract

Outside of formal education, many young people between 16 and 19 years of age are heavy consumers of digital content and some are frequent makers of digital content. Traditionally, the digital and media literacies and making skills needed for engagement with digital content come from participation in formal education courses such as Multimedia. The digital content taught and made within formal courses resembles the digital content that young people consume and make outside of formal education. However, in recent years, the participation levels of formal courses in which the making of digital content is prominent has fluctuated. Participation in some courses, for example, ICT has significantly declined and this has raised concerns about methods of teaching and learning as defined by the curriculums of such courses. Fluctuating participation patterns are often indicative of learner dissatisfaction with the methods of teaching and learning and the curriculums of formal courses that prominently feature digital-making. Consequently, learners complain about the lack of meaningful learning experiences of digital-making within formal education. Learners' experiences of digital-making outside of formal education are often unrepresented in the curriculums of formal courses and this contributes towards learner dissatisfaction and fluctuating levels of participation.

This thesis proposes an alternative curriculum for the study of digital-making within formal education, called the Digital-Making Curriculum (DMC) a term I have coined. Digital-making is the practice of 'learning about technology through making with it'. The DMC encompasses the principles, and practices regarding the study, production, analysis, consumption, and distribution of digital content. The DMC occurs in formal courses where digital-making is the dominant or fundamental focus of the curriculum; or is of rapidly growing importance and prevalence, to the point that its absence would be impractical and detrimental for the progression of learners. The DMC incorporates learners' experiences of digital-making outside of formal education into methods of teaching and learning. Consequently, the DMC facilitates the fostering of meaningful learning experiences of digital-making within formal education. At the core of the DMC, are social interactions between tutors and learners, in which both co-construct and co-develop learners' understandings of digital and media literacies needed to solve problems and make decisions, during the construction processes of digital content. The DMC not only enables learners to develop a deeper understanding of digital-making but

also enables tutors, curriculum makers and academics to gain a deeper understanding of how to effectively teach digital-making to learners on DMC courses.

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1930 – 2003

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Chapter One: Introduction to Thesis

1.1 Introduction to thesis - The annual challenge

I work in Further Education [FE] as a lecturer and leader of a BTEC level three course at a popular and Large college in London. College managers annually bestow upon course leaders the responsibility of recruiting a new first-year cohort of ten to twenty learners for the next academic year. Failure to do so may result in the cancellation of the course. The recruitment season begins in January and ends in mid-October. The ten-month period is quite stressful for many leaders within the college. Internal competition for new learners is fierce, and there is significant external competition from other colleges and school sixth form centres (Dougherty, 2009). A course that only enlists ten learners out of a possible twenty is insufficient in response to managerial demands. The real target I must achieve is at least eighteen out of twenty learners. During the recruitment period, I sit anxiously in a hall and wait for my scheduled interviewee to arrive. As I sit at my table waiting, I watch streams of learners in interviews at the tables of my colleagues. It appears that recruitment season does not cause some of my colleagues the same level of anxiety. Popular subjects like media studies and art and design seem to have little difficulty in attracting new learners. I teach multimedia, which I define as the conflation of computing/ICT art and design and media studies. Given the popularity and high levels of consumption of digital content prevalent in modern British culture (Tapscott and Williams, 2008), my course should have little difficulty in recruiting new learners. However, each year my course struggles to meet its target. After repeatedly experiencing the same annual participation patterns, I began to question why.

Several academics and funding bodies have raised concerns regarding declines in participation in computing/ICT related courses both domestically and internationally (Howard and Atkins, 2006; Jones, 2009). A series of Statistical First Releases from the Learning and Skills Council reported a significant national decrease in the number of learners participating in ICT between 2002/03 – 2006/07 (Learning and Skills Council, 2006). In Australia, Koppi et al. (2008) linked declining participation to falling entry requirements and the downsizing of ICT in HE. Jacobs and Sewry (2009) observed a significant decrease in participation in tertiary level computer science and IT related courses in South Africa and internationally after the dot-com crash of the early noughties.

Between 2001 – 2006 Livingstone and Hope (2011) noted a 43% decline in participation in A-level computing and a 50% decline in applications for computer-related courses in HE between 2006 – 2011. Wells (2012) cited figures from the Royal Society (2010) that estimated from 2003 – 2010 a 60% decline of learners that obtained an A-level in computing. Wells (2012) also highlighted a 43% decline in the number of learners taking ICT at GCSE from 2006 – 2011. It appears that falling participation in computing/ICT related courses is a significant issue in post-compulsory education, especially in FE. The Higher Education Funding Council for England (HEfCE) Analytical Services Group (2011) released a dataset titled 'Strategically Important and Vulnerable Subjects' in which the number of entrants into HE had been recorded and tracked over a decade beginning in 2003. The dataset revealed significant declines in some HE subjects. One of the most worrying declines showed that applications for computer sciences had fallen by 49%. Likewise, other computing/ICT related courses were experiencing declines. Applications for electrical and computer engineering had fallen by 19% while engineering and technology applications had decreased by 5%.

In contrast applications for arts and media-related subjects had increased between 2003 and 2013; design and creative arts rose by 13%, and media studies had increased by 24%. The issue of falling participation is not related to learner avoidance of scientific subjects. Over the same period, entrants into biosciences, chemistry, chemical engineering, mathematics, pharmacy and pharmacology, physics and mechanical, aero and production engineering had risen between 21% to 124% respectively. Falling participation in computing/ICT related subjects is of acute significance in post-compulsory education.

There is little academic literature about subject choice in the 16 - 19 sector; the majority of research focuses on compulsory and HE. The majority of existing research about computing/ICT subject choice has traditionally focused on learner perceptions and experiences of digital content and technologies in the classroom (Tripney et al., 2010) resulting in explanations of learner rationales that are often limited to general accounts of the following: gendered likes and dislikes of computing/ICT and negative perceptions of self-efficacy and subject relevancy. However, many of these explanations are not exclusive to computing/ICT, similar learner rationales can be found in the subject choice literature of many other educational subjects (Brown, 2001; Courtney et al. 2006; Crosnoe and Huston, 2007; Bevins et al. 2008; Anderson et al. 2008; Gorad, 2008; Jones, 2009; Reid, 2009;

Tripney et al., 2010). Therefore, none of the computing/ICT, subject choice rationales sufficiently explains the fluctuations and declines in levels of participation.

Additionally, of the stated explanations, I find the phrase 'subject relevancy' to be of particular concern. Once again I draw the readers' attention to high levels of digital content consumption among learners mentioned earlier in this section (Hull and Schultz, 2002; Sefton-Green, 2004; Tapscott and Williams, 2008; Ito et al. 2010; Dutton and Blank, 2011; Peppler, 2013). I find it striking that some of the subjects most closely related to digital-making are deemed irrelevant by many learners. Elsewhere in 16 - 19 subject choice research explanations of learners' choices take the form of specific theoretical models that are difficult to apply outside of their original settings (Annetta et al. 2008). Much of the existing body of research on the factors and models that affect subject choice do not sufficiently explain the recent decline in participation in computing/ICT related courses, especially within FE.

1.2 The thesis parameters, core focus and statement of research questions

There are, for obvious reasons (given we can never know what the future holds), very few studies of the actual process of becoming makers, and few studies of following makers in a sustained fashion over longer periods of time (Sefton-Green, 2013, p. 27)

Above all, it seems as if we don't have much evidence following learning across sites and within communities with any but the most obvious idea of how to describe progression in creative making. Whilst most of our understanding of making is retrospective, this will remain a gap in the knowledge base. We do know that only a very small proportion of young people are involved in sustained and developed creative activities. We don't know enough about who these young people are (in social terms), and we also don't know enough about the interrelationship of at home, informal and formal educational drivers. (Sefton-Green, 2013, p. 34)

Above, is an extract from a report entitled 'Mapping digital-makers: a review exploring everyday creativity, learning lives and the digital' by Sefton-Green (2013). In the context of this thesis, sustained and developed creative activities are defined as digital-making: the practice of learning about technology through making with it Quinlan (2015). A digital maker is a person (regardless of age) that constructs digital content. In literature the terms digital content and digital media are used interchangeably, for example in the quotation below the word 'content' could replace the word 'media' without changing its meaning:

Any media created, edited, or viewed on a computer, such as text (including the hypertext of a web page), images, sound, video (including animation), or virtual environments, and combinations of these (i.e. multimedia).
(Berry, 2013, pp, 27)

As a caveat, I would like to expand the phrase 'viewed on a computer' to include any type of electronic screen technology capable of displaying digital content. For instance, a tablet, a mobile phone, a hand-held games console or even a holographic, augmented, or virtual reality visor. Much existing research in computing/ICT course choice concerns learners' uses of digital content and technologies within formal education (McCrone et al. 2005). With the continual rise of home and personal ownership (Dutton and Blank, 2011) and the consumption of digital content prevalent in modern British culture (Tapscott and Williams, 2008) this may no longer be the case. The majority of learners may now have more experience with digital content and technologies outside of formal classroom-settings (Hull and Schultz, 2002; Sefton-Green, 2004; Ito et al. 2010; Peppler, 2013). Nonetheless, I find the word 'culture' quite problematic especially when associated with the word 'digital' as implied in the term 'modern British culture'. There are numerous descriptions of digital culture in academic literature, which often include different political, economic, social and psychological connotations (Silver, 2004; Deuze, 2006; Gere, 2009; Perlow, 2011). There is no definitive consensus as to the constitution of digital culture (Hand, 2008). As such, digital culture is too broad a term for investigation and must be narrowed.

Drawing on empirical and theoretical research located in new media and social theory, Deuze (2006) defined digital culture as a 'conceptualised, underdetermined praxis' consisting of three principal components: Participation, Remediation and Bricolage. I have annotated the three key components as:

- Participation: the production of digital content;
- Remediation: the conversion of old media into digital content;
- Bricolage: the remixing of digital content into new forms.

I suggest that the three principal components are only descriptive of the production of digital content. Thus, participation, remediation and bricolage (Deuze, 2006) are also the principal components of digital-making. Therefore, digital culture is a reference to digital-making that occurs in online and offline informal settings, outside of the classroom. In the context of this thesis, digital-

making occurs everywhere including formally within the [compulsory and post-compulsory] classroom and informally in online or offline informal settings outside of the classroom. For the sake of clarity, I will refer to digital-making within formal settings as the classroom-setting and digital-making in informal settings as the home-setting. Using the notions 'New Media Objects' (NMO) (Manovich, 2002) and 'Remediated' (Deuze, 2006) Media Objects (RMO), I will expand the definition of the term digital content (Berry, 2003). In their simplest forms, NMO are image, video and audio files that may also contain text and hypertext. However, it is possible to combine these simple files into more complex forms such as interactive digital content capable of facilitating programmable instructions and navigable spaces, for instance, a website, computer game or software program. In the earlier definition of digital media provided by Berry (2003), the word 'media' is a reference to audio-visual information. From this point onwards, when I mention 'digital content' it will be inclusive of the audio-visual information contained within a binary code file itself. I will discuss these issues in much greater depth during section 3.1 of this study.

Users or in the context of this thesis learners are able to access and interact with NMO via screen-based Graphical User Interface (GUI). Learners can use NMO to create, modify, store, delete and/or distribute more NMO of any kind. RMO describes non-interactive print and broadcast traditional media (Kayany and Yelsma, 2000) that have been converted into an electronic form. RMO (Deuze, 2006) are also accessed through a GUI. It is important to note that both NMO and RMO contain audio-visual information. The value of digital content for the learner resides primarily in its information and not necessarily in its display medium.

Therefore, to the learner within informal settings outside of the classroom, there is little difference between NMO and RMO because both are accessed through GUI. Nonetheless, the study of each is covered by separate educational courses. The study of NMO typically occurs in computing/ICT related courses, where the development of production and programming skills is the principal focus of the curriculum (Gove, 2012). The study of RMO takes place in culturally related courses for instance media studies, which place the development of analytical skills at the core of the curriculum (Buckingham, 1998).

My research will focus on the FE courses in which the study of digital-making is the dominant or fundamental focus of the curriculum, such as ICT. I will also investigate cultural courses within FE,

for example, art and design and media studies in which digital-making was not the original focus of the curriculum. All the same, on such courses, the study of digital-making particularly the production of digital content are of rapidly growing importance and prevalence; to the point that their absence would be impractical and detrimental for the progression of learners.

Consequently, I find that the term computing/ICT related courses is too narrow and excludes cultural subjects like media studies and art and design, in which I consider the study and production of digital content to share similarities with computing/ICT due to the presence of digital-making in the curriculums of each (Manovich, 2002; Office for Standards in Education, 2011a; Computing at School Working Group, 2012; Royal Society, 2012). For the sake of clarity, I will refer to the associations between courses that concern digital-making using an umbrella term that I have coined as the Digital-Making Curriculum (DMC). The DMC is an unwritten curriculum that encompasses the practices regarding the production, analysis, consumption and distribution of digital content.

1.2.1 Working definition of the DMC

I begin the definition of the DMC as a plan that will determine the educational experience (Ende and Davidoff, 1992) of digital-making; in courses where digital-making is the dominant or fundamental focus of the curriculum'. Generally, there are two broad schools of thought regarding curriculum design these being the teacher-centred curriculum and the learner-centred curriculum (Nunan, 1988; Elen et al. 2007 Bostock and Wood, 2012). Ende and Davidoff (1992) favour the learner-centred curriculum.

Curriculum development, according to the experiential model, takes place as a deliberative process (17) in which all stakeholders are involved. The stakeholders— faculty, residents, and support staff must identify, first in general terms and then with increasing degrees of specificity, what they value most in residency training. They must bring their educational values to the table, find common ground, and then choose among the types of experiences they believe will truly reflect these values. (Ende and Davidoff, 1992, p. 1056)

In the learner-centred curriculum, the learning experience is a model of progression designed to lead learners from general to specialised knowledge and skills. All stakeholders contribute their views as to what experiences should be included, based on what they perceive to be of most benefit to learners. The learner centred curriculum is constructed from the bottom up. Learners can communicate their experiences and expectations to curriculum makers and tutors are better informed

regarding learners' previously acquired knowledge and skills. Thus, the likelihood of fostering more meaningful learning experiences increases. It is important to state that the curriculum is not driven by learners' experiences and expectations, instead it is informed by them. Tutors still bear the responsibility for facilitating and supporting the progression of learning especially where gaps in learner's knowledge and skills are identified.

However, the viability of the learner-centred curriculum is dependent on two factors that are only implied in the above quotation. First is the need to theorise and generalise the experiences and expectations of learners. Second, is the need to have the progression of learning driven by problem-solving. Both factors indicate that a significant portion of learning through problem-solving occurs in environments outside of the classroom. Learning within these informal environments appears to foster meaningful learning experiences because learners must engage in reflection to progress their learning. Tutors are then responsible for stimulating reflection:

Experiential learning usually takes place in a social context and depends on the nature of the experience, the skill of the teacher in stimulating reflection, and, of course, the characteristics of the learner for successful assimilation. Previous knowledge is critical—one cannot think about things one does not know—but knowledge in this model of learning is not so much received as discovered. In sum, clinical learning is "experience examined."
(Ende and Davidoff, 1992, p. 1056)

The most difficult aspect of replicating learning from informal settings within the classroom is that of social interaction. Despite the obvious obstacles of the classroom much can be overcome through the social interaction between tutors and learners. It is within these interactions that tutors can use their knowledge and skills to stimulate reflection in learners, especially regarding a problem that learners have not yet experienced or have struggled to solve.

Harland (2003) provides an example of a curriculum in the field of zoology that used a form of problem-based learning (Savin-Baden, 2000) in conjunction with the Zone of Proximal Development (ZPD) learning theory [discussed later in section 1.4.2]. The aim of problem-based learning is the development of relevant knowledge and metacognitive skills in learners that will lead to improvements in learning and the solving of problems (Harland, 2003). In problem-based learning, the focus of the curriculum is on the presentation of problem scenarios to learners instead of subjects to be completed (Savin-Baden, 2000). Learners are not expected to follow a predetermined series of correct answers (Savin-Baden, 2000) Instead learners must assess the scenario and their existing knowledge then

decide what information and skills need to be learnt (Savin-Baden, 2000). The ZPD (Vygotsky, 1930-1934/1978) was used as a method of structuring teaching and learning and collaboration between tutors and learners (Harland, 2003).

Whether or not the DMC follows the Harland (2003) example is yet to be determined. Providing learners with a series of problems of increasing difficulty will require careful thought. This is because digital-making will vary according to the genres of production of each DMC course. For example, an Art and Design learner may use Photoshop to produce a digital painting. An ICT learner may use the same software to create an animated banner for a website. The difference here is not necessarily in the tools of production but rather the audio-visual information held within the digital content. Furthermore, much like the shape of the learning progression in the learning-centred curriculum, which funnels learners from general to specialised experiences, the DMC has also evolved from general to specialised experiences. In its early form, the DMC existed as scattered elements and subsets of academic subjects within various teacher-centred curriculums. In its fourth and current form, the DMC more closely resembles the learner-centred curriculum discussed in this section. However, the DMC is still unwritten making its perception of its existence difficult without careful explanation.

In summary, the DMC is an evolved curriculum which is a term that I have coined. The DMC is not the product of a single design and it was not created by a single author or group. It is a unique form of learner-centred curriculum that currently exists in an unwritten state. The evolution of the DMC is not random or without purpose, its ability to adapt and survive is driven by the goal of fostering more meaningful learning experiences through problem-solving when engaged in digital-making. This is signified by the progression of the DMC away from the teacher-centred curriculum towards the learner-centred curriculum. In each of its four generations, the DMC expanded its scope to include learners that were unable to participate in the previous generation. However, in its fourth and current generation, the third space (Bhabha, 1994/2012; Soja, 1996; Gutierrez, 2008; Potter and McDougall, 2017) there is now a need to examine the DMC considering the fluctuating learner recruitment trends discussed in section 1.1. The third space has the potential to attract more learners to DMC courses than all its previous generations and yet, it has struggled to do so. A better understanding of the third

space can be found in the comprehension of the relationship between learners and digital-making in formal and informal settings.

1.2.2 Research questions and gap in literature

In section 1.1, I mentioned the gap found in the subject choice literature regarding the oversight in the shift of settings in which learners experience digital content and technologies. This gap is indicative of the space in which this thesis will make its contribution to knowledge. The influence of learners perceptions and experiences of digital making in formal and informal settings (Sefton-Green, 2013), especially in 16 – 19 education, is under-discussed and undertheorised in subject choice literature. I find that there are facets of the situation, which warrant further investigation. Digital making is a field still in its infancy and there is much to be investigated and learnt about the learners that participate in it (Sefton-Green, 2013). Indeed, in section 1.2, the Sefton-Green (2013) quotations raise several salient issues concerning the lack of attention paid to the understanding of digital makers. Many of these issues also coincide with my investigation of the DMC. The first research question is will be:

1. What constitutes the Digital Making Curriculum (DMC)?

This question will address the following gaps in literature: “very few studies of the actual process of becoming makers” (Sefton-Green, 2013, p. 27). In the previous section, I mentioned that within the learner-centred curriculum the progression of learning resembles the shape of a funnel. Through problem-solving learners progress from general to specialised experiences of digital making. In short, the progression of learning within the DMC also documents the process of becoming a digital maker. “Situating young people in creative communities would seem a sensible way to understand how individuals do and do not progress.” (Sefton-Green, 2013, p. 34). Furthermore, by investigating the problem-solving approaches used by learners when engaged in digital making it is possible to identify different types of digital maker, which will lead to a more nuanced understanding of why some learners progress within the DMC and why others do not or choose not to participate at all. In short, the progression of learners within the DMC is in large part dependent on their choices, hence the second research question:

2. How are learners' choices within this curriculum influenced by their experience of digital making outside school (or in informal spaces)?

This question will address the following gaps in literature: "We don't have much evidence following learning across sites and within communities with any but the most obvious idea of how to describe progression in creative making" (Sefton-Green, 2013, p. 34). "We don't know enough about who these young people are (in social terms), and we also don't know enough about the interrelationship of at home, informal and formal educational drivers" (Sefton-Green, 2013, p. 34). Commentators such as Prensky (2001a & 2001b) have propagated the meme of the digital native/immigrant. Prensky (2001a & 2001b) claims that young people have an innate affinity or even expertise for the use of digital technologies and the production of digital content by virtue of being immersed in a digitised society since their early childhood. Prensky (2001a & 2001b) also claims that as a result of their experiences outside of education digital natives are incompatible with the classroom teaching methods of their digital immigrant teachers. The controversial notion of the digital native (2001a & 2001b) has influenced many other commentators some of whom have called for changes in the teaching of digital technologies to young people (Prensky (2001a & 2001b; Merrin, 2009; Gauntlett, 2009 and 2014).

The digital native/immigrant meme aligns with the simplistic explanations of learners' perceptions computing/ICT expressed in subject choice research (see section 1.1). The problem with such explanations and memes is that both treat the identification of symptoms such as "gendered likes and dislikes of computing/ICT negative perceptions of self-efficacy and subject relevancy" as the root causes of learner dissatisfaction with the teaching and learning of digital making in formal education. To answer the research question, one must investigate in depth learners' actual early childhood experiences of digital technologies both inside and outside of education. This question will focus on learners informal experiences outside of education, the next question will focus on learners formal experiences inside of education. The answers to questions two and three will form a much more nuanced understanding of how the teaching and learning of digital making operate inside and outside of education (Sefton-Green (2013).

3. How are learners influenced by their prior experience of digital making in school?

This question will address the following gaps in literature: “very few studies of following makers in a sustained fashion over longer periods of time” (Sefton-Green, 2013, p. 27). “Most of our understanding of making is retrospective, this will remain a gap in the knowledge base.” (Sefton-Green, 2013, p. 34). Typically, investigation of the prior influence of digital making in school has involved asking experienced creative professionals to recall their childhood experiences (Ito et al. 2010; Rowsell 2013 and 2015). In contrast, I will be asking learners about their past and current experiences of digital making in school and college. Many of the learners will be between 16 and 19 years of age, recollection of their experiences of digital making in school will be more recent in comparison to the recollections of creative professionals. Learners’ recollections of digital making in school will provide a background of understanding that will aid in the contextualisation of their current digital making experiences. Tracing learners current digital making experiences back to their origins will aid in the formation of a more nuanced understanding of the underlying drivers of learners’ digital making identities. A nuanced understanding of learners’ identities as digital makers, will also aid in answering how learners make decisions and solve problems within the DMC. The fourth research question will be:

4. What are learners’ rationales for and against participation in DMC courses?

This question will address the following gaps in literature: “We do know that only a very small proportion of young people are involved in sustained and developed creative activities” (Sefton-Green, 2013, p. 34). “We also don’t know a great deal about what triggers participation, nor why some young people might drop out of such trajectories and some continue. More research is needed to explore catalysts and disconnects in young people’s lives”. (Sefton-Green, 2013, p. 34). This question directly relates to the difficulties in learner recruitment that I discussed in section 1.1. In many ways, the rationales of students for and against participation will be visible in research question two and three. Learners will not be aware of the DMC nor will they be able to succinctly describe their relationship with it. This does not mean that learners have no relationship at all with the DMC. Therefore, the answer to this question must be interpreted by the researcher from the responses of

learners. It is anticipated that learners will cite reasons such as further study, future careers, accessibility, perceived self-efficacy and enjoyment (Tripney et al., 2010). However, such rationales are commonly cited in the subject choice literature and in section 1.1, I expressed my dissatisfaction with such rationales, hence the need for the interpretation of learner responses.

The issues raised by Sefton-Green (2013) also contain the answers for understanding the third space of the DMC. Primarily this thesis is about learners and improving learning experiences of digital making in DMC courses. However, the main beneficiaries of my thesis will be other academics, tutors and curriculum makers that are seeking a better way to foster more meaningful learning experiences on courses that predominantly prioritise digital making in their curriculums. The dissatisfaction of learners mentioned in section 1.1 is indicative of the need for a new understanding of learners' relationships with digital making inside and outside of education. The benefit of a new understanding will potentially lead to increased learner recruitment, retention and progression in DMC courses, thereby resolving the problem that inspired this thesis

1.3 Introduction Summary

Concerning the research questions stated in section 1.2.2, the remainder of this chapter will address the theoretical backdrop to research question one: What constitutes the Digital-Making Curriculum? To fully address this question, the reader needs to understand the contextual and historical development of the DMC. It is important to state that DMC is a term that I have coined, I did not invent its historical development. In section 1.2.2. I stated that the DMC is an evolved curriculum it is not the product of a single design and it was not created by a single author or group. It is a unique form of learner-centred curriculum that currently exists in an unwritten state. To make the DMC, more visible and understandable for the reader its evolution needs to be carefully explained.

The first issue faced in the discussion of the DMC is that of its visibility to the reader. The DMC is not a written document and is not overtly visible. For the sake of clarity, the generations of the DMC signify moments of remarkable change regarding the direction of teaching and learning of digital-making. These changes of direction are of twofold significance; displaying the migration from computation and high-level programming towards creative digital production. Secondly, the generations show the simultaneous incorporation of digital-making in the home-setting, and the

presence of informal teaching and learning into formal curriculums, which increases in each generation.

The rise of digital-making in the home-setting brings balance to the DMC. The Constitution of the DMC would suffer if the imbalance continued. The breadth of the DMC would have remained narrow and inaccessible to many learners without a grounding in computation and high-level programming. Through increasing levels of incorporation, the DMC has expanded its scope and constitution in each of its generations. The historical development of the DMC introduces the reader to a curriculum that may otherwise have remained unseen. The DMC is present in the curriculums of subjects that prioritise the study, production, analysis, consumption and distribution of digital-making and production of digital content.

The relationships between learners, digital-making in formal and informal settings, and DMC courses are relatively unexplored. As such the research questions, are designed to reveal undiscovered phenomena that will explain the relationships in-depth, with interest given to the rationales for and against participation in DMC courses.

For instance, The DMC is the first original concept of this thesis. It is the first of the previously undiscovered relationships mentioned in section 1.2. It is more than a convenient term for the identification of courses concerned with the study of digital-making and production of digital content. The DMC also acts as a bridge between digital-making in formal and informal settings and the curriculums of DMC courses; enabling the comparison of learners' perceptions and experiences in both arenas. Throughout this thesis, I will define the principles and practices of the DMC in greater depth and detail. The DMC will be a central concept of this thesis. In the remainder of this chapter, I will explore the historical development of the DMC.

1.4 Digital-Making Curriculum (DMC) first-generation: scientific and business-related origins

The DMC has evolved over four generations spanning a period of approximately sixty years. Digital computers invented in the 1930s as a means of overcoming the information processing limitations of analogue machines fulfilled the wartime need for more efficient computation. Governments commissioned projects to advance the development of digital computers (Denning,

2017). Analogue machines were used to perform experiments, to test existing theories and hypothesise new ones. Through digital computers, scientists were able to accelerate the processes of experimentation and theorisation (Denning, 2017). Information processing systems rapidly increased the pace of development (Randell, 1974; Cortada, 2009). Many advances in computation and programming occurred in the fields of Physics, Engineering and Mathematics (Randell, 1974; Cortada, 2009). The US armed forces were instrumental in the development of digital computers for use in RADAR systems (Manovich, 2002). The UK military developed the Colossus mark one and two computers for cryptanalysis (Randell, 1974; Cortada, 2009). Scientists recognised that digital computers could be used to perform simulations which not only reduced the need for experimentation but also facilitated the discovery of new results that were not easily achievable using analogue machines.

Scientists who used computers found themselves routinely designing new ways to advance science. Simulation is a prime example. By simulating airflows around a wing with a type of equation (called Navier-Stokes) that is broken out over a grid surrounding a simulated aircraft, aeronautical engineers largely eliminated the need for wind tunnels and test flights. Astronomers similarly simulated the collisions of galaxies, and chemists simulated the deterioration of space probe heat shields on entering an atmosphere. Simulation allowed scientists to reach where theory and experiment could not. It became a new way of doing science. Scientists became computational designers as well as experimenters and theoreticians. (Denning, 2017, p.13)

At the end of the second World war in the mid-1940s, the development of digital computing was supported by the governments that commissioned the continued in Higher Education (HE) (Davies, 2004; Watson, 2006). The first computing lecturers were Engineers, Mathematicians and Physicists that taught computational thinking and science as sub-genres of Engineering, Mathematics, and Physics courses (Lee, 2004; Watson, 2006; Passey, 2014). Computational thinking and science concentrated on computation and development of high-level programming languages (Watson, 2006). To participate in such courses learners were required to possess advanced academic numeric knowledge (Lee, 2004) consequently, with such a high prerequisite access to the study of computational thinking and science was narrow. However, Denning (2017) challenges the notion of computational thinking:

The interest from educators is forcing us to be precise in determining just what computational thinking is. Most published definitions to date can be paraphrased as follows: "Computational thinking is the thought processes involved in formulating problems so that their solutions are represented as

computational steps and algorithms that can be effectively carried out by an information-processing agent.” This definition, however, is fraught with problematic ideas. (Denning, 2017, p.15)

Denning (2017) argues the ambiguity of words such as formulating, information agent, thought processes and thinking make it difficult to describe the type of teaching and learning activities involved in computational methods. Denning (2017) offers a more nuanced understanding of computational thinking:

All these difficulties suggest that the word “thinking” is not what we are really interested in—we want the ability to design computations. Design includes the dimensions of listening to the community of users, testing prototypes to see how users react, and making technology offers that take care of user concerns. Therefore computational design is a more accurate term. It is clearly a skill set, not a body of mental knowledge about programming. (Denning, 2017, p.15)

The above quotation is significant because it describes the type of problem-solving as a collaborative process that involves requires a contextual understanding. One simply cannot solve a problem without consulting the community of users for whom the solution is designed. Social interaction with others that possess a contextual understanding of the problem in question is a key feature of the DMC, it is how solutions are constructed this will be demonstrated during this thesis.

In further education, digital computers were not used for computational design as they were in HE. By the 1960s, governments across the world began to realise the economic benefits of stimulating the growth of the commercial uses of digital computers (Cortada, 2009). European governments particularly the UK were keen to compete with the US, where computing had become a lucrative sector of the economy (Cortada, 2009). The UK government devised protectionist policies, colloquially called the *‘infant industry’*, which incentivised the promotion, development, sale, and adoption of computing by local employers (Cortada, 2009). Employers used computing in two areas automated manufacturing process control and electronic data processing systems (Gensollen, 2007). The latter would have a profound effect on the future development of the digital-making curriculum in further education. Initially, the onus of retraining staff in the use of electronic data processing systems resided with employers. Accordingly, employers focused on their needs and did not teach employees the fundamental computation and programming concepts of computational design or software

engineering. Employers dissatisfied with the high costs of retraining staff and with government backing, employers blamed education for not providing a computer literate workforce (Davies, 2004).

In response to the criticism, Information Processing became a course. As no prior academic course existed to guide pedagogies and the curriculum; information processing replicated the business practices of electronic data processing systems (Lee, 2004). Technical colleges delivered Information processing on a part-time basis as learners were often company employees on day release schemes (Davies, 2004). Davies (2004) observed several commentators such as Wegner (1963), Hughson (1964), and Samet (1968) all of whom decried the business-oriented ethos of computer curriculums in technical colleges as 'ad hoc' and 'lacking in intellectual challenge'. The commentators also noted a disconnection with academic computer curriculums in universities which focused on numerical analysis. I suggest that the disconnection represented the beginning of the erosion of computation and programming skills within the DMC in compulsory and further education FE.

In compulsory education, the use of digital computers differed from that of both FE and HE. Between the 1970s and mid-1980s, in the UK the 'infant industry' struggled to challenge its US counterpart. American firms such as IBM and Xerox dominated the computing industry. Under this context, successive governments sought disassociation from the computing industry (Cortada, 2009). Governments discontinued bolstering economic growth via interventionist market policies and funding of private sector research and development. Instead, governments introduced strategic initiatives designed to increase the knowledge and use of computers in compulsory education (Bergen, 1996; Cortada, 2009). Governments intended to create a computer literate workforce that could compete with competitive post-industrial economies (Cortada, 2009). Digital computers like the BBC Micro began to appear in schools (Passey, 2014; Crick and Moller, 2015) often bundled with software capable of displaying a limited range of colours and sounds (Passey, 2014). Computation and programming taught as part of computer studies were popular subjects among learners (Crick and Moller, 2015). According to Brown et al. (2014) and Millwood (2014) the computing studies curriculum concentrated on:

In the 1980s, computer science was available in schools, under the name “Computer Studies”, which included hardware, logic, binary, programming and various other aspects of computers [Doyle 1988].
(Brown et al. 2014, p. 1:2)

...a theoretical and historical account of the development of computers, an analysis of their component parts, a sense of the wider societal use of computers and their applications, some skills in flowcharting and a small amount of programming.
Millwood (2014, p. 303)

However, the use of digital computers struggled to find an educational application outside of computer studies due to confusion regarding practical uses, associated pedagogies, and a lack of curricular guidance (Cortada, 2009). Aside from computation and programming, there were little else computers could do due to the limitations of software (Passey, 2014). The confusion manifested amid historical tensions between successive UK governments and educators. Both groups were engaged in disputes about the control and direction of compulsory education in the UK. The uses of computers in schools got caught in the crossfire of these disputes.

Martin (2014) recalls that in the early 1970s trainee teachers were introduced to research and pedagogies that promoted the idea of a learner-centred (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012), that encouraged learners to collaborate with their teachers in creating learning experiences. Some perceived computers as offering much potential for the realisation of the learner-centred curriculum. A group of politicians strongly disagreed with the idea of a learner-centred curriculum. The politicians perceived the encouragement of collaboration between learners and teachers as the views of ‘trendy educationalists’ responsible for declines in educational standards. Instead, the politicians thought that obligating schools to purchase and use computers in all subjects would improve standards. Teachers were expected to incorporate computers into their teaching with hardly any training or direction, causing the confusion among teachers mentioned above. To resolve the confusion, a series of policies were devised regarding the physical and curricular uses of digital computers (Millwood, 2014; Passey, 2014) the policies eventually coalesced in the formation of the National Curriculum in the Education Act of 1988 (Martin, 2014).

Within the National Curriculum, the uses of computers spread across every subject, with little attention to computation and programming (Martin, 2014). The specific study of computers now

referred to as Information Technology was not a discrete subject. Instead, IT was presented as a component of design technology, again with sparing emphasis on computation and programming:

Within the design technology subject of the national curriculum [8], five aspects of IT capability were identified: developing ideas and communicating information; information handling; modelling; measurement and control; and applications and effects.

(Passey, 2014, p. 135)

In 1989, further curricular guidance arrived in the form of the Curriculum Matters 15 report, (Her Majesty's Stationary office, 1989) which outlined seven curricular objectives for the study of Information Technology (IT) for 5 – 16-year-olds (Bergen, 1996). Rather than focusing on the numerical analysis and programming skills as in HE, or the teaching of specific business-related software as in FE. The curricular objectives sought to develop a set of general competencies based on the handling of information. Learners learnt how to use software, but had no insight into its production. Ironically, business-related software such as word processors, spreadsheets and databases proliferated the new curricular focus on information handling (Passey, 2014).

In 1997, an independent enquiry conducted by Lord Stevenson (1997) recommended the renaming of IT to Information and Communication Technology (ICT) in recognition of the communicative capabilities of digital technologies, the World Wide Web and mobile telephony. Even so, computation and programming remained marginalised. In the Education Act 2002 (The Stationary Office Limited, 2002), ICT became a mandatory subject in the national curriculum. Despite several reviews and reforms (Roberts, 2014), the original seven objectives of IT remained largely intact. Learners still had little insight into the methods of software production. To rectify the erosion of computation and programming within the National Curriculum, the minister for education announced his concerns regarding UK ICT education. His intention, to discard the national curriculum for ICT and replace it with a GCSE in Computer Science, with emphasis on the production of digital content via computation and programming (Gove, 2012; Computing at School Working Group, 2012; Roberts, 2014).

I am today announcing my intention to launch a public consultation on my proposal that the National Curriculum Programmes of Study and associated Attainment Targets and assessment

arrangements for Information and Communication Technology (ICT) in maintained schools in England should not apply from September 2012. There is a significant and growing base of evidence, not least from Ofsted inspections, that demonstrates that there are persistent problems with the quality and effectiveness of ICT education in schools. Evidence indicates that recent curriculum and qualifications reforms have not led to significant improvements in the teaching of ICT and the number of students progressing to further study in ICT-related courses is in decline. Furthermore, the ICT curriculum in its current form is viewed as dull and demotivating for pupils. (Gove, 2012, p.1)

In the first-generation of the DMC, digital-making concentrated on computation and development of high-level programming languages in HE and information processing in FE. In compulsory education prior to the National Curriculum digital-making initially concerned computer science. After the formation of the National Curriculum, the focus on computer science was replaced by information handling. Disjointedness characterised the study of the digital-making curriculum in post-compulsory education (Davies, 2004). Due to the pre-requisite knowledge needed to study the digital-making curriculum and the diverse destinations of each course. The disjointed nature of the DMC was an unforeseen consequence of the erosion of computation and programming the original common thread that linked the DMC curriculum at all levels of education.

With no common thread between the numeric and business courses of HE and FE and the generic information handling curriculum of compulsory schooling, learners could not easily follow the study of digital-making throughout education (Davies, 2004; Jones, 2009). Educators struggled to define the study of digital computers as a discipline. Computers were used pragmatically as tools to supplement learning in other courses (Passey, 2014). In HE computers supplemented mathematics, physics and engineering; in FE computers supplemented business studies and in compulsory education computers were used for general information gathering and handling. To study digital computing learners had to be adept in other academic courses. Digital computing occupied niche spaces in the upper echelons of these courses. Without such knowledge, digital computers would have been of little usefulness to learners. The erosion of the common thread in the first-generation of the DMC would accrete in the second, as the thread of the computerisation of arts and media culture.

1.4.1 Digital-Making Curriculum (DMC) second-generation: cultural transcoding

Manovich (2002) defines Cultural transcoding for digital content as the conversion of media and culture into electronic data structures and vice versa. Digital content exists in two interrelated spheres, one cultural and the other technical. Manovich (2002) referred to these spheres as the cultural layer and the computer layer. In the cultural layer, digital content is organised into formats interpreted by humans, for instance, a newspaper article. In the computer layer, digital content is organised into data structures and interpreted by computers, for example, binary code. The combination of both layers facilitates the formation of a new sphere, where the cultural and computer layers conflate and become diffuse.

The old media/cultural meanings and organisations of the cultural layer become remodelled in keeping with the 'ontology, epistemology and pragmatics of computers' in the computer layer (Manovich, 2002). The new sphere is one where the production, consumption and analysis of digital content are accessible via computer screens and Graphical User Interfaces (GUI) which according to Manovich (2002) act as facilitators of the computerisation of media and culture. The increasing sophistication of GUI facilitated changes in the perception of digital computers. From practical tools used to supplement other activities to filters and producers of culture. The Internet is a principal exponent of the cultural expansion of digital computing.

In the 1990s, as the Internet progressively grew in popularity, the role of a digital computer shifted from being a particular technology (a calculator, a symbol processor, an image manipulator, etc.) to being a filter to all culture, a form through which all kinds of cultural and artistic production is being mediated. As a window of a Web browser comes to replace cinema and television screen, a wall in an art gallery, a library and a book, all at once, the new situation manifests itself: all culture, past and present, is being filtered through a computer, with its particular human-computer interface. (Manovich, 2002, p. 75-76)

Via computer screens and GUIs, the traditional scientific exploration and commercial enterprise roles of digital computers were transcoded to include new cultural roles based on leisure, recreation, lifestyle, entertainment, and artistic production (Manovich, 2002). As implied in the above quotation the term cultural transcoding encompasses more than just the conversion of media and culture; it cannot occur without the production, consumption, and analysis of digital content.

The cultural transcoding of digital computing from its original scientific and commercial origins to its new artistic applications in wider culture is visible in the second-generation of the DMC; which focused on the understanding of digital tools and the digitisation of artistic workflow processes used in the production of digital content. Participation, Remediation and Bricolage (Deuze, 2006) the principle elements of digital-making entered the curriculums of both spheres of education, profoundly changing the nature of all courses.

Learners did not need to have any understanding of mathematics or programming. The software programs that learners used to create digital content contained GUI with digital tools, wizards, filters, and templates that replicated the physical tools and methods used in traditional artistic production. Many programs used visual metaphors to represent actions, for instance, a pair of scissors and a clipboard to execute cut and paste commands (Manovich, 2002; Sefton-Green, 2005). GUI circumvented much of the specialist programming knowledge needed to operate a computer (Schifter, 2008; Pepler, 2013). Digital computing became more accessible as new artistic subfields began to emerge (Brown, 2003), and computing/ICT acquired artistic influences.

The erosion of the common thread of the first-generation of the DMC had accreted in the second. Learners could study elements of digital-making within ICT, graphics, or media studies in compulsory education; and then progress to study a similar course in post-compulsory education. Notwithstanding, the accretion of the common thread was quite precarious, the emergence of 'digital-making' had little effect on the core curriculum of computing/ICT in HE, which remained heavily influenced by old academic fields (Davies, 2004).

Engineering and business organisational methods greatly influenced subjects such as Computer Science and IT, to the extent that computer engineering, software engineering and information systems became recognised courses (Davies, 2004; Watson, 2006). Similarly, 'digital-making' had limited effect on curriculums in compulsory education. In courses, such as ICT, the curriculum maintained its focus on its original seven pillars and general competencies based on the handling of information. There was still much debate regarding the uses of digital computing (Passey, 2014). These discussions would give rise to a critical community of commentators that would drastically affect the formation of the third-generation of the DMC.

1.4.2 Digital-Making Curriculum (DMC) third-generation: the critical community

The third layer of the DMC is remarkably different to the other two layers. It is the only layer in which, a critical community of commentators exists. There are no new courses in this layer instead; the third-generation constitutes the curricular debates that surround the emergent field of digital-making. The goal of the critical community is not the efficient production of digital content but the development of critical thinking regarding the creation, distribution, and appraisal of digital-making within formal settings within educational courses (Meecham, 1999; Mitchell, 1999; Buckingham, 2009 and 2010; Merrin, 2009; Gauntlett, 2009 and 2014). Critics at both extremes cite several arguments that decry the cultural transcoding of technical courses. For example, critics of computing/ICT argue that elements of digital-making in informal settings have seeped into computing/ICT at the expense of computation and programming the traditional focus of the curriculum (Office for Standards in Education, 2011a; Computing at School Working Group, 2012; the Royal Society, 2012). The seepage has resulted in curriculums of a low standard, providing little to no insight into the construction of software. Speaking at the McTaggart lecture 2011, Eric Schmidt the executive chairman of Google, stated:

I was flabbergasted to learn that today computer science isn't even taught as standard in UK schools. Your IT curriculum focuses on teaching how to use software but gives no insight into how it's made. That is just throwing away your great computing heritage.
(Schmidt, 2011)

In contrast, the curriculums of cultural subjects such as media studies are at a crossroads. Between those who insist on maintaining the traditional models of curriculum while acknowledging the new paradigms of digital technologies: and those who are seeking new models of curriculum based on the new digital paradigms (Gauntlett, 2009 and 2014; Partington and Buckingham, 2011; Merrin, 2014).

The rise of digital media, the transformation of 'old' media into a digital form and ongoing developments in digital technology take us into a post-broadcast era, defined by new alignments of productive and distributive power and media consumption and use. This requires an upgraded Media Studies 2.0, marked by the revision and updating of existing disciplinary knowledge;
(Merrin, 2009, pp 17)

While we do not support the facile proposals for "media studies 2.0" that have emerged in recent years, the disputes that such ideas have generated do suggest that the "key concepts" of the

media studies curriculum are by no means uncontested (for a critique of these debates, see Buckingham 2010) (Partington and Buckingham, 2011, pp 9)

Arguments such as these typify the debates of the third-generation. When examined in further detail, three narratives underpin the debates. The first narrative is a diminution of authenticity versus the increase of automation within the creative process. Here authenticity refers to learner control over the creative process and automation relates to the control of software programs over the same process. Automation advocates the partial removal of human thought and action from the creative process (Gere, 2009). In other words, software programs become co-producers (Peppler, 2013) in the productive processes associated with digital content. For the sake of clarity, the critical community is a term that I have coined. There is no formal recognition of the critical community outside of this thesis. Inclusion in the critical community is reserved for influential academics that frequently discuss the impact of digital-making in the DMC courses. The critical community is also open to non-academic commentators that make less frequent but highly influential contributions to debates regarding digital-making in DMC courses. I consider all the authors of the referenced in this section as members of the critical community.

The second narrative is a rudimentary knowledge of software versus a common knowledge of production. Automation cannot exist without standardisation (Christie, 1995) subsequently; software packages have inadvertently standardised digital methods of production. For example, the ubiquity of the shortcut commands, or ctrl + s to save and ctrl + o to open files. When new iterations of software programs are released, these commands remain. Learners become accustomed to the commands, and what I have termed as a rudimentary knowledge of software, (Manovich, 2002) which leads on to the third narrative, the reduction of autonomy in the creative process. As automation, standardisation and a rudimentary knowledge of software impinge human thought and action in the creative process. Learners become increasingly reliant on software programs for guidance. Complex algorithms, in the form of digital tools, wizards, templates, and filters provide scaffolding (Bruner, 1985) for learners through the creative process. Enabling the production of complex digital content that may otherwise be beyond the knowledge and abilities of learners. The notion of scaffolding derives from the Zone of Proximal Development (ZPD) learning theory (Vygotsky, 1930-1934/1978).

The distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers. (Vygotsky, 1930-1934/1978 p. 86)

In the context of the above quotation scaffolding is simply the term given to the strategies used to advance learning from the actual development level to the potential. Within all three of the narratives, the concern of the critical community focuses on the permanence of automation, standardisation and scaffolding in the creative process. The community asserts that there is nothing amiss with automation, standardisation and scaffolding as temporary measures designed to stretch or enhance the abilities of learners in the study of digital-making and production of digital content. Still, using increasingly sophisticated creative software these temporary constructs become increasingly permanent; at the cost of authenticity, creativity and expertise leading to deskilling in learners.

The three narratives essentially highlight the progression of digital software production towards efficiency, innovation and the inadvertent 'democratisation' of digital creativity (Hills, 2013); which has led to the increase of digital content production sans 'traditional hard coding' programming skills (Peppler and Kafai, 2007). To hold the inevitable progression of digital software as solely responsible for the erosion of programming skills within the DMC is slightly unfair. The erosion of programming skills is equally if not more so, attributable to the historical tensions between groups of politicians and educators mentioned in section 1.4. I am not negating the validity of the three narratives; I view each as the cost of progress. Yet, the effects of the three narratives have been amplified by the erosion. Aside from the limited efforts of local interests (Passey, 2014) and a small minority of curious and enthusiastic educators. The teaching and learning of programming skills never manifested within compulsory education as it did in HE and even in FE.

Until the recent introduction of the Computer Science GCSE (Gove, 2012), many learners' exposure to the digital-making curriculum lacked programming, the most fundamental means of producing digital content. Moreover, learners did not receive a sound grounding in the conceptual thinking associated with programming (Olivier, 2014; Millwood, 2014). Arguably programming is the sole form of production within the DMC that is native to digital computing. All other types of production within the DMC are replications or enhancements of non-digital creative methods; this is the purpose of creative digital software (Manovich, 2002). Learners' use of creative software mediates their relationship with the digital-making curriculum. Within the DMC the successfulness of producing

digital content is based on learners' digital and media literacies, their ability to understand and use creative software. Programming, while part of the DMC is not a necessary skill for many learners, this is also the case regarding digital-making in the home-setting:

A further enlargement of the number of the people publishing online (UGC – User Generated Content); the web has lowered the publication threshold, making it possible for everybody with a little technical competence to publish online. Indeed, new applications and services are making this even more simple, not requiring any programming skill, nor – in some cases – the mediation of a computer (a telephone can be sufficient)
(Cantoni and Tardini, 2010, p. 223)

The lowering of the publication threshold is clearly apparent online; learners need only possess a little 'technical competency' or in other words digital and media literacy to produce digital content. While the critical community (section 1.4) has no official responsibility for the integration or implementation of digital-making into curriculum, the community does wield much influence on the politicians and educationalists with such responsibilities. Nonetheless, the democratisation of digital creativity impinges the influence of the critical community. Democratisation is prompting new debates within the critical community, such as those mentioned at the start of this section (Gauntlett, 2009 and 2014; Partington and Buckingham, 2011; Merrin, 2014).

Regarding the new debates prompted by the democratisation of digital creativity, the critical community needs to re-evaluate its purpose and figure out how to extend its influence to digital-making in the home-setting. Otherwise, the influence of the community will be limited to policy makers and educationalists; the danger being that digital technology companies may rise and dominate the development and direction of critical thought regarding the creation, distribution and appraisal of digital-making within educational courses. Evidence of this is already visible in the influence exerted onto the government by digital technology firms and the shaping of the Computing GCSE curriculum by Microsoft, Google, and the Confederation of British Industry. In an interview with the BBC Prime Minister David Cameron said:

I think Eric Schmidt is right... we're not doing enough to teach the next generation of programmers. One of the things you hear from the businesses here in Tech City is "I don't just want people who are literate in technology, I want people who want to create programs", and I think that's a real wake up call for us in terms of our education system.
(Computing at School Working Group, 2012, p.2)

Digital technology companies act as gatekeepers and providers of digital tools and spaces in which digital content is constructed. Subsequently, digital technology companies can influence the construction of digital content in online and offline formal and informal settings, and this is a grave concern within the community (Partington and Buckingham, 2011).

1.4.3 Digital-Making Curriculum (DMC) fourth-generation: the third space

The fourth layer of the DMC is a Third Space (Bhabha, 1994/2012; Soja, 1996; Gutierrez, 2008; Potter and McDougall, 2017) which is unique when compared to the previous three layers. All previous DMC generations occur within formal education, classroom-settings only. The fourth layer is the first that takes place concurrently inside and outside of formal education. There are several definitions of third spaces in literature, each with slightly differing inflexions that change its constitution and purpose. For the sake of clarity, I will define how the third space functions inside the fourth layer of the DMC.

Third space theory originates from the fields of socioculturalism and postcolonial sociolinguistics; it is concerned with the identities of communities, through cultural performance and communication. Third space theory is vast and complex, many of its arguments are outside the remit of this thesis, for example, Oldenburg (1999) and Oldenburg and Brissett (1982). A thorough account of third spaces can be read elsewhere, (Oldenburg, 1989 and 1991; Bhabha, 1994/2012; Soja, 1996; Gutierrez, 2008). Instead, I will summarise the definitions of third spaces that are most pertinent to the fourth layer of the DMC.

Bhabha (1994/2012) is recognised as a major contributor to the development of Third Spaces. From a postcolonial perspective, Bhabha (1994/2012) argues that the relationship between indigenous and colonial structures and cultures exists within three spaces. The first space is that of the indigenous culture or the home. In the first space, the native people are free to articulate their cultural performances and identities through social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) as they see fit; without any intervention or interaction with others outside of their culture.

The second space represents the imposition of colonial structures and cultures, onto the indigenous cultures of the first space. These colonial structures tend to be official institutions such as workplaces concerned with politics, governance, law, religion, education, employment, health,

commerce, and trade (Bhabha, 1994/2012). The Colonials also impose the social mores of their cultures onto those of the indigenous. The native people of the indigenous culture must then abide, comply, and function in the second space as dictated by the culture of colonials and not their own.

The problem here is that of cultural difference: the point where two different cultures meet. It is here that misunderstandings between the cultures manifest (Rutherford, 1990; Bhabha, 1994/2012; O'Neal, 2007). The second space denies the natives the resources and affordances necessary for the articulation of their indigenous cultural performances and identities through social interaction.

Hence, unable to function in the second space, the natives of the indigenous culture create a third space (Bhabha, 1994/2012; Potter and McDougall, 2017). Here, the useful and productive aspects of the first and second spaces are repurposed into the articulation of new hybrid cultural performances and identities through social interaction. The natives function in a state of ambivalence retaining the essence of their indigenous culture but are also able to abide and comply with the structures and social mores of the colonial culture. Bhabha (1994/2012) states that the third space has no physical geographical location, it is then a metaphorical space (Potter and McDougall, 2017). However, Bhabha (1994/2012) acknowledges that some physical locations lean more easily towards being a first or second space.

From the perspective of critical geography, Soja (1996) further defines the notion of spaces as physical locations. Soja (1996) differs from Bhabha (1994/2012) by arguing that third spaces are not just metaphorical, but are also physical locations which influence the behaviours, social interactions, and identities of the people within. Soja (1996) argues that space is a social construct made of three components: Spatiality (first space), Historicality (second space) and Sociality (third space). Soja (1996) refers to the three components under the umbrella term the *Trialectics of Spatiality*.

Spatiality refers to the first space which Soja (1996) defines as a physical location, for example, a house school or church. The material characteristics of the first space are physically perceived and influence the behaviours, social interactions, and identities of the people within.

Historicity refers to the second space which Soja (1996) defines as being mental, cognitive, imagined, or representational. In the second space, the people within the physical location project their political, ideological, cultural, and economic discourses onto the conceptual, historical, and future

purposes and uses of the space. Consequently, the second space is imposed onto the first space albeit mindful of the characteristics of the physical location.

Sociality refers to the third space which Soja (1996) defines as 'a fully lived space, a simultaneously real-and-imagined, actual-and-virtual locus of structured individuality and collective experience and agency'. In short, the third space is the combination of the first and second spaces. Thus, third spaces are simultaneously real and imagined. The third space is then a hybrid of, the experiences of life within physical locations mediated through the discourses of the people within.

From a sociocritical literary perspective, Gutierrez (2008) further develops the notion of the third space as lived experience. Using the example of migrant students within the education system of their new country; Gutierrez (2008) likens the third space to the zone of proximal development (Vygotsky, 1930-1934/1978) used to connect the experiences of the past, present, and future. Here, the first space contains the past experiences and identities of the students, for example, their indigenous language and culture and their previous education. The second space contains present experiences, in short, the everyday lives of the students in their new country. For the students, this inevitably involves their experiences in the education system of their new country. Like Bhabha (1994/2012), the imposition of the second space onto the first may hinder or constrict the students' progression within the education system; by disregarding or misunderstanding their past experiences and identities. Therefore, in the third space, the past experiences of students are remediated into their current everyday lives to produce emancipatory resources for immediate use or future actions, thereby forming nuanced lived experiences that are not bound to the binary locations of home and school. (Gutierrez, 2008; Potter and McDougall, 2017).

My rationale for discussing three different definitions of the third space; is that within the fourth layer of the DMC, the third space operates as a conflation of each. It is simultaneously a metaphoric space (Bhabha, 1994/2012), a physical location (Soja, 1996) and lived experience (Gutierrez, 2008). In the context of the fourth layer of the DMC, the home-setting is the first space, where informal digital-making is situated. Like Bhabha (1994/2012) in the home-setting learners articulate their cultural performances and identities as digital-makers (Bhabha, 1994/2012). In the home-setting, much of digital-making is driven by the personal interests of the individual learner

(Bhabha, 1994/2012). However, digital-making, in the form of homework or coursework from a DMC course may also be conducted. The home-setting is not limited to the physical locations of learners' homes but includes any informal public or private physical location outside of the classroom that facilitates digital-making, for instance, a cafe. Nonetheless, except for learners' actual homes, the spatiality of physical locations (Soja, 1996) in the home-setting is relatively weak because digital-making is a virtual activity. The articulation of cultural performances and identity is strongest in the actual home of the learner; because, it is here that the learner, has the most autonomy over the production and display of digital content. Instead, spatiality emanates from the virtual environments frequented by the learner (Soukup, 2006). Social interactions in the home-setting are often initiated by learners seeking the advice of feedback on their work, from like-minded others with comparable or greater knowledge and skill of digital-making. Many of these social interactions occur online within virtual environments and contribute towards the spatiality of the home-setting.

The classroom-setting: the second space of the fourth layer, refers strictly to educational institutions in which digital-making courses are taught formally. In the classroom-setting, learners encounter formal articulations of cultural performances and identities; as defined by the curricular objectives of their chosen DMC courses. Within, the classroom-setting formal articulations take precedence over the learners' informal articulations, like the imposition of colonial structures onto the indigenous culture (Bhabha, 1994/2012). Consequently, digital-making in the classroom-setting is driven by curriculums. Thus, the learners' experiences of digital-making in the home-setting becomes, historicity in the second space as do their experiences of digital-making in their previous education (Soja, 1996). Historicity also includes the pedagogies, experiences, knowledge and skills of their tutors and the DMC curriculum. However, historicity does not overwrite spatiality instead both operate simultaneously. The spatiality of the classroom-setting is much stronger in comparison to the home-setting. This is because the classroom-setting is purpose-built for teaching and learning; furthermore, learners are well acquainted with their expected roles and behaviours within the classroom setting. Social interactions in the classroom-setting are initiated by learners and tutors often in accordance with curricular objectives; concerning the giving and receiving of advice and feedback of digital content produced by learners. The effect of spatiality and historicity simultaneously operating in the classroom-setting; is the reduction of learner autonomy regarding

digital-making. Many learners are content with the reduction but expect a vast improvement in their digital-making capabilities, in return.

The third space of the DMC fourth layer is a hybrid of the home and classroom settings. The articulated cultural performances and identities of learners as digital-makers; are remediated according to the curricular objectives of their chosen DMC courses, via physical and digital social interactions between tutors and learners (Gutierrez, 2008). It is important to note that within the home-setting, learners on DMC courses may also engage in social interactions with other digital-makers; that possess comparable or greater knowledge. DMC learners may then also utilise these social interactions within the classroom-setting. Thus, through social interaction, DMC learners gain 'fuller lived experiences and understandings' of digital-making in the home and classroom-settings. Therefore, the sociality, (Soja, 1996) of the third space emerges from these social interactions and the resultant remediated articulations of cultural performances and identities of learners as digital-makers can only exist in the third space. Thus, the third space itself is co-constructed by learners and tutors, as such, it is the first-generation of the DMC that concomitantly facilitates digital-making in the home and classroom settings. Consequently, the third space presents tutors and learners with radical challenges unencountered in the previous layers of the DMC.

1.4.4 Digital-Making Curriculum (DMC) Summary

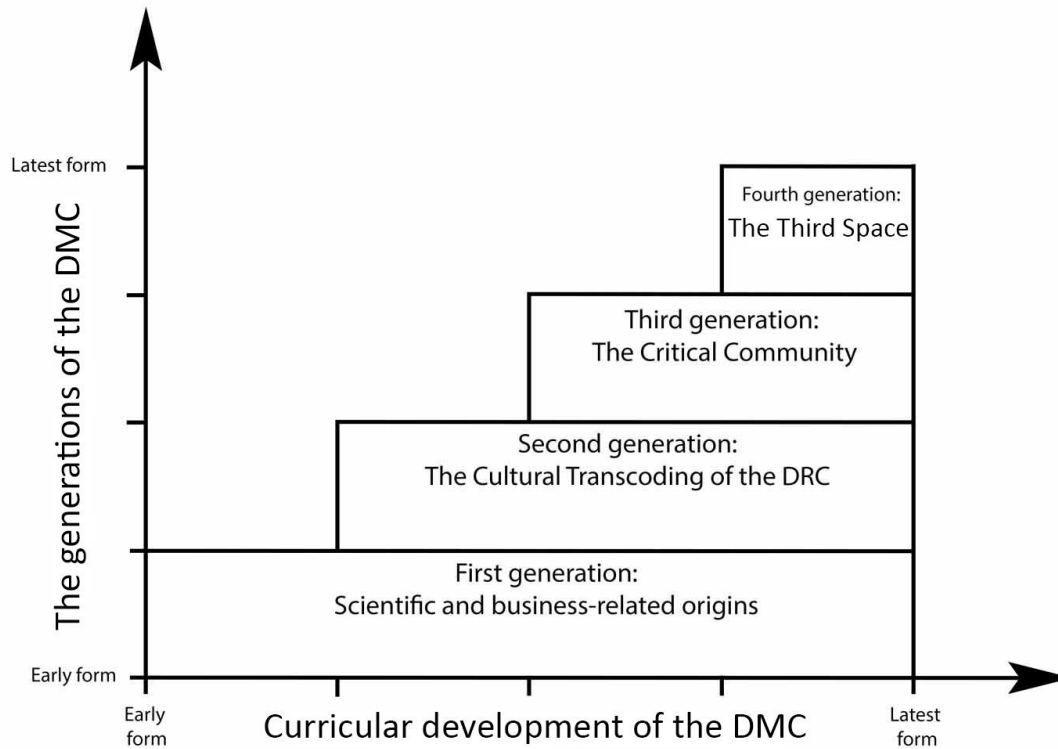


Figure 1: The historical development of the Digital-Making Curriculum

The DMC is a four-layered system that extends across all three tiers of education, compulsory, FE and HE. The layers do not replace each other but rather sit alongside. The DMC consists of two spheres one in which technical courses are located such as computing/ICT the other in which cultural courses are located such as media studies. The technical and cultural spheres of the DMC are linked together by the presence of digital-making in curriculums. However, much of the DMC is disjointed with the addition of each new layer the DMC becomes increasingly multifaceted and moves further away from its earliest form. The provision of courses skews heavily towards post-compulsory education. Yet, it is hard for learners to progress from one sphere to the other at higher levels of education as the skills required for each level greatly differ. Ironically, the presence of digital-making in both spheres suggests that the curriculums are converging into a new sphere that resembles neither. The heated criticisms of computing/ICT and media studies in section 1.4.2 may serve as a testament to such convergence (Schmidt, 2011; Partington and Buckingham, 2011; Gove 2012; Computing at School Working Group, 2012; Gauntlett, 2009 and 2014; Merrin, 2014).

Even so, the DMC suggests many courses current curriculums and pedagogical approaches regarding digital culture needs to change. The layers of the DMC vie with each other for pre-eminence and control of future curriculum development and direction. Evidence of this struggle is visible in the differing approaches to the third space and the other layers towards digital-making. The recent resurgence of computation and programming within formal curriculums encourages learners to retain the knowledge needed for digital-making. In doing so, learners may become empowered and generate new forms of digital-making independently and collaboratively. In contrast, within the third space, digital content can be produced without any programming skill. Increasingly powerful, sophisticated, and modular creative software packages will retain the practical knowledge necessary for the building of digital content. Learners may not necessarily need to keep this knowledge. Instead, learners need to develop a critical understanding of the content produced by such creative software.

The tensions between the formal and informal layers of the DMC also extend the support, tracking and assessment mechanisms that measure the progress of learning. The formal layers of the DMC contain well-established structures that provide assurance and stability for its learners. For example, tuition from a qualified professional tutor, access to expensive creative software, a qualification that provides credible proof of learning and ability and the opportunity to converse and collaborate in person and real-time with like-minded others. These mechanisms are designed to support learners of all abilities and levels of interest.

In comparison, the third space can only attempt to recreate the structures found in the other DMC layers. In many instances when such structures are present within the third space it is due to formal education extending its reach into informal settings. Notwithstanding, the third space was never intended to augment formal education, but rather it is a setting that facilitates the free exchange of ideas. To some degree, the free exchange of ideas is incongruous within formal education. Curriculums may reward some ideas and discourage others; curriculums may also struggle to keep pace with the rate of new ideas produced in the third space. The third space appeals to individuals seeking the freedom to participate and engage in bespoke forms of digital-making. The increasing appeal of the third space is prompting some of the debates within the critical community.

Which raises the question: why is the critical community not part of the third space? In section 1.4.2, I stated that the purpose of the critical community did not include the construction of digital

content. Consequently, the critical community does not engage in social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with learners on DMC courses. The DMC courses of the future may differ greatly in their constitution due to the tensions between its formal and informal components. Some courses may focus on teaching analytical rather than technical skills as implied by the critical community. Other DMC courses may do the opposite and emphasise technical skills over the analytical. Both potential outcomes for the DMC raise the issues of who will create the software of the future? Moreover, what will become of digital creativity?

Chapter Two: The Learning Theories of the Digital-Making Curriculum (DMC)

2.1 The tensions at the core of the Digital-Making Curriculum (DMC)

In the previous sections, 1.4 to 1.4.4 I discussed the historical development of the Digital-Making Curriculum (DMC) with the purpose of making it visible to the reader. In this chapter, I will continue to address the theoretical backdrop to research question one, of section 1.2. I will discuss the development and operation of teaching and learning within the DMC in each of its generations. The discussion will also make the DMC more visible to the reader. Once again, I recognise that elements of the following discussion will overlap into the other research questions. Still, my attention remains on research question one.

The purpose of the discussion in this chapter is to give the reader an understanding of how informal and formal methods of teaching and learning co-exist inside the DMC. Chapters one and two give the reader a grounding in the constitution of the DMC. Without this grounding, the reader may not comprehend the relevance of the subsequent research questions stated in section 1.2. The answers to the remaining research questions two, three and four are only significant in the context of the DMC as discussed in chapters one and two.

The internal tensions at the core of the DMC derive from the larger philosophical debate between different interpretivist and objectivist views concerning the understanding of reality (Morgan and Smircich, 1980; Gasson, 2003; Gray, 2004). This discussion manifests in education as arguments regarding whether the social or universal construction of knowledge is the best mode of learning. The arguments appeared in section 1.4.2 as the curricular power struggle for the control of compulsory education, between educators in support of a learner-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012), and politicians favouring a universal/teacher-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012). As I mentioned in the same section, the uses of computers in school got caught in this clash of opinions, and the DMC is not exempt from the power struggle.

It is important to restate that the DMC consists of four generations these being: The scientific and business-related origins, the cultural transcoding of the DMC, the critical community and the current generation of the third space. Each of the three previous generations of the DMC operated with a corresponding and dominant learning theory these being: Behaviourism (Skinner, 1953, 1968; Wilson and Myers, 2000), Constructivism (Piaget, 1936; Piaget and Cook, 1952) (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) and Constructionism (Papert, 1991). Furthermore, each learning theory coincides with the three components of digital culture named in section 1.2: Participation with behaviourism, remediation with constructivism and bricolage with constructionism. Within the DMC the presence of digital-making in the home-setting steadily increments with each generation. As does the practice of situated learning: the application of knowledge in the same social environment of its construction (Lave and Wenger, 1991; Stein, 1998).

In each successive generation, one can view learners progressively gaining control over the direction, pace, and construction of their learning. Yet, it is important to note that the learning theories, do not completely replace each other. Consequently, within the slow progression from a teacher-centred to a learner-centred curriculum; there remain elements of the previous theories. The reason for the slow progression is that the DMC is an unwritten curriculum. Consequently, it is constrained by politicians seeking to perpetuate a teacher-centred curriculum.

For the sake of clarity, the following learning theories are vast bodies of work; a full analysis of all aspects of each theory is beyond the scope of this thesis. A comprehensive analysis of each theory is well documented and can be read elsewhere. Instead, I will select and discuss the elements of each theory that describe how the DMC functioned in its first, second and third-generations. The learning theory of the current and fourth-generation of the DMC is yet to be determined. At this stage, I will review the possible contenders based on the direction indicated by the theories of the previous DMC generations. I acknowledge that all the theories to be discussed originate from fields outside of education. However, each theory has significantly impacted the fields of teaching, learning, digital technologies, and curriculum design, therefore, each theory is relevant to the discussion of the inner workings of the DMC. I will discuss each theory in the context of the previously named fields.

2.2 The first learning theory of the Digital-Making Curriculum (DMC): Skinnerian Behaviourism

Behaviourism, (Skinner, 1953, 1968; Wilson and Myers, 2000) in general, is based on the notion that the internal processes of the mind are not visible. Evidence of learning is only observable as changes in overt behaviour in responses to external stimuli (Ertmer and Newby, 1993). My interest is in the version of behaviourist thinking defined by Skinner (1938, 1968) particularly operant conditioning due to its associations with technology, learning and teaching. In 'the technology of teaching', Skinner (1968) expressed alarm concerning the training of trainee teachers. Aside from anecdotal 'tricks of the trade' based on the advice of more experienced teachers; trainees were given little formal guidance if any on pedagogy and classroom management.

Trainees simply replicated the teaching methods of the teachers they encountered as students. Variations in teaching methods contributed to behavioural problems within the classroom such as violence, truancy, and vandalism among learners (Skinner, 1968). Interactions between teachers and learners were unarranged, and the progress of learning was inefficient and confusing. Other strategies for improving teaching methods, for example, increased expenditure, better recruitment of teachers and learners, the building of more and better schools and greater use of technologies had little impact on the development of pedagogy. Any improvements in teaching methods were dependent on trainees learning-by-doing, learning from their experience, learning by trial and error or improvisation, consequently, teaching resembled an art. For Skinner, the art of teaching was too crude of a methodology for application towards the management of complex human behaviours. The types of learning exhibited by trainees were symptomatic of learning sans instruction and any semblance of pedagogy.

So far as we are concerned here, teaching is simply the arrangement of contingencies of reinforcement. Left to himself in a given environment a student will learn, but he will not necessarily have been taught. The school of experience is no school at all, not because no one learns in it, but because no one teaches. Teaching is the expediting of learning; a person who is taught learns more quickly than one who is not. Teaching is most important, of course, when the behavior would not otherwise arise. (Everything which is now taught must have been learned at least once by someone who was not being taught, but thanks to education we no longer need to wait for these rare events.) (Skinner, 1968, p. 25)

In other words, teaching is the arrangement of any instruction, action or resource used in the manipulation of learner behaviour. The purpose of teaching is not only the expedition of learning but

also the manipulation of the learning environment to produce behaviour in learners that 'would not otherwise arise'. For clarity, I define a learning environment as any topic of study within the curriculum of any DMC course. It is important to clarify that 'manipulation of the learning environment' requires teachers to navigate and define the most efficient existing route through, as opposed to the modification or creation of environments. Invariably, the most expeditious routes are linear, therefore, teaching becomes sequential. The contingencies of reinforcement are used to prevent learners deviating from the linear route; teaching becomes a science with teachers as the programmers of learner behaviour. To competently function as programmers Skinner (1968) argued that teachers need 'a true technology of teaching' in short, a pedagogy based on scientific rather than individual intuitive observations of learner behaviour.

Skinner (1968) argued that the field of the experimental analysis of behaviour and two of its products: teaching machines and particularly programmed instruction; could be used to create the technology of teaching, to be utilised by all teachers of varying levels and experience. A teaching machine is any device that mechanises the functions of teaching. The early teaching machines created by Pressey (1926) were mechanical devices used for such tasks as multiple-choice exams. Pressey (1926) observed that by increasing the immediacy of feedback, the teaching machines became capable of expediting changes in learner behaviour. In short, the machines possessed the capacity to teach. Teaching machines also possessed the limited potential to mimic the role of the teacher as the navigator of the learning environment.

Programmed instruction (Skinner, 1968), is the concept of using reinforcements and punishments to lead a learner through a sequence to the desired outcome. Each step of the sequence must be within the learner's range of ability, and the learner is not to progress until the current step is understood. With the principles of programmed instruction in mind, Skinner adapted the existing psychological theory of operant conditioning, the modification of behaviour through reinforcement, for use in education:

The application of operant conditioning to education is simple and direct. Teaching is the arrangement of contingencies of reinforcement under which students learn. They learn without teaching in their natural environments, but teachers arrange special contingencies which expedite learning, hastening the appearance of behaviour which would otherwise be acquired slowly or making sure of the appearance of behavior which otherwise never occur.

(Skinner, 1968, p. 79)

In operant conditioning (Skinner, 1968) reinforcements are used to increase the occurrence of desirable behaviours; these being whichever behaviour teachers wish to manifest in learners. Punishments are used to decrease the incidence of undesirable behaviour. When combined with a stimulus, reinforcement and punishment are usable positively or negatively. I suggest that the arrangement of contingencies of reinforcements and sequences of instruction; severely limits teaching and learning. Neither tutors nor learners are fully able to engage in learning environments. Tutors are limited to navigation, due to the principle of expedited teaching. Tutors are bound to the identification of the most linear path, and cannot modify the environment in any other way.

Skinnerian Behaviourism (Skinner, 1968) does require a degree of experimentation, but it is constrained to the search for the most efficient linear route; once identified all other aspects of the environment become redundant; thereby reducing the environment to just the identified linear path. The principle that learners only perform tasks within their capacities further limits tutorial choice of the most efficient route. If the most expeditious path is deemed too difficult for the learner, the tutor will abandon it for an adequate one. Repetition is the only means of teaching new skills to learners, who are obligated to follow initially unfamiliar routes until they become familiar. The learner never fully engages with the learning environment, save for that which is identified by the tutor. Learners do not construct their learning experiences and are unable to acquire new skills without tutorial support. The scaffolds of Skinnerian Behaviourism reduce learning environments to just the 'essential' information as opposed to stretching the capabilities of learners. In the DMC, Skinnerian Behaviourism is both an instructional technology and a teacher-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012).

Instructional technology can be defined in two ways. In its more familiar sense, it means the media born of the communications revolution which can be used for instructional purposes alongside the teacher, textbook, and blackboard... television, films, overhead projectors, computers, and the other items of 'hardware' and 'software' (to use the convenient jargon that distinguishes machines from programs). In nearly every case, these media have entered education independently and still, operate more in isolation than in combination.

The second and less familiar definition of instructional technology goes beyond any particular medium or device. In this sense, instructional technology is more than the sum of its parts. It is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction. (House Committee on Education and Labor, 1969, pp 21)

As a technology, Skinnerian Behaviourism (Skinner, 1968) predicated itself on the strict control of a one-directional flow of information. Every aspect, of the learning theory, is designed to reinforce the direction of flow from tutor to the learner; via the elimination of experiential learning (Skinner, 1968). Teaching machines were intended to expedite the delivery of instruction; by narrowing the learning environment to the routes defined by tutors thereby reinforcing the one-directional flow. However, unlike many of technologies mentioned in the quotation above teaching machines disrupted the flow of information; by facilitating a new flow between learners and technology. Learners now had an alternative albeit a limited source of feedback and the facility to monitor their learning, without further instruction from their tutors.

This type of interaction is anathema to Skinnerian Behaviourism because it facilitates experiential learning. In the Skinnerian view, teaching machines supported the experiential learning that he was trying to eradicate. For Skinner (1968), the teaching machine was “simply a way of inducing the student to learn without being taught” (Skinner, 1968). I suggest that teaching machines, albeit in a limited capacity offered learners a means of input that was not present in the broadcast mediums mentioned above. I suggest that the adoption of operant conditioning for use in education was an attempt to restore the flow of information from tutor to the learner. In doing so, the technology of teaching intended as a new form of pedagogy supports a teacher-centred curriculum.

Operant conditioning, falls under the second definition of instructional technology in the above quotation. Operant conditioning, fulfils the same purpose as teaching machines without the need for a bespoke physical device. The principles of behavioural reinforcement, expedited teaching and learning and immediate feedback migrated from physical teaching machines to systems of operant conditioning, to instructional software (Skinner, 1968). The first instructional software programs were sequences of tasks that bore all the hallmarks of Skinnerian Behaviourism (Skinner, 1968, Cooper, 1993; Ertmer and Newby, 1993). Digital computers became the new teaching machines, and instructional software became the new operant conditioning. The design principles of instructional software tried to maintain control over the flow of information from tutor to learner; but as argued earlier digital technologies disrupt the flow by introducing a new flow between technology and learner.

Herein, resides the conflict at the centre of Skinnerian Behaviourism and the DMC in general. The Digital-making curriculum tends to lean towards a teacher-centred curriculum; with a one-

directional flow of information from tutor to student. The flow is significant because it allows tutors full control over scaffolding structures including the feedback that guides learning. Here, learning experiences are created solely by tutors. Policymakers prefer the teacher-centred curriculum because it is better suited for the measurement and manipulation of educational standards (Martin, 2014). When deployed to raise standards, technology is presented by policymakers as an aid to teaching and learning, as is the case with Skinnerian Behaviourism. The assumption being that technology is a panacea that automatically improves learning (Martin, 2014).

In contrast, the uses of digital technologies tend to support the learner-centred curriculum (Nunan, 1988; Elen et al. 2007 Bostock and Wood, 2012) favoured by the trainee teachers of section 1.4.3. Digital technologies mimic the scaffolding structures offered by tutors thereby facilitating the collaborative creation of learning experiences between technology and learners. The use of digital technologies began the gradual, irreversible migration towards a learner-centred curriculum. These different types of learning experiences cannot co-exist one must dominate the other, yet neither can eliminate the other. Consequently, the DMC is in constant flux, as it strives for a balance between both types of learning experience. Arguably this balance is not yet achieved.

Skinnerian Behaviourism (Skinner, 1968) signalled the start of the integration of digital-making into education. Learners in the first-generation of DMC courses were engaging in Participation: the production of digital content (Deuze, 2006) centred around scientific and business-related activities. The influence of Participation on the DMC became evident with the addition of new DMC courses. No longer was Participation just a skill within a subset of older academic disciplines. The production of digital content had become salient enough to warrant recognition as a field of study. In response, became more inclusive of Participation and propelled the growth of the DMC. As the use of digital technologies spread in DMC and non-DMC courses so too did the presence of digital-making in education. In the next generation of the DMC, new aspects of digital-making begin to manifest, as the DMC starts to shift its focus from methods of teaching only, towards methods of facilitating learning and teaching in collaboration. In response to the collapse of Skinnerian Behaviourism (Skinner, 1968; Saettler, 1990) and the rise of Cognitivism, Constructivism and the cultural transcoding of the DMC.

2.2.1 The second learning theories of the Digital-Making Curriculum (DMC): Piagetian and Vygotskian Constructivism

In education, Cognitivism became influential in the mid-twentieth century when the premise of the effectiveness of Behaviourism was questioned and rejected by cognitive psychologists (Lesh and Lamon, 1992; Kellogg, 2012; Ertmer and Newby, 1993). Cognitivism is the notion that learning is evident through changes in the internal cognitive processes and structures of the mind; such as thinking, problem-solving, language, concept formation and information processing (Ertmer and Newby, 1993). The internal changes are inferable from changes in overt behavioural responses to external stimuli. Cognitivists argue that the mind is an information processor capable of receiving, organising storing, rehearsing, and retrieving information (Hung, 2001). Learning is not always evidenced by immediate behavioural responses to stimuli as in Behaviourism (Skinner, 1953, 1968; Wilson and Myers, 2000). Instead, Cognitivists argue that the exhibition of appropriate behavioural responses is dependent on the learners' perception of its relevance to stimuli. Cognitivists, view learners as active participants in the learning process in comparison to Behaviourism, where learners are considerably more passive (Ertmer and Newby, 1993). In cognitivism, learners gain the capability to construct their internal scaffolding structures; this is the view espoused by Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952).

Constructivism, in general, is the notion that individuals construct their meanings and understandings of knowledge obtained from experience, using the internal cognitive processes and structures of the mind (Ertmer and Newby, 1993). Piaget (1936) held the view that cognitive development, is the progressive reorganisation of the cognitive processes and structures of the mind; based on biological maturation and discrepancies between prior environmental understanding and new experiences. Piagetian Constructivism relies on three apparatuses that work in unison these being: schemas – the building blocks of knowledge; the adaption processes of equilibrium, assimilation and accommodation which enables the transference of knowledge and the stages of development – sensorimotor, preoperational, concrete operational and formal operational (Piaget, 1936; Piaget and Cook, 1952). In this thesis, my discussion of the stages of development within the DMC will appear in Chapter Four; my rationale being that discussion of the stages at this time is

beyond the scope of the point, regarding the shift of focus within the DMC that I mentioned at the end of section 2.2.

It is highly significant that the emergence of Piagetian Constructivism coincided with the cultural transcoding (Manovich, 2002) of the DMC in section 1.4.1. Just as creative software provided learners with a scaffolded means of digital-making production; Piagetian Constructivism provided learners with the facility to use their internal cognitive processes and structures of the mind as scaffolding, to make their experiences of learning environments more meaningful. I am not suggesting that DMC learners suddenly became aware of their cognitive faculties as defined by Piaget (Piaget, 1936; Piaget and Cook, 1952). Instead, I am stating that Piagetian Constructivism, (Piaget, 1936; Piaget and Cook, 1952) inspired changes in curriculums that gave learners a means of modifying learning environments which encouraged discovery learning and greater introspection. Discovery learning greatly influenced compulsory primary education, due to the publication of the Plowden report (Plowden, 1967). According to Gillard (2004), the report promoted the following notions:

The report's recurring themes are individual learning, flexibility in the curriculum, the centrality of play in children's learning, the use of the environment, learning by discovery and the importance of the evaluation of children's progress - teachers should 'not assume that only what is measurable is valuable.
(Gillard, 2004)

Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952) introduced the notions of play and discovery into DMC for learners; by requiring learners to interpret learning environments using the internal scaffolding mechanisms of their minds. Learners now had a means of scaffolding their learning that could not have been provided by Skinnerian Behaviourism (Skinner, 1968). Previously, within Skinnerian Behaviourism play and discovery had only applied to tutors in a very limited form, within their scope for experimentation with contingencies of reinforcement. Thus, Piagetian Constructivism is to learners what Skinnerian Behaviourism is to tutors. Consequently, the DMC became a more holistic entity in the sense that tutors had mechanisms for teaching and learners had mechanisms for learning.

Yet, the expansion of the DMC only represented a slight step towards a learner-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012). Both parties did not gain the ability to modify learning environments. Just as Skinnerian Behaviourism mainly focused on teaching, Piagetian Constructivism focused on learning. The role of tutors within

Piagetian Constructivism is ambiguous. Within learning environments, the remit of tutors had not changed other than the encouragement to recognise the learner as an active participant in the learning process. The DMC was still reliant on the Skinnerian pattern of stimulus and response (Skinner, 1968) that firmly kept tutors in the role of stimulators and learners as responders. To an extent, the pattern was not easy to change (DeVries, 2000). A basic requirement of any teacher-centred curriculum is that tutors provide stimuli for learners to respond. The learner-centred curriculum advocates that tutors and learners have an active role in devising learning experiences (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012). Both parties should devise stimuli and responses. Such collaboration is difficult to achieve neither Skinnerian Behaviourism nor Piagetian Constructivism provided guidance in this respect.

An issue here is that in both learning theories the role of the tutor is reduced to that of prompting learners to rehearse and recall sensory information gained by experience. If the DMC was solely reliant on Skinnerian Behaviourism (Skinner, 1968) and Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952) it would mainly focus on the use of digital technologies to reaffirm previously acquired knowledge. This reaffirmation is most visible within cultural transcoding in the cultural layer of the DMC. Here, learners used visual metaphors and processes within creative software to repeat in digital form what they had once done non-digitally for example, making a digital painting or drawing a graph. To become a more holistic learner-centred curriculum, the DMC required a learning theory that specified a means for the tutor and learner to work in collaboration.

At this point, it is important to reiterate that the learning theories do not completely replace each other. Within the DMC the theories are related and overlap in several areas as discussed earlier. Skinnerian Behaviourism set the principles of teaching, and Piagetian Constructivism established the principles of learning. I suggest that Vygotskian Constructivism (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) provides the mechanisms for collaboration between tutor and learner.

Vygotskian Constructivism is the notion that individuals construct their meanings and understandings of knowledge obtained from social interaction, using the internal cognitive processes and structures of the mind (Ertmer and Newby, 1993). Vygotsky asserts that culture and social interaction precedes learning (Vygotsky, 1930-1934/1978). For Vygotsky, social interaction allows individuals to learn from the experiences of others as well as their own. In short, Vygotsky is a

proponent of guided learning. (Vygotsky, 1930-1934/1978). When Vygotskian Constructivism is applied to the social interactions between tutors and learners; the tutor fulfils the role of the More Knowledgeable Other(s) (MKO), the title given to any individual that uses their greater knowledge to guide the learning of the less knowledgeable (Vygotsky, 1930-1934/1978). Social interaction between the MKO and the learner happens within the Zone of Proximal Development (ZPD) (Vygotsky, 1930-1934/1978).

... the zone of proximal development. It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers.
(Vygotsky, 1930-1934/1978, p. 86)

In rare instances, a learner skilled in a topic or activity may also function as an MKO (Vygotsky, 1930-1934/1978). Notwithstanding, when applied to the DMC, the role of the MKO can also be fulfilled by digital technologies. The language used in the social interaction between tutor and learner appears in the form of visual metaphors and processes within digital technologies. In some instances, it is possible for learners to construct knowledge with minimal or even no interaction with their tutors. Furthermore, the sophistication and scope of digital technologies increase with each iteration giving rise to the narratives discussed in section 1.4.2 which enables the extension of the ZPD (Vygotsky, 1930-1934/1978), beyond social interaction with tutors (Vygotsky, 1930-1934/1978). Consequently, learners engage in digital socio-cultural interactions that produce knowledge of digital-making which cannot be obtained by other means; resulting in the creation of new types of digital content in informal settings and the remixing of old.

The potential development level is not that of the learner but that of the knowledge, experience, and skills of the MKO. The learner only achieves the potential level when the ZPD no longer exists. Theoretically, learners will reach a point beyond which the assistance of the MKO is no longer necessary, at this stage the learner can demonstrate knowledge independently (Vygotsky, 1930-1934/1978). The ZPD is a temporary construction, designed to scaffold learning; in comparison to Skinnerian Behaviourism (Skinner, 1968) and Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952) which are both permanent structures in which the learner is always dependent on the MKO or environment.

One may infer that learning within the ZPD is merely an imitation of the MKO, to an extent this is the case. All the same, the imitation is that of the best and most efficient practices of the MKO. Social interaction must include scaffolding that efficiently communicates best practices to learners. McKenzie (2000) argues that scaffolding should reduce the confusion and frustration of learning by providing structured examples with a clear purpose and direction for learning including assessment and feedback. Hence, the social interaction between tutors and learners shape the learning environment. Thereby, tutors gain the ability to modify learning environments using their previous knowledge and experiences to guide learning.

Scaffolding facilitates transmission of activities, and the social interaction provides the context for the activities. Scaffolding and social interaction cannot be separated from each other, both form the learning environment. In short, scaffolding and social interaction situate learning. The activities cannot be abstracted or separated from their learning environments, neither are the activities reduced to their core elements as in Skinnerian Behaviourism (Skinner, 1968). The activities transmit in whole from MKO (Vygotsky, 1930-1934/1978) to the learner, and this creates an authenticity of activity that is not present in Skinnerian Behaviourism or Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952).

In the DMC, Vygotskian Constructivism (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) provides the collaborative bridge between tutor and learner that was missing in Skinnerian Behaviourism and Piagetian Constructivism. The collaboration occurs within the ZPD (Vygotsky, 1930-1934/1978) with the tutor often acting as the MKO. The collaboration is scaffolded using digital technologies, particularly creative software upon which, both tutors and learners tacitly depend. Vygotskian Constructivism introduces the idea that digital technologies are used for more than just the prompting of recall and rehearsal of knowledge in learners, by situating learning within authentic activities. Consequently, the DMC leans even further towards the learner-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012). The co-construction indicates that both tutors and learners are now able to modify learning environments. Learners gained this facility under Piagetian Constructivism; tutors gained modification under Vygotskian Constructivism. Through the notions of the MKO and authentic activity, tutors can expand the boundaries of previously navigated routes through learning environments by their knowledge and experiences (Vygotsky, 1930-1934/1978).

Still, Vygotskian Constructivism (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) does not sufficiently describe how learning occurs from the perspective of learners. Just as Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952), treated the role of the tutor with ambiguity, Vygotskian Constructivism also treats the learner ambiguously. Piagetian Constructivism and Vygotskian Constructivism are still based on the stimulus and response principle established in Skinnerian Behaviourism (Skinner, 1968, DeVries, 2000). Learning is still the learner following the direction defined by the tutor. Vygotskian Constructivism cannot explain the salience of production as part of the learning process. Learners have the facility to understand digital-making from a theoretical perspective due to Piagetian Constructivism. Learners can learn from the distilled experiences of their tutors within the ZPD (Vygotsky, 1930-1934/1978) and then reconstruct those experiences to form meaning in their minds. Yet, to gain a full understanding of digital-making, learners need a means of constructing meaning from the firsthand production of digital content (Manovich, 2002). Vygotskian Constructivism reinforces the flow of information between tutor and learner, but it does not improve the flow between learner and digital technologies. In section 1.4.3 I mentioned that digital technologies become co-producers of digital content alongside learners (Peppler, 2013). Therefore, learners also need a means of understanding the flow of information between digital technologies and themselves.

Piagetian and Vygotskian Constructivism (Piaget, 1936; Piaget and Cook, 1952; Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) combined with the cultural transcoding of the DMC; ushered in a new aspect of digital-making, Remediation (Deuze, 2006): the conversion of old media into digital content. Learners on DMC courses were now engaging in Participation and Remediation (Deuze, 2006), especially in the cultural layer of the DMC. Digital technologies replicated non-digital methods of production, in areas which required much more explorative forms of learning, in comparison to Skinnerian Behaviourism (Skinner, 1968). Under Constructivism, learners gained the facility to remediate the knowledge and experiences of their tutors. Learning as Remediation became an integral part of many DMC Courses especially those in the cultural layer. Consequently, digital-making became even more enmeshed with curriculums; and new DMC subjects such as multimedia emerged based almost exclusively on the practice of Remediation. Once again, the influence of

digital-making in curriculums had spread due to the use of learning theories. Like the previous generation, the incorporation of digital-making in education would only lead to its greater presence in the next generation of the DMC.

So far, the learning theories of the DMC alternate between focusing on teaching and learning. Skinnerian Behaviourism (Skinner, 1968) focused on teaching, Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952) focused on learning, Vygotskian Constructivism (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) focused on teaching. In the next section of this chapter, the focus of the DMC shifts again towards learning. Amid the emergence of a critical community, Papertian Constructionism (Papert, 1991) rises to provide learners with a means of constructing meaning from the firsthand production of digital content and understanding the flow of information between digital technologies and themselves.

2.2.2 The third learning theory of the Digital-Making Curriculum (DMC): Papertian Constructionism

Constructionism (Ackermann, 2004), in general, is the notion that the internal cognitive processes and structures of the mind, used by individuals to construct their own meanings and understandings of knowledge obtained from experience; are strengthened when the individual actively engages in the construction of an accompanying tangible object:

Constructionism--the N word as opposed to the V word—shares constructivism's connotation of learning as "building knowledge structures" irrespective of the circumstances of the learning. It then adds the idea that this happens especially felicitously in a context where the learner is consciously engaged in constructing a public entity, whether it's a sand castle on the beach or a theory of the universe.
(Papert, 1991, p. 32)

Papertian Constructionism (Papert, 1991) is closely related to Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952; McLoughlin and Oliver, 1998), as a former student of Piaget; Papert (1991) also believes that that knowledge is actively and incrementally constructed by individuals through personal experiences of environmental interaction (McLoughlin and Oliver, 1998). However, Papert (1991) places a much greater emphasis on the role of construction in the learning process; which has led some to the reductionist view of labelling Papertian Constructionism as learning-by-making:

It is easy enough to formulate simple, catchy versions of the idea of constructionism; for example, thinking of it as "learning-by-making." One purpose of this introductory chapter is to orient the reader toward using the diversity in the volume to elaborate--to construct--a sense of constructionism much richer and more multifaceted, and very much deeper in its implications than could be conveyed by any such formula.
(Papert, 1991, p. 32)

But in saying all this I must be careful not to transgress the basic tenet shared by the V and the N forms: If one eschews pipeline models of transmitting knowledge in talking among ourselves as well as in theorizing about classrooms, then one must expect that I will not be able to tell you my idea of constructionism. Doing so is bound to trivialize it. Instead, I must confine myself to engage you in experiences (including verbal ones) liable to encourage your own personal construction of something in some sense like it. Only in this way will there be something rich enough in your mind to be worth talking about.
(Papert, 1991, p. 32)

In the above quotations, Papertian Constructionism (Papert, 1991) appears to be a metatheory, the implications of which can only be understood through its reconstruction by the individual. In this respect, Papertian Constructionism resembles an ethos rather than a learning theory. In comparison to the previous learning theories of the DMC, Papertian Constructionism (Papert, 1991) does not possess the sub-mechanisms that describe its operation. Papert (1991) concedes that his version of Constructionism (Papert, 1991) cannot be explained as it does not follow the pipeline structure of knowledge transmission found in theories such as Skinnerian Behaviourism (Skinner, 1968). Furthermore, notions of Papertian Constructionism vary according to the purposes and contexts in which individuals are engaged in the construction process. Papertian Constructionism may appear to lack structure; Nonetheless, this is not the case.

Kafai and Resnick (1996) argue that Constructionist thinking can be arranged into three categories: Learning through design, learning about systems, and Learning in communities. Learning through design refers to the building of a relationship between the designer and public entity. It is from this relationship that meaning is constructed. The designer determines the meaning of the public entity for his or herself and others, by selectively connecting the characteristics of the entity to the features of the context in which the entity is built. The design process is perceived as vital for the designer to gain an understanding of the objective constraints and subjective meanings of the public entity. The focus of design becomes the construction of meaning, the realisation of the public entity is secondary.

Learning about systems refers to the use of digital technologies for the generation of new thinking about many types of systems, for example, biological, technical, and social. Here, digital technologies assist the designer in the analysis of system behaviour (Kafai and Resnick, 1996). By reconstructing the system, or building a similar system the designer is able to gain an understanding that could not be derived from observation alone.

Learning in communities refers to the social nature of learning in different types of community, for instance, classroom, urban and virtual (Kafai and Resnick, 1996). When engaged in the construction of a public entity the designer is influenced by the culture of the setting in which construction occurs. In short, a public entity must convey the meaning and understandings of the communities in which it is situated. Public entities can be described as shareable networks that connect the designer to the community and vice versa.

While Papertian Constructionism (Papert, 1991) itself may not possess an inherent structure; it is useful for the generation of meaning and understanding, the analysis of system behaviour and the formation of networks. These skills are relevant to DMC learners, in the context of the DMC; Papertian Constructionism is defined as a means for learners to develop these skills from the first-hand production of digital content. It is for this reason that I am adding the word digital to the term public entity. I feel that 'digital public entity' more accurately depicts the type of work produced in the DMC. From this point, onwards I will refer to digital content as digital public entities.

The notion of learning as problem-solving is present in all the learning theories of the DMC; nevertheless, Papertian Constructionism (Papert, 1991) demands that learners think much more deeply about problem-solving in comparison to Skinnerian Behaviourism (Skinner, 1968) and Vygotskian Constructivism (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) where problem-solving is led by the tutor. Construction of a digital public entity allows the learner to become familiar with all aspects of a problem. It is the depth of familiarity which leads to a solution (Papert, 1991). Papertian Constructionism generates methods of thinking and learning not found in the other DMC learning theories; even in Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952), where problem-solving is also led by the learner. Piagetian Constructivism takes the opposite approach and encourages thought about solutions rather than problems. Papertian Constructionism could be described as learning to learn (Ackermann, 2004). Learners do not use Papertian Constructionism to

generate an expedient solution but rather to understand a problem in greater depth via its tools and medium of construction. The objective is not to create a final product but to engage deeply in the building of understanding and meaning.

By constructing their experiences learners gain practice in correcting their mistakes through experimentation. It is the capacity for experimentation that differentiates Papertian Constructionism from Skinnerian Behaviourism and Piagetian and Vygotskian Constructivism. Papertian Constructionism is a social activity. Even though a learner may be the only person constructing a digital public entity; its construction is the sum total of the learner's interactions with the MKO (Vygotsky, 1930-1934/1978), the use of digital tools, the environment in which the entity is constructed and the learner's capacity for adaption (Piaget and Cook, 1952), assimilation and internalisation (Piaget and Cook, 1952). By its very nature, a digital public entity is a physical representation of a network (Papert, 1991; Belshaw, 2014). Nothing in the DMC is learnt or constructed in isolation; everything is made in collaboration.

Regarding digital-making, Papertian Constructionism (Papert, 1991) facilitated the entry into the DMC: of Bricolage (Deuze, 2006), the remixing of digital public entities into new forms. The concept of remixing is paramount in the third-generation of the DMC. In this generation, there were no new DMC courses. Instead, the presence of Bricolage in DMC courses prompted several debates regarding their constitution. A critical community emerged and challenged the curricular status quo of the DMC. It is significant that the critical community did not rise until Papertian Constructionism entered the DMC. I suggest that the critical community could not have existed in the previous DMC generations.

Papertian Constructionism prompted learners to engage in the reconstruction of ideas through their tools and mediums of construction, in section 1.4.2. I stated the goal of the critical community. Bricolage advocates the same goal. This is the reason that academics such as Merrin (2009) and Gauntlett (2009) called for the creation of Media Studies 2.0. Both academics are engaging in perspectives inspired by Papertian Constructionism and Bricolage in DMC courses. These types of perspective were not possible in previous DMC generations because the DMC was incomplete.

By incomplete, I mean that under Skinnerian Behaviourism (Skinner, 1968) the DMC focused on the establishment of its basic curricular principles. The integration of digital-making in the home-setting was an unintentional secondary issue that almost happened by default. Under Constructivism the DMC was focused on the establishment of learning and teaching; although digital-making in the home-setting became further integrated into the DMC, it was not the core focus. Under Papertian Constructionism (Papert, 1991), the DMC edged closer to completion. With the curricular principles, methods of teaching, learning and the co-construction of learning experiences established previously, the focus changed. Now the focus is on understanding the processes of construction, the salience of which should not be underestimated. More so than in previous DMC generations, Participation Remediation and Bricolage (Deuze, 2006) are challenging and in some instances redefining the role of the tutor and learner. I suggest that in many cases tutors must also engage in Bricolage to maintain the traditional status of the tutor as MKO (Vygotsky, 1930-1934/1978). Bricolage digital public entities are representative of a network, that has multiple flows of information between the learner, the tutor, the digital technology, and the community in which the entity is situated.

Ever since its first-generation, the DMC has steadily progressed away from the teacher-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012), towards a learner-centred equivalent (Nunan, 1988; Elen et al. 2007 Bostock and Wood, 2012). With the addition of each learning theory learners have moved from being programmed to learn, and towards programming their learning. This progression includes the increasing presence of online communities and networks in the study and production of digital-making in the home-setting. Hence, the established pattern of the DMC generations alternating between teaching and learning may be disrupted in the fourth and current generation. In general, the DMC is progressing further away from the single flow of information between tutor and learner found in the first-generation. It is moving towards multiple flows of information between tutors, learners, and digital technologies. Learners have progressed from being told how to learn towards learning how to learn. Therefore, in the possible learning theories of the fourth and current DMC generation, learners will need to learn how to manage multiple flows of information as digital-making becomes increasingly social.

In the next section, I will explore the possible learning theories that operate in the fourth and current generation of the DMC. These theories will describe how digital-making occurs in informal settings.

2.2.3 The possible fourth learning theories of the Digital-Making Curriculum (DMC): in the third space

The fourth and current generation of the DMC: the third space differs from the previous generations. It is the first to deviate from the alternating teaching and learning focus of previous generations. This current generation focuses simultaneously on teaching and learning, as the processes of digital-making employ multiple flows of information and become even more social. The third space facilitates the joint construction of digital public entities, by learners and MKO (Vygotsky, 1930-1934/1978). The digital public entities produced in the third space are too similar those made in the previous DMC generations. The only difference being the increased presence and influence of digital-making in the home-setting, in the third space.

In the three previous DMC generations, many learners' experiences with digital-making took place within formal settings. In the fourth-generation, digital-making occurs much more in informal settings than within formal. The issue here is that without a curriculum to inform the production of digital-making in the home-setting it is hard to determine how learning occurs within the third space. In the remainder of this chapter, I will discuss the viability of Participatory Cultures (Jenkins et al. 2009), Communities of Practice (Lave and Wenger 1991), Affinity Spaces (Gee, 2004) and the Trajectory of the Self (Giddens, 1991) as viable theories for the explanation of digital-making in the third space. My rationale for selecting these theories is that each one facilitates the production of digital-making on platforms of differing sizes these being: Communities, the Spaces, and the self. I envision that no single theory will dominate the fourth-generation; instead, a conflation of the theories will emerge.

In the view of Jenkins et al. (2009) participatory cultures are populated by online communities: groups of teenagers that share common interests: who use the Internet to interact, communicate, collaborate and pursue their interests (Plant, 2004; Sproull and Arriaga, 2007; Beck, 2007).

In many cases, these teens are actively involved in what we are calling participatory cultures. A participatory culture is a culture with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing one's creations and some type of informal mentorship whereby what is known by the most experienced is passed along to novices. A participatory culture is also one in which members believe their contributions matter, and feel some degree of social connection with one another (at the least they care what other people think about what they have created).

(Jenkins et al. 2009, p xi)

For the moment, let's define participatory culture as one with

1. relatively low barriers to artistic expression and civic engagement,
2. strong support for creating and sharing creations with others,
3. some type of informal mentorship whereby what is known by the most experienced is passed along to novices,
4. members who believe that their contributions matter, and
5. members who feel some degree of social connection with one another (at the least, they care what other people think about what they have created).

(Jenkins et al. 2009, p. 5-6)

From the above definitions, Participatory cultures (Jenkins et al. 2009) appear to resemble the ZPD of Vygotskian Constructivism (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992); in the sense that knowledge is passed from an MKO (Vygotsky, 1930-1934/1978) to a learner. All the same, the ZPD describes a relationship between a single MKO and a single learner. In comparison, participatory cultures (Jenkins et al. 2009) describe relationships between several MKO and several learners.

van Dijck (2009) asserted that individual participation in online communities is far more complex than the didactic relationship between the person and the larger community. Rather, individuals have various relationships in a number of communities (van Dijck, 2009). A learner may participate in more than one participatory culture.

Learner behaviour changes depending on the goal of the larger community. For successful participation, learners must adhere to whatever system is in place; by doing so, learners become knowledgeable and gain prominence within the community. Within participatory cultures, learning is a means to an end, the primary focus of the learner is the development of new literacies via socialisation (Jenkins et al. 2009). In participatory cultures, Jenkins et al. (2009) build on the Vygotskian ZPD by providing specific outcomes for learning that were never declared in the ZPD. Jenkins et al. (2009) insist that the skills developed in participatory cultures (Jenkins et al. 2009) build upon a foundation of traditional literacies, research, technical, and critical analysis normally learned in the classroom. Jenkins et al. (2009) define the skills as follows:

- Play: The capacity to experiment with the surroundings as a form of problem-solving.
- Performance: The ability to adopt alternative identities for the purpose of improvisation and discovery.
- Simulation: The ability to interpret and construct dynamic models of real-world processes.
- Appropriation: The ability to meaningfully sample and remix media content.
- Multitasking: The ability to scan the environment and shift focus onto salient details.
- Distributed cognition: The ability to interact meaningfully with tools that expand mental capacities.
- Collective intelligence: The ability to pool knowledge and compare notes with others toward a common goal.
- Judgment: The ability to evaluate the reliability and credibility of different information sources.
- Transmedia navigation: The ability to follow the flow of stories and information across multiple modalities.
- Networking: The ability to search for, synthesize, and disseminate information.
- Negotiation: The ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative norms.

(Jenkins et al. 2009, p 105-106)

Each skill is representative of a flow of information between the learner and MKO (Vygotsky, 1930-1934/1978). The skills are dispersed across all types of participatory culture. Only learners involved in all participatory cultures (Jenkins et al. 2009) will learn to manage various flows of information. Social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) is only sufficient for certain types of flow such as collective intelligence and judgement. Other types of flow such as simulation and appropriation can only be acquired via the construction of a digital public entity. A hierarchy emerges in which learners that construct digital public entities have greater understanding and management of the flows of information, in comparison to learners that only engage in social interaction.

Arguably, the main objective of learning in the fourth-generation of the DMC is not proficiency in digital tools nor the construction of digital public entities; but the management of multiple flows of information. Management skills are developed through social interaction with an MKO and the construction of digital public entities (Vygotsky, 1930-1934/1978). Even so, the literacies obtained by the learner are determined by the more knowledgeable members of the communities that inhabit participatory cultures (Jenkins et al. 2009). A learner may choose which communities suit their own interests, but once a learner engages in the community, the flows of information present within are not set by the learner. A learner may only exhibit their influence within a community after being recognised as knowledgeable.

Consequently, learners must socially interact in the manner stated by the community and any construction of digital public entities must reflect the literacies present in the community. Learners

cannot obtain any type of literacy that is not present in the community. The flows of information within participatory cultures (Jenkins et al. 2009) are most effective when applied in the community in which it is learnt. This does not mean that the flows are not transferable. The basic flows obtained by social interaction are commonplace in many communities. Conversely, advanced flows achieved by construction are not as transferable across communities. The implication of this being that a learner may only employ a flow of information in another community if both communities share similar aims and values. Therefore, the learning and management of flows are situated practices (New London Group, 1996); in which the transferability of flows between informal and formal settings are dependent on the similarities between the goals of each community. For the sake of clarity, a situated practice is defined below; it should not be confused with situated learning (Lave and Wenger, 1991; Stein, 1998). Both concepts are related, but not the same:

Situated Practice is the immersion in a community of learners engaged in authentic versions of language and literacy practices.
(New London Group, 1996)

Communities of Practice (CoP) (Lave and Wenger 1991), is a learning theory that considers how, individuals that share common interests collaborate to solve problems and achieve common goals (Lave and Wenger, 1991). In a CoP, learning/practice can be described as the efforts of the individual to conform to the social norms of the wider community. The greater the degree of integration into the community (Stein, 1998): the greater the perception of the individual as an accomplished community member or even leader.

For the sake of clarity, I define a CoP as a goal-oriented hierarchical structure in which the goal of the overall community takes precedence over those of individual members. Members can only achieve personal goals by pursuing the overall community goal. This often requires direct socialisation, collaboration, observation, and imitation of peers (Lave and Wenger, 1991); as the knowledge needed to achieve such goals resides with other individual members. Consequently, for the duration of the CoP, those with greater knowledge can shape the pace and direction of learning. The community itself does not retain any knowledge; once the overall community goal has been achieved, the CoP disbands.

Conceptually, CoP resembles the ZPD (Vygotsky, 1930-1934/1978), both function as spaces in which a learner can interact with an MKO (Vygotsky, 1930-1934/1978) and gain skill. Still, this is

where the similarities end and subtle differences between the theories appear. Communities of Practice could almost be described as the plural form of the ZPD; in the sense that it facilitates multiple flows of information between learners and several MKO. Whereas, the ZPD tends to support one-to-one social interaction between a learner and MKO. Furthermore, in a CoP, the goal of the learner is always a subset of the MKO goal. The CoP does not disband until the MKO goal is achieved. In contrast, within the ZPD the only target is shared between the learner and MKO; once the learner has achieved the skill taught by the MKO, the ZPD closes.

Conversely, CoP bears little resemblance to participatory cultures (Jenkins et al. 2009). Membership in a CoP is dependent on the benefit offered by the learner to the community. In a participatory culture, membership is dependent on the benefit to the learner afforded by the community. In a CoP, the learner must pursue the community goal in a participatory culture the learner pursues an individual goal. Participatory cultures do not cease to function when the student's goal is achieved (Lave and Wenger 1991). Learners can be members of several CoP concurrently, yet, once engaged in a CoP the learner is obligated to remain until the goal of the community has been achieved (Lave and Wenger 1991). In contrast, learners can move freely between participatory cultures in pursuit of their individual goals.

Despite its popularity and application as a description of learning and practice; as a strategy for the study and production of digital-making CoP is problematic (Gee, 2004). The problem resides with the constitution and functions of the community. For example, a tutor may ask a cohort of learners to achieve a goal by collaborating in a group task. Therefore, the goal and group membership of the CoP has been manufactured by the tutor; as opposed to the normal organic formation of a CoP by individuals with a common interest. If all the learners are of similar knowledge and skill, which acts as an MKO? and how is knowledge transferred from one member to another? Furthermore, who decides when the goal of the community is complete the tutor or the learners?

Gee (2004) also raises several concerns regarding the problems of defining a community and its functions. *Affinity Spaces* (Gee, 2004), questions the idea of using terms like CoP (Lave and Wenger 1991) as a means of identifying the members that belong to a group or community. Gee (2004), observed several scenarios where the application of the word 'community' is problematic when identifying members based on criteria: such as age, ethnicity, gender, and socio-economic

status. Rather than attempting to identify community members by assigned roles or labels, Gee (2004) suggested that examination of the locations (be they physical or virtual) where individuals converge yields greater insights regarding identity, activity, and interaction. Gee (2004), refers to these sites as affinity spaces. Gee (2004), argues that individuals are not drawn to affinity spaces by the obligations of roles or labels that accompany community membership: but rather by a shared affinity for the digital public entities generated within a space.

An affinity space has eleven hallmarks that differentiate it from a CoP (please see Gee, 2004 for an exhaustive description). However, I define an affinity space as an amorphous organisation, in which the personal goals of individuals perpetuate the existence of the space. The affinity space itself has no explicit goal other than the perpetuation of itself. In this sense, the affinity space becomes a repository of digital public entities generated by the previous social interactions of individuals seeking to further their own knowledge. Nevertheless, affinity spaces (Gee, 2004) are not just a random collection of digital public entities; each affinity space is themed around a topic of interest. Interactions that are not suitable for an affinity space do not enter. Otherwise, the affinity space may collapse. Consequently, once the individual has achieved their aim, the affinity space improves and continues to function. It does not disband. As learning primarily occurs through asynchronous interaction with the digital public entities as opposed to synchronous social interaction, the individual retains greater control over the pace and direction of learning.

Regarding the learning theories of the previous DMC generations, affinity spaces (Gee, 2004) and Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952) both imply that social interaction between individuals is inferior to that between the individual and the learning environment. Affinity spaces are learning environments in which the contributions of the learner adds value to the constitution of the environment (Gee, 2004). Social interaction within an affinity space (Gee, 2004) is akin to the construction of a digital public entity. In the sense that the affinity space itself is a digital public entity. Piagetian Constructivism, Papertian Constructionism, and affinity spaces; all appear to support the notion of learning as the modification and construction of learning environments. The scaffolding, traditionally provided by tutors through instruction is now available to learners within the learning environment and tools of construction.

Through social interaction and environmental modification and construction, a learner may gain more understanding of digital-making than through instruction alone. Within the third space, learning is available in all three forms. Instruction may be gained from social interaction between a learner, and an MKO (Vygotsky, 1930-1934/1978), but understanding is gained through environmental modification and construction of digital public entities. In the fourth and current generation of the DMC, the learner takes on even greater responsibility for their own learning and development. The learner becomes a digital public entity and learning becomes the modification and construction of the self.

So far, the potential learning theories support the general progression narrative of the DMC. With each generation, the DMC moves further from the mass teaching methods of Skinnerian Behaviourism (Skinner, 1968) towards more personalised methods of teaching. The DMC is increasing its emphasis on learning as the construction of the self. The questions here are why and to what end?

Commenting on the work of Baumeister (1986), Giddens (1991) discussed the historical understandings of individuality; the notion that 'each person has a unique character and extraordinary potentialities that may or may not be fulfilled'. Baumeister (1986) stated that prior to the division of labour (Smith, 1776) individuality as defined above did not exist. The division of labour demanded the abstraction, standardisation and mechanisation of artisan tools and production methods so that any individual could produce goods and services without long years of training (Gere, 2009). Consequently, individual performance was also standardised and individuals were now differentiated by the uniqueness of their character and extraordinary potentialities (Giddens, 1991).

Regarding why the DMC has increased its focus on the self; I suggest, that Skinnerian Behaviourism (Skinner, 1968) had the same effect on teaching and learning, as the division of labour had on economic production. The standardisation of learning via operant conditioning prevented differentiation among learners based on performance. Subsequently, learners became differentiated by the uniqueness of their character and distinct potentialities; as evidenced by the rejection of Skinnerian Behaviourism by Cognitive psychologists (Lesh and Lamon. 1992; Kellogg, 2012; Ertmer and Newby, 1993). In all the subsequent, learning theories of the second and third-generations of the DMC, individuality is a key aspect of the learning process. Piagetian and Vygotskian Constructivism

(Piaget, 1936; Piaget and Cook, 1952; Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) and Papertian Constructionism (Papert, 1991) all view the learner as an individual exercising agency in learning. In each generation of the DMC, the presence of individuality has increased.

Regarding what to end has the DMC increased its focus on the self? Giddens (1991) provides the following perspective. The trajectory of the self (Giddens, 1991) is derived from the portrayal of therapy by Rainwater (1989) which argues the following:

For therapy is not something which is 'done' to a person or 'happens' to them: it is an experience which involves the individual in systematic reflection about the course of his or her life's development. The therapist is at most a catalyst who can accelerate what has to be a process of self-therapy
(Giddens, 1991, p. 71)

I suggest that the understanding of the therapist-patient relationship (Rainwater, 1989) shares many parallels with that of the tutor-learner relationship. For example, in the quotation above replace the words therapy, individual, life and therapist with learning, learner, educational and tutor and the parallels become clear. With the substitution of words, the above quotation is an accurate description of learning in the DMC from its second-generation onwards. In short, the quotation describes the rising dominance of the co-construction of learning experiences between tutor and learner within the DMC. In the co-construction, the tutor acts as a catalyst and the learner is required to engage in active reflection (Nunan, 1988; Elen et al. 2007 Bostock and Wood, 2012). The roles played by the tutor and learner in co-construction, mirror the functions of the MKO (Vygotsky, 1930-1934/1978) and learner within the ZPD (Vygotsky, 1930-1934/1978). The trajectory of the self (Giddens, 1991) is underpinned in part by the ZPD. I further suggest that the Trajectory of the Self has elements of Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952; McLoughlin and Oliver, 1998) and Papertian Constructionism (Papert, 1991). It should be noted that that trajectory of the self is the collective term consisting of several interacting components. Giddens' (1991) analysis begins with the notion of the self as a reflexive project. Giddens (1991) argues that the individual is responsible for the construction of his/her unique character and extraordinary potentialities.

We are, not what we are, but what we make of ourselves...what the individual becomes is dependent on the reconstructive endeavours in which he or she engages'
(Giddens, 1991).

The individual is indeed a digital public entity that bears the hallmarks of all the processes used in its construction. The purpose of reconstruction is not the development of greater understanding of oneself, but rather the building of a coherent and rewarding sense of identity (Giddens, 1991). Therefore, identity is a digital public entity developed by the constant construction and reconstruction of the self (Giddens, 1991). Giddens' (1991) notion of identity is the combination of individuality, the internal cognitive processes of the mind and the environmental influences of the communities in which the identity is constructed.

The constant reconstruction of the self eventually forms a pathway of development which Giddens (1991) calls 'the trajectory of the self'. Here the learner carefully examines and selects knowledge and experiences from their past for use in an anticipated and organised future. The anticipated future is based on an awareness of various stages in the lifespan of the learner. For instance, a learner may seek future employment as a creative professional; to realise this anticipation the learner may utilise relevant aspects of his or her past development, such as the previous study of a creative field. The result is a trajectory of the self that begins in the learner's past heading towards the anticipated future. The trajectory is not curvilinear in the conventional sense; its shape is affected by outside institutions that either support or hinder the construction of identity (Giddens, 1991).

The continual reconstruction of the self is reminiscent of Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952) and Papertian Constructionism (Papert, 1991). Both learning theories require learners to constantly engage in the rebuilding of schema (Piaget and Cook, 1952) and digital public entities. Learning within the DMC is most effective when the learner is constantly reconstructing a digital public entity (Papert, 1991; Giddens, 1991). In short, learning in DMC courses is the construction of an identity. Arguably, the notion of learning as the building of an identity has existed in the DMC since the shift to Cognitivism away from Behaviourism (Lesh and Lamon, 1992; Kellogg, 2012; Ertmer and Newby, 1993). The trajectory of the self has simply made the association between learning and identity more conspicuous than it was in previous DMC generations (Giddens, 1991).

In terms of Participatory Cultures (Jenkins et al. 2009), Communities of Practice (CoP) (Lave and Wenger 1991), Affinity Spaces (Gee, 2004) and the Trajectory of the Self; it may appear that the trajectory may be most beneficial in the explanation of how learning occurs in the fourth and current generation of the DMC. It is certainly the case that the DMC has been heading towards individualised

learning, but one must recognise the merits of the other theories. Nothing in the DMC is learnt or constructed in isolation; everything is made in collaboration. The other theories all support the collaborative narrative. Participatory Cultures (Jenkins et al. 2009) suggest collaboration with peers; CoP suggests collaboration with MKO (Vygotsky, 1930-1934/1978) and Affinity Spaces (Gee, 2004) suggests collaboration with digital public entities. It is most likely that a conflation of the theories describes how learning happens in the third space. The presence of Skinnerian Behaviourism (Skinner, 1968), Piagetian and Vygotskian Constructivism and Papertian Constructionism in the fourth-generation learning theories; implies a smooth continuation between the current and previous DMC generations.

In summary, learning within the DMC is described in the conflation of several learning theories (Skinner, 1968; Piaget, 1936; Piaget and Cook, 1952; Vygotsky, 1930-1934/1978; Vygotsky, 1931/1984; Smolucha, 1992; Jenkins et al. 2009; Lave and Wenger 1991; Papert 1991; Gee, 2004; Giddens, 1991). Elements of theories such as Skinnerian Behaviourism (Skinner, 1968) and Vygotskian Constructivism (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) describe the operation and objectives of teaching. Other theories such as Piagetian Constructivism (Piaget, 1936; Piaget and Cook, 1952) describe the operation and objectives of learning. The conflation of learning theories in the third space describes how the study and production of digital-making occur inside the classroom and online. It is important to state, that the theories operate in collaboration; rather than negating each other the conflation of theories highlights the importance of each within the DMC. All the learning theories of the DMC work towards the goal of a learner-centred curriculum, where learning experiences are co-constructed by tutors and learners (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012). Tutors function as a catalyst for the acceleration of learning and learners learn via the construction of an identity (Skinner, 1968; Piaget, 1936; Piaget and Cook, 1952; Vygotsky, 1930-1934/1978; Vygotsky, 1931/1984; Smolucha, 1992; Jenkins et al. 2009; Lave and Wenger 1991; Papert 1991; Gee, 2004; Giddens, 1991).

Nevertheless, from the perspective of a learner, an identity is constructed within a culture. Learners construct their identities through their digital public entities, which are used to differentiate one person from another, especially when in an informal setting. To participate in these digital-making settings learners require a degree of digital and media literacies. Yet, the learning theories of this

chapter do not explain the literacies used by learners in the third space. In the next chapter, I will explore the digital and media literacies used by learners in the third space.

Chapter Three: The Digital and Media

Literacies of the Digital-Making Curriculum

(DMC)

3.1 Digital literacy

In the previous chapter, I described how aspects of several theories describe the purpose and operation of teaching and learning in the Digital-Making Curriculum (DMC). All the same, learners do not participate and engage in digital-making through an awareness of learning theories. From the perspective of the learner, participation in digital-making occurs through digital and media literacies (Buckingham, 2003; Street, 2003; Burn and Durran, 2007; Belshaw, 2014). In this chapter, I will explore the digital and media literacies used by learners within the third space: the fourth and current generation of the DMC. The discussions in this chapter focus more on learners' experiences of digital-making within formal and informal settings. Therefore, this chapter will address the theoretical backdrops to research questions two, three and four, of section 1.2.

There is much confusion surrounding the term digital literacy. Consequently, there is no commonly agreed definition. The problem being that stakeholders [Politicians, Employers, Educators, and the Individual] have differing views not only as to what constitutes digital literacy but also its goals (Hague and Williamson, 2009; Gee, 2010; Grant, 2010; Hague and Payton, 2010; Williamson et al. 2010; Champion, 2012; Foresight Future Identities, 2013; Ito et al. 2013; Sefton-Green, 2013). Prior to the proliferation of digital literacy as a term, concepts such as visual literacy, technological literacy, computer literacy, ICT literacy and information literacy all unsuccessfully attempted to extend traditional notions of literacy to digital public entities (Belshaw, 2014). Belshaw (2014) suggests that the reason for these unsuccessful attempts is that literacy is often viewed as a fixed state to be achieved rather than as a continual process.

The perception of digital literacy as a continual process (Belshaw, 2014), infers that it is fluid; in the sense that it tends to take on the shape of its container. Here, the container is the environment in which digital literacy operates. Fluids are not only amorphous but can also exist in multiple states: solid, liquid and gas; as a fluid, literacy may appear and behave differently in differing environments.

The fluidity of digital literacy is only realised when traversing differing environments. Consequently, to individuals that do not frequently traverse differing environments, digital literacy may appear to be in a fixed state; making it difficult for those within the environment to view digital literacy in any other form. I suggest that literacy and by extension digital literacy exists in multiple context specific forms (Belshaw, 2014).

Street (2003) discussed the concept of new literacies, which denotes a distinction between "autonomous" and "ideological" models. The autonomous view holds that literacy is a neutral and universal skill that is automatically able to improve the cognitive abilities of the illiterate and thereby overcome social, cultural, and economic problems that may have hindered the development of literacy. In this view, literacy is learnt as a set of mechanical skills and technical competencies that can be later applied to any social, cultural, and economic context. The ideological view argues that literacy is a social practice embedded within epistemologically constructed principles rather than just a universal, technical, and neutral skill:

It is also always embedded in social practices, such as those of a particular job market or a particular educational context and the effects of learning that particular literacy will be dependent on those particular contexts. Literacy, in this sense, is always contested, both its meanings and its practices, hence particular versions of it are always "ideological", they are always rooted in a particular world-view and in a desire for that view of literacy to dominate and to marginalize others (Gee, 2004; Besnier and Street, 1994). The argument about social literacies (Street, 1995) suggests that engaging with literacy is always a social act even from the outset. The ways in which teachers or facilitators and their students interact is already a social practice that affects the nature of the literacy being learned and the ideas about literacy held by the participants, especially the new learners and their position in relations of power. It is not valid to suggest that "literacy" can be "given" neutrally and then its "social" effects only experienced afterwards.
Street (2003, p 78)

Hague (2010) interviewed several primary and secondary school teachers regarding their definitions of digital literacy. None could provide a definition devoid of contextual references and meanings. The teachers were unable to define digital literacy as an abstract collection of skills as in the autonomous view: neither were they able to define the use of digital literacy outside of their own educational contexts. In accord with Street (2003) Hague (2010) observed that digital literacy is a situated practice (New London Group, 1996) as described by the ideological model. Belshaw (2014) builds upon Street (2003) and Hague (2010) by arguing that literacy is an inherently social practice and that it is impossible for an individual to become literate in isolation:

Indeed digital literacy itself is a situated practice; it involves understanding a range of situations, tools, spaces, ideas and ways of communicating in relation to very specific contexts and altering one's behaviour to be appropriate to those contexts.
(Hague, 2010, p. 6)

When we talk about literacy we're talking about using a tool for a particular purpose. That purpose is to communicate with other people and, potentially, other things...I would argue that literacy is inherently a social phenomenon. In fact, I'd argue that, in isolation, an individual cannot be literate at all.
(Belshaw, 2014, p. 14)

One may infer from the above quotation, that all individuals are literate. In support of this notion Belshaw (2014) highlighted a UNESCO (1957) study of literacy which found that it was virtually impossible to separate the literate from the illiterate.

Literacy is a characteristic acquired by individuals in varying degrees from just above none to an indeterminate upper level. Some individuals are more or less literate than others but it is really not possible to speak of illiterate and literate persons as two distinct categories.
(UNESCO, 1957, p. 18)

Beginning in section 2.2.2, I frequently mentioned the concept of 'flows of information' that exist between the learner, the tutor, the digital technology, the community, and environment in which the digital public entities are situated. I now recognise these flows as digital literacies. The degree of literacy possessed by an individual is dependent on the frequency of communication with other people or things. Belshaw (2014) views literacy as a spectrum, in which some individuals are more literate than others. In short, the greater the level of social interaction (Vygotsky, 1930-1934/1978; Turner, 1988), the greater the level of literacy. In section 2.2.3, I argued that digital literacies [flows of information] can be obtained via social interaction and the construction of digital public entities. The digital literacies of the latter are more advanced and difficult to attain because learners must participate and engage in the construction process; socialisation alone is insufficient (Papert, 1991). The perception of literacy as a spectrum supports the argument regarding basic and advanced forms of literacy. I suggest, that DMC learners that frequently participate and engage in social interaction and the construction of digital public entities are further along the spectrum; in comparison to those learners that only participate and engage in social interaction.

The evolution of DMC learners' uses of digital literacies mirrors that of the increasingly social forms of teaching and learning. For learners and teachers, participation in the DMC is dependent on their capacity for digital literacy. One cannot participate in a system without an understanding of the

tools, mechanisms and other actors working in the system (Belshaw, 2014). This was discussed throughout the previous chapter. The salience of social interaction grew in each new generation; as a means of accessing and managing the basic digital literacies [scaffolding structures] used in the study of digital-making. Furthermore, the advanced digital literacies obtained by the construction of digital public entities are inherently social representations of the identity of the learner, the environment, and the community in which the entity is built. Aside, from Skinnerian Behaviourism (Skinner, 1968), all the theories discussed contain a social dimension (Piaget, 1936; Piaget and Cook, 1952; Vygotsky, 1930-1934/1978; Vygotsky, 1931/1984; Smolucha, 1992; Jenkins et al. 2009; Lave and Wenger 1991; Gee, 2004; Giddens, 1991). I reiterate that nothing in the DMC is learnt or constructed in isolation, everything is made in collaboration. Digital literacy is both a form of situated learning (Lave and Wenger, 1991; Stein, 1998) and a situated practice (New London Group, 1996) containing social dimensions (Belshaw, 2014).

3.2 Media literacy

It is important to remember that as first suggested in the notion of new literacies (Street, 2003) learners obtain literacies using tools. Likewise, learners obtain digital literacies using digital tools and new literacies (Belshaw, 2014). Belshaw (2014) further argued that literacy is closely associated with not only the knowledge concerning the use of tools referred to as tool knowledge. But also, the information conveyed by the content created by use of tools referred to as content knowledge. I suggest that both types of knowledge reinforce digital literacy as situated learning (Lave and Wenger, 1991; Stein, 1998) and situated practice (New London Group, 1996) both of which are inherently social. Even so, digital literacies only provide an outline or an indication of learner participation in the third space. Digital literacies, do not provide enough insight into the digital public entities produced by learners. The concept of content knowledge (Belshaw, 2013) is only valid within an agreed system, practice, or culture. Communication between two or more parties can only exist if both have a common understanding of the information conveyed through content (Belshaw, 2014). Otherwise, communication becomes transmission of a cypher; with the other party lacking the key to deciphering it. Digital literacy indicates that communication is social, context-specific and available in multiple forms; yet it does not reveal how both parties discern communication, only that some parties

are more adept than others in doing so. Notwithstanding, I suggest that the field of media literacy may provide further insights.

Burn and Durran (2007) offer a cultural-semiotic model of media literacy based on cultural contexts, social functions, and semiotic processes. The model is drawn from extensive academic bodies of work concerning cultural studies and the study of semiotic processes. All three areas contain subsets which describe media literacy in detail. The model provides an excellent and comprehensive overview of media literacy in each subset. Rather than reciting the model, I will discuss its relevance to the third space. Regarding the three cultural contexts, one must remember that the third space consists of two settings: the classroom and the home. Social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) and construction of digital public entities differ vastly in both settings.

Table 1: Media literacy – a cultural-semiotic model (Burn and Durran, 2007)

Cultural Contexts	Social Functions	Semiotic processes
Lived	Cultural	Discourse
Selective	Creative	Design/Production
Recorded	Critical	Distribution
		Interpretation

In the classroom setting, the cultural contexts of the third space concern the development of expertise (Bereiter and Scardamalia, 1993; Gee, 2003). Through engagement in Participation, Remediation, and Bricolage (Deuze, 2006), learners acquire digital and media literacies, the result of which is a corresponding increase in the expertise of digital-making. I suggest that literacy and expertise are inseparable. The perception, of literacy as a continual process (Belshaw, 2014) was preceded by an argument of Bereiter and Scardamalia (1993) which viewed expertise as a continuous process. Using the analogy of learning to drive, Bereiter and Scardamalia (1993) illustrate their argument. In the initial stages, the mental resources of an individual are fully invested in driving: until such a time that the individual can drive without using the full capacity of their mental resources. While this level of skill may be sufficient for driving in everyday traffic conditions: it is insufficient for driving in a race on a track, where the conditions are far more demanding.

I suggest that the perceptions of literacy and expertise as continuous processes are both expressions of situated learning (Lave and Wenger, 1991; Stein, 1998). Therefore, the spectrum of

literacy is also the spectrum of expertise. Progression along the spectrum is not dependent on innate ability or self-expression, but rather the traversal of various environments. In the classroom setting, the available learning environments are determined by the curricular needs of DMC courses.

It is important to clarify that the DMC is not a culture but rather a curriculum that incorporates the subcultural practices of digital-making. The term Digital-maker denotes a propensity to produce digital public entities through the situated practices of Participation, Remediation, and Bricolage (Deuze, 2006). These subcultural practices in combination with the curricular goals of courses, infuse the DMC with its meanings and values. Namely, directed learning at an accelerated pace through immersion in social interaction and the construction of digital public entities; resulting in the continual reconstruction of identity or the self as evidenced by the display of expertise (Vygotsky, 1930-1934/1978; Giddens, 1991; Papert, 1991). The assessment of learning in the DMC is not based on the identities of its learners; but rather the expertise displayed by learners. In short, the combination of situated learning (Lave and Wenger, 1991; Stein, 1998) and situated practice (New London Group, 1996) forms the lived, selective, and recorded culture of the third space in the classroom setting.

In contrast, in the home-setting, the cultural context of the third space concerns the development of identity or the self; which is acquired by the same means as the pursuit of expertise in the classroom setting. Nevertheless, without the supervision of a formal curriculum the third space operates purely as a digital subculture (Mc Arthur, 2009). It is important to note that Participation, Remediation, and Bricolage (Deuze, 2006) are expressions of digital and media literacies that pertain to the construction of digital public entities. Consequently, the presence of these literacies permeates all creative software, online communities, and environments; especially those that encourage social interaction and the construction of digital public entities. All participants of digital-making are deemed digital-makers and all exist on a spectrum (Belshaw, 2014). Digital-makers cannot be separated from non-digital-makers; just as UNESCO (1957) could not divide individuals into the literate and illiterate. Traversal of differing creative software, online communities, networks, and environments, requires the adjustment of behaviour to an extent, to conform to the customs of an environment. This modification of behaviour is achieved via selective uses of digital and media literacies, is how a learner forms the basis of his/her identity as a digital-maker. Inevitably, any digital public entities produced by the learner will retain common elements that are translatable across various communities and environments. Learners then bring these literacies from the home into the classroom and vice versa.

Identity is a conflation of the values and aspirations held by the learner, the online communities and environments frequented by the learner. Identity also possesses a degree of fluidity like literacy.

Toward this aim, Williams (2006) suggested that the Internet has become a medium for subcultural affiliation and the negotiation of social identity (Bandura, 1986) within cliques or groups. The use of the Internet as a resource for subcultures suggests that subcultures today are able to affiliate across location and time constraints (Mc Arthur, 2009, p. 59)

The theme of a social identity aligns well with the second social functions section of the media literacy model (Burn and Durran, 2007). Citing Bruner (1990) Burn and Durran (2007) highlight the notion of selfhood within the concept of social identity:

First, 'the meanings in terms of which Self is defined both by the individual and by the culture in which he or she participates'. Second, 'the practices in which "the meanings of Self" are achieved and put to use' (Bruner, 1990:116). This allows for a conception and study of identities which are negotiated (between the individual and the culture) and distributed (throughout the individual's cultural world and its other inhabitants). (Burn and Durran, 2007, p. 12)

The meanings of the self are the result of negotiation when a learner enters a community, network or environment, the learner is obliged to alter some aspects of their identity to function within. To achieve successful learning, a learner must familiarise him/herself with the MKO (Vygotsky, 1930-1934/1978), community or environment, via social interaction and construction of digital public entities. Likewise, the community, network or environment is obliged to acknowledge the identity of the learner and their contributions. This negotiation is present in Participatory Cultures (Jenkins et al. 2009), CoP (Lave and Wenger 1991), Affinity Spaces (Gee, 2004) and the Trajectory of the Self (Giddens, 1991). I suggest that the practices of the social functions section of the media literacy model concern the selective uses of digital and media literacies by the learner. Learners further along the spectrum are better disposed to the distribution of cultural practices via their identities. The duality of Selfhood shares many similarities with the notion of socially situated identities Gee (1990).

I use the term identity (or, to be specific, socially situated identity) for the multiple identities we take on in different practices and contexts and would use the term core identity for whatever continuous and relatively (but only relatively) fixed sense of self underlies our contextually shifting multiple identities. (Gee, 1990, p. 34)

As Gee (1990) does not venture into greater clarification as to what exactly constitutes a core identity. I will use the concept of anchored and transient identities (Merchant, 2005) to elaborate. Like

Gee (1990) Merchant (2005) argues that anchored identities are constituted of personal traits and attributes that are either intransigent or very difficult to change regardless of social context. Although Merchant (2005) does not provide an exhaustive topology of anchored identities; personal traits and attributes such as gender, ethnicity, religion, and social class are mentioned in this regard. Transient identities (Merchant, 2005) on the other hand, are the aspects of personalities that vary depending on social contexts. Again, Merchant (2005) does not engage in an exhaustive definition but does indicate that transient identities entail things such as popular cultural tastes in literature, music, film, and sport. Merchant (2005) does not consider transient identities lesser to anchored identities: and only uses 'transient' to indicate that these identities are easier to adopt and discard.

The key difference between both forms of identity is that individuals perform transient identities presumably to ease communication and navigation inside social contexts. In this regard, transient identities share many parallels with socially situated identities (Gee, 1990): in which individuals adopt an identity to be recognised by others within their environments. It is important to observe that individuals determine transient identities: whereas Discourses determine socially situated identities (Gee, 2004). The question here is what is the extent of learner agency in determining their identities? Burn and Durran (2007) expand the question of agency to include points raised by Bruner (1990) these being cultural circumstances, forms of social action, ideas, and beliefs. Burn and Durran (2007) address these issues through the creative functions of media literacy. Burn and Durran (2007) view creativity as an act with the potential to transform the creator.

In making something valuable, worthwhile, new, we change our sense of ourselves, whether through representing some aspect of ourselves in what we have made or in our altered sense of what we can do.
(Burn and Durran, 2007, 12-13)

The creative subset of the social functions of media literacy addresses the growing prominence of digital-making as a form of learning. The sentiment of the above quotation echoes that of all the learning theories of the DMC discussed in Chapter Two, in which the identities of learners are transformed to an extent through creative production of digital public entities. I use the term 'to an extent' because the act of production also breeds a critical function which also has a transformative effect on the identity of learners. Drawing on the work of Vygotsky (1931/1978, 1998) Burn and Durran (2007) argue the following:

Our approach to creativity draws on the work of the Russian psychologist, Lev Vygotsky, for whom the creativity of children was closely related to play (Vygotsky, [1931] 1978, 1998). In playful activity, children learn the meaning of symbolic substitution through the manipulation of physical objects: so a broomstick becomes a horse, to use Vygotsky's example. These symbolic understandings become internalised and develop into the mental processes which generate creative work.

(Burn and Durran, 2007, p. 13)

Vygotsky (1930-1934/1978) argues that in play children combine elements of their previous experiences with aspects of their imagination to create a new reality that conforms to his/her own needs. For Vygotsky (1930-1934/1978), the ability to combine experience and imagination to produce a new structure is the basis of creativity. This argument is equally if not more so applicable to digital-making. When learners engage in Participation, Remediation, and Bricolage (Deuze, 2006) they are essentially performing the same acts of play; especially within the third space in the home-setting. The children in the above quotation did not construct their physical objects of play, yet the learner within the third space does construct digital public entities. In digital-making for the learner acting as creator, symbolic substitution becomes symbolic construction and the manipulation of physical objects becomes the construction of digital public entities.

Through symbolic construction, the learner gains greater control over how others may perceive their identity. Symbolic construction is then tantamount to the reconstruction of the self as described in Papertian Constructionism (Papert, 1991). The act of play as described in the above quotation becomes a description of how others perceive the identity of the learner through social interaction. The construction of identity occurs through acts of social play, with the learner acting as the constructor and others acting as manipulators of the learner's identity. Each instance of play is a creative act that transforms the identity of learners as digital-makers (Burn and Durran, 2007). I suggest that participation in digital-making as a constructor or manipulator imbues greater ability to view digital public entities critically. In this light, digital public entities and digital-makers may be viewed as rhetorical systems (Buckingham, 2007) that convey beliefs, emotions, and meanings.

The ability to critically perceive belief, emotion, meaning and identity within digital public entities is a semiotic process. The semiotic functions of the media literacy model concern the operation of media literacy; namely how learners develop their understanding. Here, it is assumed that learners possess highly developed understandings of media literacy prior to entering education.

For Burn and Durran (2007) the purpose of semiotics in media literacy is the enhancement of these prior understandings through the analysis of learners existing competencies. The analysis is then used outline new competencies to add to the existing understanding of learners. The combination of new and existing competencies results in learners developing an understanding of the semiotic workings of media texts. Semiotics in media literacy becomes a process of detection and inspection; rather than the imposition of competencies as dictated by formal education. Drawing upon the work of Hodge and Kress (1988) and van Leeuwen (2005) Burn and Durran (2007) argue that media literacy operates through social semiotics or semiosis.

Semiotics is the general study of semiosis, that is, the processes and effects of the production and reproduction, reception and circulation of meaning in all forms, used by all kinds of agent and communication. ('Semiotic' as an adjective thus refers to the range of objects of this study while 'semiosis' refers specifically to the process itself). (Hodge and Kress, 1988, p. 261)

In the context of this thesis, the difference between Semiotics (Saussure, 1916/1983) and Semiosis is like the difference between the autonomous and ideological models of literacy (Street, 2003) discussed earlier in this chapter. Semiotics presents a view of signification in which the relationship between the signifier and the signified is arbitrary (Burn and Durran, 2007). There is no social context linking the signifier to the signified. Semiotics becomes a mechanical practice applied to the analysis of systems and products [digital public entities]; without consideration of the constructors, manipulators, and participants within, nor their connections and interactions with each other. In contrast, Semiosis argues that semiotic systems cannot be removed from their social contexts (Burn and Durran, 2007). Signification includes the constructors, manipulators and participants of systems and products and their connections and interactions. Burn and Durran (2007) argue that in all acts of signification all texts [digital public entities] are representative of the world in particular ways. All texts communicate with audiences and are systematically organised to convey coherent and cohesive messages. Hodge and Kress (1988) hold the view that the message is the smallest semiotic form:

The smallest semiotic form that has concrete existence is the message. The message has directionality – it has a source and a goal, a social context and purpose. It is oriented to the semiotic process, the social process by which meaning is constructed and exchanged, which takes place in what we will call the semiotic plane. The message is about something which supposedly exists outside itself. It is connected to a world to which it refers in some way, and its meaning derives from this representative or mimetic it performs. We will call this plane in which representation occurs the mimetic plane. (Hodge and Kress, 1988, p. 5)

In semiosis, signification is far more socially and culturally expansive than in semiotics, yet the underlying structures of semiotics remain. For instance, the semiotic plane (Hodge and Kress, 1988) expands upon the signifier, the mimetic plane (Hodge and Kress, 1988) expands upon the signified and both planes form the sign. Likewise, the notion of the message is more expansive in semiosis. The message with its meanings is socially constructed in the semiotic plane; whereas the representative form of the message is located in the mimetic plane. Socially constructed meaning occurs in the semiotic plane and representations of the world are constructed in the mimetic plane.

Messages travel between sources and goals and vice versa in clusters which then form structures called texts that contain socially related messages (Hodge and Kress, 1988). That is messages deemed by the community as possessing similarities in their meanings within social contexts. In the context of this thesis, texts are akin to digital public entities, hence messages are conveyed within digital public entities. Just as in the message, texts are located in the semiotic and mimetic planes. The collective socially constructed meanings of texts are embedded within social processes called discourses which are located in the semiotic plane. The text itself is then located in the mimetic plane as digital public entities and collections of texts form sign systems.

From a semiotic perspective, the arbitrariness of the sign is also applicable to sign systems (Hodge and Kress, 1988). Semiotics, views sign systems as abstract and static structures, in contrast, Hodge and Kress (1988) argue that all sign systems are semiotic acts. Therefore, sign systems are socially contextual, specific, and dynamic structures of development and change. Sign systems are continually reproduced and reconstituted within texts, consequently, sign systems document their own history and construction. Sign systems are discourses:

Discourse in this sense is the site where social forms of organization engage with systems of signs in the production of texts, thus reproducing or changing the sets of meanings and values which make up a culture.
(Hodge and Kress, 1988, p. 6)

Throughout chapters two and three I have frequently referred to learning as the construction of a social identity that displays the combined values and aspirations of the learner and the MKO (Vygotsky, 1930-1934/1978), communities, networks, and environments. I suggest that the combination of values and aspirations is visible within discourses which govern the production of digital public entities. Earlier in this section, I argued that all participants of digital culture are deemed digital-makers and all exist on a spectrum. For the sake of clarity, the spectrum to which I refer is that

of digital-making. I now suggest that discourses may reveal the positions of digital-makers on the spectrum of digital-making. Hodge and Kress (1988) continue to define discourses as genres of texts:

Such systems often operate by specifying genres of texts (typical forms of text which link kinds of producer, consumer, topic, medium, manner and occasion). These control the behaviour of producers of such texts, and the expectations of potential consumers. (Hodge and Kress, 1988, p. 7)

Drawing upon the work of Kress and van Leeuwen (2001), Burn and Durran (2007) view discourse as the first of a four-part model of semiosis processes. In this model, discourses are viewed as not only precursors to acts of meaning-making; in which every aspect of making texts are discursively situated and informed. Discourses become pervasive mediums in their own right. Gee (1990) echoes the sentiments of discourses expressed by his contemporaries:

The term "Discourse" (with a big "D") is meant to cover important aspects of what others have called: discourses (Foucault 1966); communities of practice (Lave and Wenger 1991); cultural communities (Clark 1996); discourse communities (Bizzell 1992); distributed knowledge or distributed systems (Hutchins 1995); thought collectives (Fleck 1979); practices (Bourdieu 1990); cultures (Geertz 1973); activity systems (Engeström, Miettinen, and Punamäki 1999); actor-actant networks (Latour 2005), collectives (Latour 2004); and (one interpretation of) "forms of life" (Wittgenstein 1958). Discourses, for me, crucially involve: a) situated identities; b) ways of performing and recognizing characteristic identities and activities; c) ways of coordinating and getting coordinated by other people, things, tools, technologies, symbol systems, places, and times; d) characteristic ways of acting-interacting-feeling-emoting-valuing-gesturing-posturing-dressing-thinking-believing-knowing-speaking-listening (and, in some Discourses, reading-and-writing, as well). (Gee, 1990, p. 40)

"The key to Discourses is "recognition." If you put language, action, interaction, values, beliefs, symbols, objects, tools, and places together in such a way that others recognize you as a particular type of who (identity) engaged in a particular type of what (activity), here and now, then you have pulled off a Discourse (and thereby continued it through history, if only for a while longer). Whatever you have done must be similar enough to other performances to be recognizable. However, if it is different enough from what has gone before, but still recognizable, it can simultaneously change and transform Discourses. If it is not recognizable, then you're not "in" the Discourse." (Gee, 1990, p. 35)

Based on the perspectives on discourse expressed above, I suggest that discourses may reveal significant insights into the situated languages, practices, behaviours, identities, and social interactions (Vygotsky, 1930-1934/1978) of digital-makers and the production of digital public entities. These elements exist as coded patterns within the communications of digital-makers (Burn and Durran, 2007). As I stated earlier in this section, I consider all learners to be digital-makers that exist on a spectrum. Implicit within the concept of a spectrum, is the notion that some digital-makers are more active than others. For the sake of clarity, it is my assertion that greater insights concerning the third space reside in the discourses of its frequently active participants. These FDM(s) (FDM) possess

a greater understanding of digital and media literacies through their greater social interaction and the construction of digital public entities. Mc Arthur (2009) cited Sugarbaker (1998) and Muggleton (2000) in arguing that to understand a subculture one must speak to those actively involved. Although, learners cannot be separated into digital-makers and non-digital-makers (Belshaw, 2014); I contend that learners can be categorised as frequent and infrequent digital-makers. I contend that the FDM will recognise their peers and MKO (Vygotsky, 1930-1934/1978) through patterns in their discourses, hence, the label of the frequent digital-maker is valid. The knowledge concerning the subculture of digital-making and the DMC resides in the discourses of FDM.

The design and production of semiosis processes of the media literacy model (Burn and Durran, 2007) refer to the mode and medium chosen to produce digital public entities. Modes are signifying systems used to convey the meanings of texts, for instance, language verbal and written, moving images, still, images, music, visual design, action, and dramatic action are all modes carried by mediums such as film, television, and printed books (Burn and Durran, 2007). Part of the meaning conveyed in a text is affected by the choice of medium and its construction; which becomes even acuter when the medium is digital and interactive. All digital public entities are produced via Participation, Remediation, or Bricolage (Deuze, 2006), consequently, digital mediums have the potential to change the representation of meaning within an entity (Belshaw, 2014). For example, the meaning of a meme may change frequently depending on its construction (Belshaw, 2014). The distribution and exhibition of digital public entities may also affect how others perceive it. In distribution, the modes of a meme are frequently transformed resulting in new memes created by recipients of the original meme. Again, due to Participation, Remediation, and Bricolage, the distribution and exhibition of texts become even more salient.

The final semiosis process of the media literacy model is Interpretation: the process through which the understanding of media texts is gained. Burn and Durran (2007) describe interpretation as a dialogic process between formal and informal analysis and the production of texts. Interpretation and production are inseparable; each production of digital public entities is also an interpretation of an aspect of reality from the perspective of its maker. The interpretation of any media text is influenced by previous interpretations of texts formerly encountered by the individual (Papert, 1991; Burn and Durran, 2007). Hodge and Kress (1988) also support the perception of interpretation as a dialogic

process; one in which the texts made by producers cannot function as intended unless an audience interprets them. Without an audience, capable of interpretation the social power of meanings of messages within texts would be rendered impotent. The texts and its producer and audience must all be situated within the same discourse, interpretation is how this is achieved.

In summary, I suggest that in conjunction with the model of digital literacy presented in the first half of this chapter; the media literacy model (Burn and Durran, 2007) equips learners with the skills and abilities reflective of modern literary practices (Buckingham, 2003; New Media Consortium, 2005; Gee, 2010). Regardless of the setting in which the third space functions; whether in the home-setting or the classroom; learners use digital and media literacies indiscriminately. To function in the third space learners must utilise both types of literacy; the boundaries between which are becoming increasingly narrow (Buckingham, 2003) in response to the democratisation and rise of digital creativity, mentioned in section 1.4.2. The public entities that populate the third space are simultaneously textual and digital.

Chapter Four: Theoretical Framework – The Discourse of the Digital-Maker

4.1 The discourse of the digital-maker

In this chapter, I will continue to address the theoretical backdrops to research questions two, three and four, of section 1.2. The discussion may also overlap into the theoretical backdrop for research question one as well. I will discuss the structure of the third space. I will also discuss learners' progression through the third space based on their experiences of digital-making. In section 2.2.1. I stated that I would reserve my discussion regarding the stages of development within the DMC for this chapter. My rationale being that the reader needed to be familiar with notions of infrequent and frequent digital-makers existing in a spectrum (section 3.2). The reader also needed to understand how digital-makers use digital and media literacies to create meaning in the classroom and home-settings of the third space; and the concept of discourses as precursors to acts of meaning-making. Finally, the reader needed to understand the notion of the co-creation of learning experiences (section 2.2.1) which began in the third-generation of the DMC; but now takes on greater significance in the third space.

Building on the work of Vygotsky, (1930-1934/1978; 1931/1984; Smolucha, 1992) and Bereiter and Scardamalia (1993); I will map the spectrum of the digital-maker in the form of a discourse (Gee, 1990, 1999). The discourse of the digital-maker will map the sections of the spectrum through which learners must progress to develop as digital-makers. In short, the mapping of the spectrum is the mapping of the third space itself. Much is known about the initial and final stages of becoming a digital-maker but little is known about the phases between (Sefton-Green, 2013). Progression through the spectrum is dependent on learners utilising the teaching and learning practices of Chapter Two, and the literacies of Chapter Three, in their digital-making endeavours whether in the home or classroom setting. The discourse will be used as a tool to locate the positions of digital-makers in DMC courses. The discourse will generate strong evidence regarding learners' influences, perceptions, and experiences of digital-making inside and outside of FE, and learners' rationales for and against participation in DMC courses in FE. It is my assertion that the answers to all

the research questions stated in section 1.2 reside within the discourses of learners identified as Frequent Digital-makers (FDM).

The work of Ito et al. (2010), Roswell (2013) and Peppler (2013) argues that digital-making is an iterative and incremental process characterised by trial and error, playfulness, improvisation, reflection, and experimentation (Latour, 1986; Ito et al. 2012; Roswell, 2013; Sefton-Green 2013). This is significant because it portrays how learning takes place within the third space. Too often, learning regarding creative production is overly romanticised as occurring in leaps and bounds of creative epiphanies (Sefton-Green 2013). Similarly, quoting Ribot (1906) Vygotsky (1931/1984; Smolucha, 1992) argued that acts of creativity perceived as individual moments of 'genius' are built upon the collective labour of others prior to the creative act. The research of Ito et al. (2010) and Rowsell (2013 and 2015) present retrospective accounts of the initial phases of digital-making in early life and professional applications in later life: such as to imply the existence of a continuum. For the sake of clarity, I will refer to the continuum as a spectrum, as established throughout Chapter Three.

Both Ito and Rowsell therefore hint at a set of preconditions and a model of development for makers in the digital era.
(Sefton-Green, 2013, p. 27)

Many scholars – in line with Ito's progression model above – suggest that all of these activities belong on a continuum, and therefore they are worth capturing in these surveys.
(Sefton-Green, 2013, 2013, p. 31)

These two studies are interesting because they represent study of two moments in time: setting out to become a maker, and looking back on the process of having become one.
(Sefton-Green, 2013, 2013, p. 27)

While the robustness of this research is acknowledged by many (Peppler, 2013; Quinlan, 2015). Sefton-Green (2013) highlights several salient concerns regarding the dearth of knowledge about the stages between the initial and final phases of becoming a digital-maker, (section 1.2). For Sefton-Green (2013), there is no distinction between digital-making and creative production. Even so, while all digital-making is creative, not all creative making is digital. In the view of Bereiter and Scardamalia (1993) the development of creativity is the acquisition of expertise. In Chapter Three, I argued that improvement of expertise corresponds with increased involvement in Participation, Remediation, and Bricolage; the hallmarks of digital-making (Deuze, 2006). For the sake of clarity, the discourse of the digital-maker is a spectrum that maps the progression of digital-makers within the

third space. While the acquisition of creativity and expertise is certainly a feature of this spectrum, I do not intend the discourse to apply to all forms of non-digital creativity and expertise. The discourse applies to digital-making only.

4.1.1 Stage one: Play

In Chapter Three, I discussed the Vygotskian model of symbolic play (Vygotsky, 1930-1934/1978) and introduced the term of symbolic construction. I derive the concept of symbolic construction from the work of Vygotsky on imagination and creativity in childhood and adolescence (Vygotsky, 1930-1934/1978; Vygotsky, 1931/1984; Smolucha, 1992). The substitution of which children engage during symbolic play (Vygotsky, 1930-1934/1978) gives rise to the creative imagination; which matures into the artistic and scientific creativity of adulthood. For Vygotsky (Vygotsky, 1930-1934/1978) the imagination is the basis of all cultural, artistic, scientific, and technical creativity:

Vygotsky's theory of creative imagination has four main features: 1. Imagination develops out of children's play. 2. Imagination becomes a higher mental function and as such is a consciously directed thought process. 3. In adolescence, creative imagination is characterized by the collaboration of imagination and thinking in concepts. 4. The collaboration between imagination and thinking in concepts matures in the artistic and scientific creativity of adulthood. (Smolucha, 1992, p. 49-50)

Vygotsky (1930-1934/1978) begins from the position that the imagination is the internalisation of play. Within the imagination resides several notions that facilitate its development into the mature artistic and scientific creativity of adulthood. The first of these notions being repeated experience; here the materials, meanings, gestures, actions, and movements of symbolic play (Vygotsky, 1930-1934/1978) originate from the imagination. Inside the imagination, play exists in an idealised form, thus in the physical act of symbolic play the idealised experience is repeated in the physical environment. Notwithstanding, this is only possible if the environment contains objects to which the child can assign a symbolic substitution. This is how the child adapts the environment to create a reality suitable for his/her own needs. A broomstick becomes a horse; not due to any resemblance but rather its representational functionality (Vygotsky, 1930-1934/1978). The gestures and actions of riding a horse can be replicated by treating the broomstick like a horse.

I suggest that digital-making operates in a similar manner to play. Digital public entities originate in the imagination of the digital-maker as an idealised experience; digital public entities are the repetition of the idealised experience in material form. The digital-maker uses digital public entities to suit his or her own needs.

The child's capacity to assign representational functionality to objects is indicative of the reproductive and combinatory functions of the imagination (Vygotsky, 1930/1967; Smolucha, 1992). The reproductive imagination is concerned with memory namely the ability to recall and replicate previous behaviours and impressions; for instance, the gestures associated with horse riding. The combinatory imagination concerns creative thinking; here elements of previous experiences are creatively applied to new situations and behaviours (Vygotsky, 1930/1967; Smolucha, 1992). It is through the combinatory imagination that fantasy (Vygotsky, 1930/1967; Smolucha, 1992) is developed. Here, fantasy refers to the ability to imagine, realise and materialise a desired future reality (Vygotsky, 1930/1967; Smolucha, 1992). One may infer that in the combinatory imagination the child is not merely reacting to environmental conditions as in the reproductive imagination; but rather through fantasy the child is able to reconstruct their present environment in the mould of their desired future reality.

When the imagination is combined with the inner speech of the child during symbolic play (Vygotsky, 1930-1934/1978); it becomes a higher mental function: functions that require conscious thought, for example, language memory, thinking, attention, abstraction, and perception (Kovalchick and Dawson, 2004). Imagination becomes a consciously directed thought process (Vygotsky, 1934/1962).

Inner speech is not the interior aspect of external speech--it is a function in itself. It still remains speech, i.e., thought connected with words. But while in external speech thought is embodied in words, in inner speech words die as they bring forth thought. Inner speech is to a large extent thinking in pure meanings. It is a dynamic, shifting, unstable thing, fluttering between word and thought, the two more or less stable, more or less firmly delineated components of verbal thought. (Vygotsky, 1934/1962, p. 249)

Dialogue launches language, the mind, but once it is launched we develop a new power, 'inner speech,' and it is this that is indispensable for our further development, our thinking. . . 'We are our language,' it is often said; but our real language, our real identity, lies in inner speech, in that ceaseless stream and generation of meaning that constitutes the individual mind. It is through inner speech that the child develops his own concepts and meanings; it is through inner speech that he achieves his own identity; it is through inner speech, finally, that he constructs his own world. (Sacks, 1989, p. 72- 73)

Clearly, all digital-makers possess inner speech, yet I suggest that in the discourse of the digital-maker, Frequent Digital-maker(s) (FDM) engage in fantasy (Vygotsky, 1930/1967; Smolucha, 1992) more often than the infrequent. The behaviours described in fantasy resemble those described in the Trajectory of the Self (Giddens, 1991). Fantasy (Vygotsky, 1930/1967; Smolucha, 1992) may also be regarded as a key aspect in the development of learning as the construction of identity. FDM acquire greater depths of digital and media literacies; not due to a greater desire for learning but a sense of dissatisfaction with aspects of their current identity, environment, or reality, especially in adolescence (Vygotsky, 1930/1967; Smolucha, 1992). Dissatisfaction is the stimulus of fantasy, whereas fantasy is the product of inner speech (Vygotsky, 1930/1967; Smolucha, 1992).

As the psychologists we quoted earlier correctly said, the adolescent doesn't fantasize when he is unhappy but rather when he is unsatisfied. The unsatisfied wish is the initiating stimulus of fantasy. Our fantasy, the achievement of the wish, is an amendment to the unsatisfying reality. (1931/1984, p. 216-217)
(Smolucha, 1992, p. 61)

In adolescence, the imagination becomes more closely aligned with thinking in concepts; because of the convergence between fantasy and thinking (Vygotsky, 1931/1984). The more excitable and surreal elements of childhood fantasy begin to fade, and the imagination becomes increasingly abstract and concerned with realistic subjects. Collaboration (Vygotsky, 1931/1984) occurs between imagination and thinking, resulting in the creation of a psychological system that organises creative thought. Fantasy is then separated into objective and subjective types (Vygotsky, 1930/1967; Smolucha, 1992). Objective fantasy (Vygotsky, 1930/1967; Smolucha, 1992) concentrates on the environment external to the adolescent. In contrast, subjective fantasy (Vygotsky, 1930/1967; Smolucha, 1992) focuses on the emotions creating an internal environment inside the mind of the adolescent. Subjective fantasy seeks to manifest itself within its objective counterpart; appearing as creative works, for example, digital public entities. Therefore, the digital public entities that populate the third space contain elements of their creator's identity in a form that is compatible with the environment. In this context, media literacy may be viewed as an external version of thinking in concepts; a means of organising creative thought so that others can interpret the meanings conveyed by digital public entities. For the digital-maker, digital public entities are the evidence of thinking in concepts. To the imagination of the digital-maker, digital public entities are realistic subjects. In adulthood, the collaboration between the imagination and thinking in concepts matures

into artistic and scientific forms of creativity (Vygotsky, 1930/1967; Smolucha, 1992). Consequently, fantasy and abstract thinking also mature (Vygotsky, 1930/1967; Smolucha, 1992). In maturity, one becomes adept in the production of creative works, or in the context of this thesis digital public entities:

It is not until adulthood that one becomes proficient at coordinating the iconic and conceptual, and subjective and objective, aspects of thinking in the production of creative works. (Smolucha, 1992, p. 59)

Play leads to expertise in creative production, to this extent I agree with Vygotsky (1930/1967; Smolucha, 1992). Still, I disagree with the notion that creativity is linked to biological development (Vygotsky, 1930/1967; Smolucha, 1992). At the time of writing, Vygotsky had not witnessed digital forms of artistic and scientific production. Non-digital methods of artistic and scientific production were time-consuming and difficult to master. I meet Vygotsky's (Vygotsky, 1930/1967; Smolucha, 1992) argument of puberty being the catalyst of change between the childhood and adolescence with scepticism. Additionally, I also remain sceptical regarding Vygotsky's (Vygotsky, 1930/1967; Smolucha, 1992) argument of literary creativity taking precedence over artistic creativity during adolescence. In section 1.1, I mentioned the 'popularity and high levels of consumption of digital content prevalent in modern British culture' (Tapscott and Williams, 2008). Much of this content is produced by young people of similar age to digital-makers in DMC and non-DMC courses (Erstad, 2010). I suggest that due to the ubiquity, scaffolding structures, and the efficiency of digital public entity production; the progression from play to creative expertise is no longer dependent on biological development. It is possible for Frequent Digital-maker(s) (FDM) to develop the mature imagination and creativity of adulthood without physically being an adult. Neither does being an adult preclude the development of imagination and creativity beginning with play. I assert that environmental factors are far more influential in the development of digital-making, as I argued throughout Chapter Two.

Furthermore, as the key area of development within the imagination, fantasy is a social semiotic process (Hodge and Kress, 1988). I suggest that FDM feel greater dissatisfaction with elements of their identities and the environments and communities in which they participate. FDM, possess greater media literacies than the infrequent and this allows FDM to recognise more easily, analyse, and understand the meanings of messages inside media texts [digital public entities];

prompting dissatisfaction. I suggest that dissatisfaction is akin to the recognition of a creative problem (Bereiter and Scardamalia, 1993), subsequently, FDM seek to alter or rectify their dissatisfaction.

A commonality in the work of Ito et al. (2010), Rowsell (2013) and Peppler (2013) is that the initial experiences of digital-making are strongly associated with moments of inspiration, epiphany, enthusiasm, or altruism regarding a social, leisure and recreational activity. In contrast, I suggest that play (Vygotsky, Giddens, 1964; Smith and Pellegrini, 2008 and 2013) is the first stage in the development of digital-making.

Play suggests an alternative model in which learners' initial encounters of digital-making are situated in social interaction (Vygotsky, 1930-1934/1978; Turner, 1988), leisure and recreation (Veal, 1992): and it is by these activities, that learners develop their knowledge of digital-making. Like the ideological model of literacy (Street, 2003) and argued by Vygotsky (1930-1934/1978, 1931/1984; Smolucha, 1992) play, is not just a universal, technical, and neutral skill: but rather a social practice embedded within epistemologically constructed principles.

Many scholars recognise the importance of play in the development of learning in young children (Giddens, 1964; Vygotsky, 1930/1967; Vandenberg, 1986; Smolucha, 1992; Long et al. 2010). I suggest that the concept of play should not be limited to childhood only (Vygotsky, 1930/1967; Giddens, 1964; Smolucha, 1992) but should be extended to include an individual's initial learning experiences in the understanding of new skills (Long et al. 2010). It is from this viewpoint that I also suggest that play is of similar importance in the initial stages of digital-making development, regardless of a learner's age. Although digital-making has not traditionally been viewed as a form of play, I contend that the initial experiences of digital-making situated in fantasy (Vygotsky, 1930/1967; Smolucha, 1992) social interaction (Vygotsky, 1930/1967, 1930-1934/1978), and leisure and recreation resemble play:

Play is often defined as activity done for its own sake, characterized by means rather than ends (the process is more important than any end point or goal), flexibility (objects are put in new combinations or roles are acted out in new ways), and positive affect (children often smile, laugh, and say they enjoy it). These criteria contrast play with exploration (focused investigation as a child gets more familiar with a new toy or environment, that may then lead into play), work (which has a definite goal), and games (more organized activities in which there is some goal, typically winning the game). (Smith and Pellegrini, 2013, pp 1)

The distinction between play and other non-ludic activities is the presence of a goal. Since play is an activity performed for its own sake, it is reasonable to conclude that play is an end, in and of itself (Giddens, 1964; Lowenfeld, 1935/1991; Smith and Pellegrini, 2008 and 2013). The goals that differentiate exploration, games and work from play must be external to those activities (Piaget, 1962; Smith and Pellegrini, 2008). Any digital-making activity that is not performed to meet an external goal must be interpreted as an instance of play. Yet, it should be noted that some learners do not begin the development of their digital-making literacy at stage one. For such individuals, many activities have external goals often set by another person, group, or organisation.

The definitive characteristic of learners who are engaged in this phase of the spectrum is that: the majority of activities are situated in social interaction, leisure, and recreation, which may have little to do with digital-making. It is far more likely that these playful pursuits are 'practices embedded in contemporary popular culture' (Gee, 2010). These learners' uses of digital public entities are simply screen-based extensions of these playful pursuits. Such learners may perceive digital technologies as pragmatic tools but may struggle to perceive or utilise digital technologies as creative devices (Durdell, 1990, Anderson et al. 2008; Koppi et al. 2008). Consequently, learners that reside in this phase have little efficacy or even enthusiasm for the uses of digital technologies outside of their playful personal interests (Bulfin and Koutsogiannis, (2012).

4.1.2 Stage two: Exploration

The second stage is exploration or focused play; although Smith and Pellegrini (2008 and 2013) suggest that exploration may lead to play, I view this as a regression rather than a progression. In short, I argue that play leads to exploration. After acquiring a rudimentary understanding of digital-making in stage one; the individual begins to engage in more focused activities most likely connected to schoolwork or employment. Nonetheless, the majority of activities are still largely situated in social interaction (Vygotsky, 1930-1934/1978; Turner, 1988), leisure and recreation.

Bereiter and Scardamalia (1993) argue that creative expertise can only be achieved through progressive problem solving - the setting and achievement of increasingly complex creative goals. From this perspective, each stage of the spectrum represents a larger problem that must be solved before moving to the next stage. Therefore, the goals within each stage drift progressively further from play and nearer towards work. Exploration is the first stage of the spectrum in which the drift becomes

apparent. Unlike play where the goal of the activity is often intrinsic and indefinite, save for the development of the imagination (Vygotsky, Piaget, 1962; Lowenfeld, 1991), in exploration the goals are extrinsic to the activity and are easier to define. It is the goal rather than the activity that differentiates exploration from play (Smith and Pellegrini, 2008 and 2013).

For instance, in the search for specific information a learner may employ a search strategy based on their existing knowledge of digital-making, this would be considered, exploration. The same information may also be 'randomly found' by the learner without the use of a strategy, although the random search resembles play, it becomes explorative in the sense that a specific goal has been achieved. Without an extrinsic goal, performing a random search has no purpose other than as an act of play.

Play and Exploration are the early developmental stages of digital-making. Due to the pragmatic view of digital technologies common to many learners within these stages: the potential use of digital technologies as creative devices is limited. Consequently, many activities are of a very basic nature, for instance, using a search engine, typing documents, and playing audio-visual streams. These basic activities resemble traditional media (Kayany and Yelsma, 2000) consumption (Damásio, et al. 2015) and tasks common to educational coursework or employment activities. These learners are still yet to venture into further regions of digital-making and tend to dwell in digital environments and interfaces to which they are accustomed.

4.1.3 Stage three: Experimentation (lower and higher tiers)

Experimentation is the third stage of the spectrum, but unlike the play and exploration stages, experimentation is split into two tiers: lower and higher. At the lower tier, much of the digital-making activities are still situated in social interaction (Vygotsky, 1930-1934/1978; Turner, 1988), leisure and recreation. Here the learner can confidently participate and engage in simple forms of digital-making that do not require complex instruction. By this stage, learners can make basic digital public entities. Even when presented with new digital environments learners can quickly familiarise and adapt, by use of trial and error:

The process of trial and error can thus be viewed from two very different points of view. On the one hand, it can be regarded as simply an attempt at success; so that when it fails we give zero marks for success. From this point of view, it is merely a second-rate way of getting to success. There

is, however, the other point of view that gives it an altogether higher status, for the process may be playing the invaluable part of gathering information, that is absolutely necessary if adaptation is to be successfully achieved.
(Ashby, 2013, pp 83)

I am not suggesting that learners are aimlessly guessing and stumbling through digital-making, but rather those learners are using their prior knowledge of play and exploration to solve progressively harder problems. From this perspective, trial and error are far more useful as a means of increasing digital and media literacies. Yet this raises the question of 'how does experimentation differ from exploration?' It is important to note that the accumulation of partial successes represents an incremental progression towards greater levels of digital and media literacies. By this logic, the objective of experimentation is not only the accumulation of partial successes but also, more importantly, the desertion of any actions or behaviours that are counter-intuitive towards the development of digital-making literacy. I suggest that experimentation at the lower tier is the stage where learners begin to refine their knowledge of digital literacy. To the extent, that one can adapt to almost any digital environment: albeit with varying degrees of independence. Sefton-Green (2013) observed a similar notion in the work of Rowsell (2013):

In addition, Rowsell is interested in common cross-media meaning-making capabilities. She explores the capacity to work in the multimodal forms, and might suggest that a certain kind of fluency and common language across more than one medium is a necessary attribute for being creative in the modern era.
(Sefton-Green 2013, p. 27)

I suggest that the result of this common fluency is the refinement of digital-making as both situated learning and situated practice (Lave and Wenger, 1991; Stein, 1998; New London Group, 1996). Throughout chapters two and three, I discussed the resemblance between digital-making and the ideological model of literacy (Street, 2003). I also dismissed any resemblance between digital-making and the autonomous model of literacy (Street, 2003). Consequently, I argued that digital-making is both, situated learning and situated practice (Lave and Wenger, 1991; Stein, 1998; New London Group, 1996). Situated learning and situated practice were also present in all the learning theories discussed in Chapter Two, and the digital and media literacies of Chapter Three.

To move between environments at the higher tier of experimentation, learners must develop a means of abstracting digital and media literacies into common elements that can be recognised

across multiple digital environments. The process of abstraction is that of trial and error, and learners that engage frequently in fantasy (Vygotsky, 1930/1967; Smolucha, 1992) become more adept in the use of trial and error. In section 4.1.1, I mentioned that fantasy prompts dissatisfaction which is akin to the recognition of a creative problem (Bereiter and Scardamalia, 1993), subsequently, FDM seek to alter or rectify their dissatisfaction. Trial and error are how learners solve creative problems (Bereiter and Scardamalia, 1993). Based on their prior knowledge of play and exploration learners at the higher tier, choose actions which are more likely to succeed in the new environment and discard others that do not; like the notion of transient identities (Merchant, 2005). Experimentation is the ability to adapt to new environments via the process of trial and error based on the existing knowledge of play and exploration. The difference between learners at the lower and higher tiers of experimentation is that learners in the higher tier are more adept at moving between environments due to their greater engagement in fantasy. Experimentation is also the stage where the distinction between frequent and infrequent digital-makers emerges. Beyond the higher tier, the distinction becomes more profound.

4.1.4 Stage four: Logical Instruction

Logical instruction is the penultimate stage of the spectrum. Like experimentation digital-making literacy is developed incrementally. However, logical instruction is preferred to the randomness of trial and error. Logical instruction can be imparted to the individual via the classroom-setting or the home-setting of the third space. Learners at this stage seek to become creators of complex digital public entities. The words 'creative' and 'creators' are not used here to denote expertise but as a means of identifying the willingness to engage in complex digital-making. After interviews with many creative professionals across several fields, Rowsell (2013) observed a retrospective recognition of incremental patterns of production. Creative professionals did not produce digital public entities in erratic leaps and bounds of inspiration, but rather in small rigorous and incremental steps: guided by the traditions associated with different genres of production. Rather than engaging in acts of creation, creative professionals engage in acts of modification. Ito et al. (2010) also observed similar patterns of gradual and recursive participation in young people engaged in complex digital-making. As inferred by Ito et al. (2010) regardless of age digital-makers tend to produce artefacts incrementally.

The question here is why do digital-makers work in this manner at such an advanced stage of the spectrum? Incremental modification seems to be contrary to the development of creative expertise, yet it is the preferred method of production for creative professionals and aspiring young digital-makers. In the view of Bereiter and Scardamalia (1993), incremental modification is tantamount to problem reduction. Learners engaged in problem reduction frequently seek to identify and utilise procedural routines used to overcome commonly occurring problems. In doing so, individuals use existing knowledge to broaden their own capabilities: yet this does not broaden their creative outlook. Bereiter and Scardamalia (1993), refer to such individuals as experienced non-experts. In keeping with their earlier argument in section 4.1.2, Bereiter and Scardamalia (1993), assert that creative expertise can only be achieved through progressive problem-solving. Problem reduction is the antithesis of creativity; procedural routines are not sufficient for growth of new solutions to progressive problems.

Much of the digital-making described in the logical instruction stages of the spectrum can be attributed to learners with well-developed levels of digital and media literacies (Burn and Durran, 2007; Belshaw, 2014). These learners have varying degrees of experience that may even allow some to work as professionals in the creative industries in future. Regardless of age, learners at this stage of the spectrum tend to work in the same fashion; that is finding the most efficient means of production via logical instruction whilst avoiding common related problems. Although, this method of working increases the digital-making skills of so-called experienced non-experts: it does little to foster creativity. Indeed, none of the stages from play to logical instruction so far can be considered creative. Yet one cannot achieve the status of a creative expert without being an experienced non-expert first (Bereiter and Scardamalia, 1993).

4.1.5 Stage five: Creative expertise

The Vygotskian model of creativity (Vygotsky, 1931/1984; Smolucha, 1992) is built on Ribot's developmental model of the imagination (Ribot, 1906). In the final section of the model, the developmental line of the imagination diverges into two paths at the point where it meets thinking in concepts (Vygotsky, 1931/1984). The lower path represents the gradual decline of the imagination in the majority of individuals:

According to Ribot, "Creative imagination starts to decline—this is the general case. Only the unusually rich, gifted imagination is the exception. The majority of people go little by little to the prosaic side of practical life, conceal the dreams of their youth, consider love a chimera, etc. This, however, is only a regression, but not an elimination, because this creative imagination does not disappear completely, but only happens by chance." (Vygotsky, 1930/1967, p. 29-30) (Smolucha, 1992, p. 55)

In contrast, the upper path represents the minority of individuals; in which the collaboration between the imagination and thinking in concepts does not regress into occurrence by chance. In short, the creativity of the minority continues to function at high levels, indicative of the maturity of the imagination. Creative expertise is the final stage of the continuum. It is at this stage that one becomes adept in the creation of productive works (Vygotsky, 1930/1967; Smolucha, 1992). Creative expertise is a sign of the maturation of the imagination (Vygotsky, 1930/1967; Smolucha, 1992). Very few individuals reach this level of digital-making. To achieve the status of creative expert, learners must go through each stage of the spectrum sequentially: amassing a vast amount of knowledge and experience. For the sake of clarity, I am not suggesting that a non-expert experienced or otherwise is incapable of working in a creative fashion, as indicated in the above quotation. To be recognised as a creative expert one must consistently display evidence of setting creative goals and a record of achieving some (Bereiter and Scardamalia, 1993). In addition, this achievement must be recognised by others able to judge its merits.

Studies of expertise conducted by learners of Bereiter and Scardamalia (1993), investigated the approaches to creative challenges used by learners and professionals in the fields of music and medicine. The learners selected for the challenge were divided into two categories: those who were deemed to work in an 'expert-like' manner and those considered 'typical learners'. The approaches of both learner groups were compared to the approaches used by the professionals who were all experts in their fields.

The study found that like the procedural routines of experienced non-experts, the typical learners tried to solve the problems by using patterns of best fit. The typical learners chose to reduce the problem so that their solution was the best satisfactory fit between their existing competence and the demands of the challenge. Consequently, the work produced by the typical learners was judged as lacking in creativity.

In contrast, the study found many similarities between the approaches used by the expert-like learners and the expert professionals. When presented with the same challenge the expert-like learners recognised that their existing knowledge alone was insufficient to solve the creative problem. At this point, the expert-like learners began to conceptualise unconventional approaches to supplement their existing knowledge and solve the problem based on the outcome demanded. The expert-like learners spent much of their time planning and devising creative goals before producing work that met the creative demands of the challenge. I suggest that the conceptualisation of unconventional approaches is the mature fantasy of the mature imagination as described by Vygotsky (1930/1967; Smolucha, 1992).

Bereiter and Scardamalia (1993), argue that the difference between the expert-like learners and the typical learners is that of the creative goals devised and pursued by the experts. In taking unconventional departures from patterns of best fit, the experts expanded their existing knowledge. By frequently setting creative goals that cannot be solved using conventional approaches, experts engage in progressive problem-solving. Essentially, experts perpetuate their knowledge by taking greater creative risks than taken by experienced non-experts. Creative experts do not take incremental steps but rather much larger steps that lead to desired solutions. One should not assume that creative experts are taking great inspirational and random leaps in pursuit of greater creativity. On the contrary, creative experts often find that the constraints of creative problems prohibit the use of procedural routines and patterns of best fit; forcing creative experts to venture beyond conventional solutions (Bereiter and Scardamalia, 1993). The question here is how do creative experts know which risks to take?

According to Bereiter and Scardamalia (1993), creative experts take risks using the concept of promisingness. In its simplest form promisingness is the ability to predict the most successful course of action in the solution of a creative challenge based on prior knowledge and experience. Promisingness is an ability forged over long and sustained periods, which can only be achieved after the accumulation of vast knowledge and experience. Due to frequent involvement in progressive problem solving (Bereiter and Scardamalia, 1993) creative experts, develop the ability to recognise indicators of promising ideas (Bereiter and Scardamalia, 1993). These indicators eventually coalesce into patterns, which are also recognised by creative experts. Once again, I suggest that the ideas of Bereiter and Scardamalia (1993) are underpinned by Vygotsky (1930/1967; Smolucha, 1992).

Promisingness is tantamount to mature fantasy (Vygotsky, 1930/1967; Smolucha, 1992). Frequent Digital-maker(s) (FDM) at this stage engage in mature fantasy far more consistently than digital-makers in the other stages.

4.1.6 Summary of the discourse of the digital-maker

The discourse of the digital-maker consists of five stages play, exploration, experimentation, logical instruction, and creative expertise. A common theme that is present at all levels is that of refinement. Maturation of digital-making is signified by the discarding of unproductive actions as learners' progress through the stages of the spectrum. The discovery of play is refined into the focused play of exploration. This, in turn, becomes trial and error in the experimentation stage. Procedural routines represent the next maturation within the logical instruction stage. The progression is completed in the promisingness of creative expertise. Once a learner achieves the status of a creative expert, the learner begins to work in a manner that resembles the discovery of play. This implies that the spectrum may, in fact, be a cycle. Nonetheless, this is not so, the discovery involved in creative expertise is informed by a wealth of knowledge and experience of digital-making. The initial discovery of play is unstructured and loosely guided by one's pursuit of social interaction (Vygotsky, 1930-1934/1978; Turner, 1988), and leisure and recreation (Veal, 1992). This implies that in theory promisingness (Bereiter and Scardamalia, 1993) may not be exclusive to the creative expertise stage of the spectrum.

As argued by Bereiter and Scardamalia (1993) the difference between a novice and a creative expert is a matter of degree. Every digital-maker has the potential to become a creative expert. Yet only a few habitually engage in complex digital-making (Sefton-Green, 2013) and even fewer become creative experts (Bereiter and Scardamalia, 1993). A possible explanation for this is that the majority of digital-makers rarely set complex creative goals. Consequently, the goals of many digital-makers are simple, short-term and can be solved using any of the methods from the play, exploration, and experimentation stages. The type of complex, long-term creative goals set at the logical instruction and creative expertise levels require sustained effort and instruction. This type of instruction is usually gained formally in education, employment or informally within the home-setting of the third space. Individuals deemed experienced non-experts and creative experts may likely have formal training or even be employed in the creative digital industries.

Chapter Five: Methodology

5.1 Refinement of research questions and proposal of digital-maker hypothesis

In section 1.2, I discussed the research questions of this thesis. However, in the subsequent chapters, several issues were discussed that prompt a re-examination of the research questions. The most salient of these issues concerns the notion that all participants of digital-making are digital-makers; all learners are also digital-makers. Consequently, the scope of the research questions cannot be limited to learners on Digital-Making Curriculum (DMC) courses. The scope must be expanded to include learners on non-DMC courses as well, a point I previously raised in section 3.2. Even so, an investigation into the choices, experiences, influences and rationales of all DMC and non-DMC learners even within a single FE institution is unfeasible. Consequently, the research questions will target the views of Frequent Digital-maker(s) (FDM) only, as I argued in section 3.2. Furthermore, the discourse of the digital-maker strongly indicates that only a minority of learners will be FDM.

Speaking at a TED Global conference regarding an investigation of contributors to Flickr, a photo-sharing website. Shirky (2005) discussed the notion of power-law distributions “in unconstrained social systems where people can contribute as much or as little as they like.” Shirky (2005) made an indirect reference to the Pareto distribution otherwise known as the eighty-twenty rule (Rodd, 1996). In which eighty percent of content is produced by twenty percent of contributors. The other eighty percent is referred to as the long tail (O’Reilly, 2007) in which participation is much less frequent. I suggest that digital-making, especially in the home-setting, is an example of an unconstrained social system; therefore, the discourse of the digital-maker is an example of a power law distribution. Based on this rationale, I estimate that approximately twenty percent of learners on DMC and non-DMC courses at FE institutions will be FDM. Thus, the investigation becomes feasible. The refined research questions are stated below:

1. What is the constitution of the Digital-Making Curriculum (DMC)?
2. How are Frequent Digital-maker(s) (FDM)’ choices within the DMC influenced by their experiences of digital-making in the home-setting of the third space?

3. How are Frequent Digital-maker(s) (FDM) influenced by their prior experiences of digital-making in the classroom-setting of the third space?
4. What are Frequent Digital-maker(s) (FDM) rationales for and against participation in Digital-Making Curriculum (DMC) courses?

5.1.1 Research context

In the UK, much of the existing literature about digital-making and digital-makers is in the form of reports commissioned by the government and national organisations (). In many commissioned reports, the methods used for sampling and the gathering and analysis of data are not clearly stated although, questionnaires are commonly used. The surveys tend to concentrate on learners' general habits and attitudes towards digital-making. Or the utility of learners' as workers for the future economy, which is based almost entirely on the production of digital content, knowledge, and services. To complicate matters further the commissioned reports often arrive at one of two contradictory conclusions. The first being, that young people have great enthusiasm for digital-making and many produce digital content. But more research is needed to understand why young people choose to engage in digital-making (Sefton-Green, 2013). The second being, that young people are lacking the skills necessary to sustain a strong and competitive future economy ().

Internationally, digital-making research consists of interviews with creative professionals. In the interviews, the professionals are asked questions about their working practices and philosophies, including the early digital-making experiences of their teenage or even childhood years. Once again, the methodologies used in international studies of digital-making are unclear. Furthermore, much digital-making research, domestic or otherwise is performed on a one-off basis. The research cannot be replicated because it does not follow an experimental design. Therefore, it is difficult to replicate the findings of such reports in other settings. With no clear empirical guide from previous digital-making/makers research, I must search elsewhere for methodological guidance. However, I must first address the complexities of my own investigation of digital-making and makers which differs significantly in terms of sampling, methods, scale, and focus.

My investigation of digital-making/makers differs greatly from the commissioned reports and international studies. The scope of my investigation will concentrate on learners within a London FE

college. The learners will be frequent digital-makers on DMC and non-DMC courses. From the outset, my investigation will be much more specific in its sampling of learners. Simply being of compulsory schooling age will not be the main basis of selection. The sampling criteria of my investigation will initially include, all learners on eligible courses within the college. All eligible learners will complete a survey designed to identify frequent digital-makers (FDM) on DMC and non-DMC courses. Only those identified as (FDM) will be included in a series of focus group interviews in the second and final round of investigation. Simply, identifying a learner as a digital-maker will not sufficiently answer my research questions. In section 3.1, I discussed the notion that all learners are digital-makers that exist on a scale ranging from infrequent to frequent. I also stated that I am only concerned with the identification of FDM, because a more meaningful understanding of digital-makers may be drawn from their experiences. However, the identification of FDM is complicated by the fact that there is no prior example within the academic field of digital-making; regarding how to identify a group of learners who are not aware of their identities as digital-makers. None of the learners that will participate in this study will be aware of terms such as the DMC and FDM, some may not even be aware of what constitutes digital-making. This is problematic because the digital-making identities of learners will be defined according to their relationships with the DMC. To counter the issues regarding the identification of FDM, my investigation will follow a rigorous and replicable research design, that will involve methods that can be performed by other researchers in similar settings. The use of a replicable research design is not a feature commonly seen in digital-making/makers research, which often concentrates on obtaining a cross-sectional picture of young peoples' current skills and activities. I recognise that my investigation of FDM must be more than just a cross-sectional view. I am concerned with the digital-making identities of learners, which involves an understanding of their histories and future ambitions as digital-makers. I also recognise that the development of digital-making identities occurs simultaneously in formal and informal environments. These considerations, affect the sampling methods used to define not only the unit of analysis but also the distribution of the survey and the generalisation of research findings.

The success of my research design is dependent on the alignment between the revised research questions of section 5.1. and the methods used to gather and analyse the responses of FDM. Arguably, all the research questions can be addressed through the focus-group interviews.

Regarding the first revised research question, outside of this thesis, there is no singular document that describes the DMC. Some elements of the DMC exist scattered across various curriculums of DMC courses, but one must remember that its principles are derived from the views and experiences of stakeholders, especially the learners as I stated in section 1.2.1. Therefore, investigation of the DMC's constitution through document research would be insufficient, the answer to the question resides in the views and experiences of FDM. Three of the four revised research questions directly address FDM. The questions concern the decisions, rationales, and experiences of FDM from their early to their current experiences of digital-making in the home and classroom-settings of the third space. The questions are essentially seeking to understand how the historical digital-making experiences of FDM have formed their present digital-making identities. The complexity and depth required to achieve this understanding of frequent digital-makers require the interview participants to give detailed and protracted answers. Furthermore, I am also searching for evidence of similarities between FDM experiences. Therefore, it is imperative to facilitate recognition of similar experiences among individual FDM. Focus-group interviews are well suited for this purpose

While questionnaires can provide evidence of patterns amongst large populations, qualitative interview data often gather more in-depth insights on participant attitudes, thoughts, and actions (Kendall, 2008).
(Harris and Brown, 2010, p. 1)

The in-depth insights are crucial for the generation of evidence in support of the theoretical framework of Chapter Four. The discourse of the digital-maker will act as the verification of the existence of the DMC. One must remember that the discourse describes the progression of learning within the DMC. The discourse of the digital-maker is split into two tiers: lower and higher. The learning progression of all learners on DMC courses is described in the lower tier stages, these being play, exploration and experimentation [lower]. However, the learning progression described by the higher tiers: experimentation [higher], logical instruction and creative expertise only apply to FDM. This is because the infrequent digital-makers of the lower tier have not yet engaged in the types of digital-making described in the higher stages of the discourse. The difference between infrequent and Frequent Digital-makers (FDM) is that the FDM possess greater maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992). Therefore, the entire generation of evidence in support of the existence of the DMC rests on the design and sampling of the survey.

Furthermore, the success of the survey can be triangulated by the alignment between the open questions of the questionnaire and the responses of focus-group interview participants. The closer the alignment the more compelling the evidence supporting the existence of the DMC. Therefore, the sampling of the survey and the methods of data gathering and analysis must be consistent and rigorous. The criteria used for sampling, data gathering and analysis must be the same for every learner included in the study. In summary, a well-designed survey within well-designed research methodology is vital for the identification of FDM. The most compelling evidence in support of the existence of the DMC will come from the focus-group interview responses of the FDM. The success of this investigation is overwhelmingly dependent on the correct identification of FDM and this can only happen within a consistent and rigorous research design. In the remainder of this chapter will discuss the consistent and rigorous research design that will be used in the investigation of the DMC.

5.2 Justification of small-scale heuristic case study research design

I wish to reiterate that I am not interested in the choices, perceptions, experiences, influences, and rationales of learners at the lower stages of the digital-making spectrum [play, exploration, and experimentation lower]. Due to their infrequent participation in digital-making. The discourse states that infrequent digital-makers can only offer limited insights into the third space, commensurate with their position in the spectrum. Infrequent digital-makers are the least likely to consider their experiences of digital-making as a significant factor in the decision of whether to participate and engage in a DMC course. I also anticipate the majority of learners in FE will occupy the lower stages of the spectrum (Sefton-Green, 2013).

We do know that only a very small proportion of young people are involved in sustained and developed creative activities.
(Sefton-Green, 2013, p. 8)

I am interested in the rationales of the minority of learners that frequently produce digital public entities as they are most likely to occupy the upper stages of the spectrum [experimentation higher, logical instruction and creative expertise]. It is important to remember that progression within the spectrum is sequential. The Frequent Digital-maker(s) (FDM) possess the same experiences as the infrequent. Yet, due to their frequent participation in digital-making, the discourses of these

learners offer much greater insights into the third space. Frequent digital-makers are the most likely to consider their experiences of digital-making as a significant factor in the decision of whether to participate in a (DMC) course. The first objective of this research design is the identification of FDM on DMC and non-DMC courses. Once, these FDM have been identified, the second objective of the research design will be the investigation of their discourses regarding digital-making in the classroom and home-settings of the third space.

With both these objectives in mind, I begin the proposed research design from the position of the theoretical framework of Chapter Four and a hypothesis that I will define later in this chapter. The proposed empirical investigation is essentially a practical exercise in theoretical development. By this, I mean that the design of the investigation should discover and generate empirical evidence that either supports or contradicts the discourse of the digital-maker. The digital-maker hypothesis is then used as a guide for the discovery and generation of empirical evidence. In keeping with this view, and the previously expressed concerns regarding the small amount of academic exploration into digital-making (Sefton-Green, 2013); I will frame the research design in the form of a case study (Yin 2009). Historically, case studies have been used for the development of theories (Darke et al. 1998; George and Bennett, 2005; Yin 2009).

Case-study research has often been associated with description and with theory development, where it is used to provide evidence for hypothesis generation and for exploration of areas where existing knowledge is limited.
(Darke et al. 1998, p. 275)

The above quotation presents a dilemma regarding the use of hypotheses within case studies. Darke et al (1998) argue that a hypothesis is generated at the end of a case study based on empirical evidence. As a means of theoretical development, case studies do not begin from the position of a prior hypothesis. In my proposed research design, the case study begins with a prior framework and hypothesis, that guides the generation of empirical evidence. To overcome this issue, I suggest the addition of a heuristic element to the case study methodology:

However, the feedback effect in Verba's recommended sequence of inquiry can be isolated from the rest of the sequence and case-study deliberately used to stimulate the imagination toward discerning important general problems and possible theoretical solutions. That is the essence of heuristic case studies (heuristic means serving to find out). Such studies, unlike configurative-idiographic ones, tie directly into theory building and therefore are less concerned with overall concrete configurations than with potentially generalizable relations between aspects of them; they

also tie into theory building less passively and fortuitously than does disciplined-configurative study, because the potentially generalizable relations do not just turn up but are deliberately sought out. (Eckstein, 2002, p. 143)

The purpose of a heuristic case study is the deliberate development of theoretical propositions. Scott and Usher (2011) wrote: "...heuristic case studies (the case is deliberately chosen to develop theoretical propositions)." In a discussion about the justification of heuristic case studies, Eckstein (2002) wrote, "The track record of case studies as stimulants of the theoretical imagination is good." Moreover, in the same discussion Eckstein (2002) observed:

Theories do not come from a vacuum, or fully and directly from data. In the final analysis they come from the theorist's imagination, logical ability, and ability to discern general problems and patterns in particular observations. (Eckstein, 2002, p. 144-145)

The heuristic case-study facilitates the theoretical framework as an initial starting point for theoretical development, and the hypothesis acting as a guide for the generation of empirical evidence. VanWynsberghe and Khan (2007) noted that heuristic case studies can take many forms one of which is described by Yin (2009) the Multiple Case Study (MCS) (Eisenhardt and Graebner, 2007; Darke et al. 1998). Compared to single case studies, MCS is thought to yield more robust results, especially when used for the building of theory (Herriott and Firestone, 1983; Bengtsson, 1999; Eisenhardt and Graebner, 2007; Yin, 2009). Theories constructed from MCS are "better grounded, more accurate and more generalizable." (Eisenhardt and Graebner, 2007).

But while single-case studies can richly describe the existence of a phenomenon (Siggelkow, 2007), multiple-case studies typically provide a stronger base for theory building (Yin, 1994). Again, to use the analogy of laboratory experiments, the theory is better grounded, more accurate, and more generalizable (all else being equal) when it is based on multiple case experiments. Multiple cases enable comparisons that clarify whether an emergent finding is simply idiosyncratic to a single case or consistently replicated by several cases (Eisenhardt, 1991). Multiple cases also create more robust theory because the propositions are more deeply grounded in varied empirical evidence. Constructs and relationships are more precisely delineated because it is easier to determine accurate definitions and appropriate levels of construct abstraction from multiple cases. (Eisenhardt and Graebner, 2007, p. 27)

The robustness of empirical evidence from MCS is due to the use of replication logic, the application of a single research design across several cases, equivalent to the replication of an experiment in differing settings (Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Yin, 2009; Iacono et al. 2011). A typical MCS may involve nine to ten separate cases (Bengtsson, 1999; Yin, 2009):

In an embedded design, a study even may call for the conduct of a survey at each case-study site. For instance, suppose a study is concerned with the impact of the same type of curriculum adopted by different schools. Each school may be the topic of case-study, with the theoretical framework dictating that nine schools be included as case studies, three to replicate a direct result (literal replication) and six others to deal with contrasting conditions (theoretical replications). For all nine schools an embedded design is used because surveys of the students (or, alternatively. Examination of students archival records) are needed to address research questions about the performance of the schools. However, the results of each survey will not be pooled across schools. Rather, the survey data will be part of the findings for each individual school, or case. These data may be highly quantitative, focusing on the attitudes and behaviour of individual students, and the data will be used along with archival information to interpret the success and operations at the given school. If in contrast, survey data, are pooled across schools, a replication design is no longer being used. (Yin, 2009, p. 59-60)

The robustness of replication logic is generated by the development of a theoretical framework that outlines the conditions under which a phenomenon may likely or may not likely occur; this is known as literal and theoretical replication, respectively (Leonard-Barton, 1990; Yin, 2009). In an MCS, each case is investigated as a single entity. The results of each case are not merged but are compared to each other to determine the occurrence of literal or theoretical replication within the cases.

Notwithstanding, Eisenhardt (1989) argues that there is no ideal amount of cases and that settling between four to ten often works well. Zach (2006) also recognises the ambiguity of required cases for replication logic and settles for Yin's (2009) specification. In which the initial two or three cases will seek literal replication. The remaining four to six cases will be split into two or more groups seeking differing predicted outcomes from the literal replication.

If all the theoretical cases produce results as predicted, compelling evidence is generated in favour of the literal replication. If however, the results are contradictory the literal replication must be revised and retested with other cases (Bengtsson, 1999; Yin, 2009). The extent of theoretical replication is dependent on the credence of any existing rival explanations concerning the likelihood of phenomena (Yin, 2009). Fewer theoretical replications are required in the absence of credence or even any type of rival explanations (Yin, 2009).

The goal of an MCS is analytic generalisation (Bengtsson, 1999; Yin, 2009) it is important to note that due to the use of replication logic research findings cannot be generalised to a population. Instead, like logical inference (Yin, 2009), analytic generalisation provides a means of theorising the phenomenon of study. Theories generated from MCS may then be applied to a much wider selection of similar cases outside of those included in the study.

Yin argued that analytic generalisation is the appropriate method for generating theory from case-study, by which he meant that: a previously developed theory is used as a template with which to compare the empirical results of the case-study. If two or more cases are shown to support the same theory, replication may be claimed. (1994:31)
(Bassegy, 1999, p. 31)

Regarding the minimal number of cases required for analytic generalisation, there are examples of MCS involving fewer than nine cases (Mintzberg, and McHugh, 1985; Baucus and Human, 1994). Although it is not clear if both studies began from an initial theoretical proposition. Bengtsson (1999) argues that the inclusion of several cases within an MCS may not always be necessary especially if all the cases may likely result in literal replication. The same result could have been achieved using fewer cases.

If we have selected all cases to be literal replications the results could be interesting if all come to the same conclusion. However, the conclusions in these ten case studies are not much more robust than what could probably have been obtained with only five cases.
(Bengtsson, 1999, p. 7)

In keeping with the heuristic element of the proposed case study, I will retain the use of a theoretical framework, as it is fundamental to the generation of literal or theoretical replication. Without the presence of replication, analytic generalisation cannot be achieved (Bengtsson, 1999; Yin, 2009).

Fuzzy generalisation (Bassegy, 1999) is another means of generalising theories to wider cases. Essentially fuzzy generalisation is a method of making predictions or logical inferences (based on research findings) that include a degree of uncertainty. For example, rather than stating that an increase of x will lead to an increase in y as in a statistical generalisation (or statistical inference): a fuzzy generalisation would state that an increase in x might lead to an increase in y. Statistical generalisation assumes that there are no exceptions to the rule, regardless of context or the presence of other variables. Fuzzy generalisation recognises that some exceptions to the rule may exist and that in some cases the rule may produce a different outcome or may not even be applicable depending on the context and variables. This in no way diminishes the validity of fuzzy generalisations. In short, fuzzy generalisation states that a phenomenon that occurred in one context may occur in another context if both have similar conditions resulting in a general theory that fits each case involved in the study (Bassegy, 1999).

Despite possessing many benefits, Multiple case studies are often criticised for being time-consuming and requiring a vast amount of planning before embarking on data generation (Bengtsson, 1999; Yin, 2009). As a sole researcher, I do not possess the time or resources to investigate nine separate FE institutions, therefore, I propose the following modifications.

For the sake of clarity, I define the proposed research design as a heuristic case study with multiple cases; rather than a heuristic multiple case study. This distinction is subtle yet profound. The purpose of the heuristic case study is the gathering of evidence supporting the theoretical framework of Chapter Four (Eckstein, 2002; Scott and Usher, 2011). This will be achieved via replication logic (Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Iacono et al. 2011). The heuristic case study will utilise some features of the MCS research design, but it will not follow the format described above by Yin (2009).

I propose a small-scale heuristic case study, that will be limited to a single large metropolitan general FE college with multiple campuses. From this point, onwards this college will be referred to as Large college; it is comprised of four campuses north, south, east, and west. Collectively the campuses span six large multicultural London boroughs some of which are considered affluent and others of more modest means. Large college was selected because its campuses provide a diverse institutional background in terms of learner socio-economic composition and provision of courses. Large college is also deemed a high emphasis provider of DMC courses based on the ratio of DMC and non-DMC courses listed in official prospectuses for full-time learners. Like many other metropolitan situated FE colleges, Large college has recently undergone a merger between two established FE providers in close proximity. Yet, most of this provision is split between the north and south campuses subsequently, the east and west campuses will not be included in the investigation. The north and south campuses are of comparable population and size both offer a wide range of DMC and non-DMC courses yet due to the relatively short passage of time since the merger and abiding institutional characteristics, the pedagogic and andragogic delivery of DMC courses is different across both campuses. For the purposes of the research design, the north and south campuses will be treated as separate institutions.

The decision to use only two institutions does not negate the use of the small-scale heuristic case study research design. Earlier in this section commenting on an argument of Yin (2009) Bassey (1999) stated that "if two or more cases are shown to support the same theory, replication may be

claimed.” If replication is viable from a minimum of two cases, then all the subsequent features of the MCS (Yin, 2009) are viable as well. Literal and theoretical replication and analytic and fuzzy generalisation are all viable, even with a minimum of two cases.

The issue here is not the appropriateness of the small-scale heuristic case study research design, but rather what constitutes a case? One must remember that although it is acknowledged that institutional settings will influence the discourses of FDM; the focus of this investigation is the examination of FDM discourses rather than the institutions which they attend. Consequently, if two or more FDM display replication in their discourses in accordance with the theoretical framework then replication has occurred. In the context of this investigation, the individual FDM is the case, not the institution. The issue now becomes that of how the cases will be sampled? In section 4.1.3, I argued that fantasy can be used to distinguish FDM from the infrequent, as evidenced by greater social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) and construction of digital public entities (Vygotsky, 1930-1934/1978; 1930/1967; Smolucha, 1992). The only means of making such a determination is to conduct a survey of DMC and non-DMC learners digital and media literacies, to determine their maturity of fantasy. Once, the survey has identified the FDM, the infrequent will be removed from the investigation, based on the rationale expressed at the start of this section. The discourses, of the FDM, will then be explored in focus-group interviews (Barbour and Schostak, 2011). Theoretical sampling (Eisenhardt and Graebner, 2007) will be used in this heuristic case study:

A key response to this challenge is to clarify that the purpose of the research is to develop theory, not to test it, and so theoretical (not random or stratified) sampling is appropriate. Theoretical sampling simply means that cases are selected because they are particularly suitable for illuminating and extending relationships and logic among constructs. Again, just as laboratory experiments are not randomly sampled from a population of experiments, but rather, chosen for the likelihood that they will offer theoretical insight, so too are cases sampled for theoretical reasons, such as revelation of an unusual phenomenon, replication of findings from other cases, contrary replication, elimination of alternative explanations, and elaboration of the emergent theory...But although multiple cases are likely to result in better theory, theoretical sampling is more complicated. The choice is based less on the uniqueness of a given case, and more on the contribution to theory development within the set of cases. That is, multiple cases are chosen for theoretical reasons such as replication, extension of theory, contrary replication, and elimination of alternative explanations (Yin, 1994). (Eisenhardt and Graebner, 2007, p. 27)

It is highly unlikely that random or stratified sampling will exclusively identify FDM. There would certainly be several infrequent digital-makers among the sample for focus-group interviews. As I previously mentioned, the inclusion of infrequent digital-makers beyond the survey will not yield significant insights into the choices, perceptions, experiences, influences, and rationales at the higher

stages of the spectrum. The contributions of infrequent digital-makers towards the development of the theoretical framework are limited. The eligibility of a case is dependent on the extent of its contribution towards the development of theory (Eisenhardt and Graebner, 2007). Regarding the theoretical framework, each case will be chosen for the purposes of development (Yin, 1994; Eisenhardt and Graebner, 2007) of the discourse of digital-making.

All cases will be instances of literal replication, theoretical replication will not be used in the heuristic case study research design, due to its limited contribution towards theoretical development. I acknowledge, that this is a significant departure from the MCS model, of which theoretical replication is an integral feature (Yin, 2009; Eisenhardt and Graebner, 2007; Darke et al. 1998). However, there is no definitive MCS format as implied earlier in this section by Eisenhardt (1989) and Zach (2006). Furthermore, in the discussion of the MCS format discussed by Yin (2009) Bengtsson (1999) and Eisenhardt and Graebner (2007), theoretical replication has the same benefit as literal replication for the development of theory.

In my proposed research design, the utility of theoretical replication is greatly limited in comparison to literal replication. In the discourse of the digital-maker, frequent and infrequent digital-makers are indistinguishable until the experimentation (higher) stage; where the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) begins to become apparent. As the infrequent digital-makers, do not venture beyond the experimentation (lower) stage, there is little need to include the infrequent. The choices, experiences, influences, and rationales of digital-makers at the lower stages of the spectrum can be obtained from FDM. Any potential accusations of researcher bias (Lincoln and Guba, 1985 and 1994; Shenton, 2004) or engineering are nullified, as the empirical evidence that would have been obtained from theoretical replication is available through literal replication. Furthermore, the use of literal replication does not exclude variations in evidence. Among all the identified FDM there will be significant similarities and differences concerning their choices, perceptions, experiences, influences, and rationales regarding digital-making. I suggest that multiple literal replications will enable a much wider and in-depth analysis of the discourses of FDM; in comparison to a mixture of literal and theoretical replication.

In summary, the proposed small-scale heuristic case study research design will involve the replication of a single research design applied to multiple cases. The heuristic case study will retain elements of the MCS model described by Yin (2009) Bengtsson (1999) and Eisenhardt and Graebner

(2007); except for theoretical replication. I am taking advantage of a unique position, in that I do not need theoretical replication to develop the discourse of the digital-maker. This is not a consequence of design or any type of deliberate action to avoid the gathering of contrary evidence. It is simply due to the indistinguishability between the frequent and the infrequent digital-makers at the lower stages of the spectrum. The proposed research design is replicable in any FE institution that places a high emphasis on the provision of DMC courses. Research findings are generalizable to similar research settings. In the next section, I will discuss the first round of data collection and analysis in detail including the unit of analysis.

5.2.1 Small-scale heuristic case study: Data Generation and Analysis Methods

- First Round

Investigations of DMC and non-DMC learners, in the north and south campuses of Large college, will follow the same replicable small-scale heuristic case study research design. Data generation will occur in two overlapping rounds over the course of one academic year. The first round will involve a survey in the form of a questionnaire. This phase of data gathering will be conducted between September and March 2013 [spanning the first and second terms] in north campus first then the south campus. The primary purpose of the survey is the identification of Frequent Digital-maker(s) (FDM) on DMC and non-DMC courses. At this stage, the survey will be used to provide a general background of themes pertinent to all the refined research questions. These themes will complement the deeper inquiry of themes present in FDM focus-group interviews in the second round of data collection. The questions used in the survey will be based on the discourse of the digital-maker previously discussed in Chapter Four. The questions will focus on the identification of FDM via the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992). This is evidenced by greater depth of social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) and constructions of digital public entities in comparison to the infrequent. The only means of making such a determination is to survey the digital-making practices, of DMC and non-DMC learners; within the third space in the settings of the classroom and the home. The survey is comprised of forty-nine questions divided across four sections. The questions are designed to appeal to frequent digital-makers. It is envisaged that FDM will provide much more extensive and detailed answers in comparison to the infrequent:

- Learners' uses of digital content and technologies:

That is any use of digital content and technologies used to augment personal hobbies and interests (Ito et al. 2010). Learners will be presented with a list of common digital-making skills associated with personal hobbies; for example, the making/editing of digital files and the listening/watching of digital files. The skills are representative of the digital and media literacies used by learners in the performance of their digital skills. Learners will be asked about skills rather than literacies because it is thought that learners will be more familiar with the concept of skills. The questions will measure the frequency, length and complexity of the skills used in their digital-making activities. It is envisaged that FDM will provide a greater range and depth of responses.

- Learners' uses of the internet:

This section concerns learners online social interaction and construction of digital public entities. Learners will be asked to give examples of the websites which they visit and the nature of their encounters with other visitors. Learners will be asked about the rules or cultural practices of such websites. Learners will be asked to provide links to any digital public entities they have created and displayed online. Again, the questions will measure the frequency, length and complexity of social interaction and construction of digital public entities. Again, frequent digital-makers are expected to offer more extensive responses.

- Learners' perceptions and experiences of their current course(s):

Here learners will offer their opinions regarding the uses of digital content and technologies in their courses. Learners will be presented with a mixture of Likert scale and open questions by which their opinions will be measured. Learners will also be asked to provide their rationales for their choices of course. Learners will be asked to consider the significance of their digital skills in their decisions of which course to study. It is anticipated that FDM will consider the significance of their digital skills more thoroughly than the infrequent.

- Learners' specific uses of digital content and digital technologies in the home-setting:

This section regards learners' roles in the uses of digital content and technology among the members of their households. This section will gauge the level of support learners receive from parents, siblings or other family and friends. Or if the learner is the person that instructs and guides others within their household. These questions pertain to the levels of digital and

media literacies possessed by the learner and the presence of any social interaction with More Knowledgeable Other(s) development in the home-setting. It is thought that learners that are the beneficiaries of MKO (Vygotsky, 1930-1934/1978) within their household may possess more advanced levels of digital and media literacies.

The unit of analysis will consist of approximately five hundred learners (two hundred and fifty in each campus) on full-time level three A-level (AS and A2) and BTEC (90 credit and extended diploma) courses only. Learners will be asked about their uses, perceptions, influences, rationales, choices, and experiences of digital-making in the classroom and home settings. The rationale for this decision stemmed from consideration of logistical constraints: and the English language literacy limitations of learners at BTEC levels one and two. Accordingly, East campus was excluded, as it does not provide level three courses. West campus does provide a small number of level three courses similar to apprenticeships. Most of the courses at the west campus are also at BTEC levels one and two. Additionally, the number and timetables of west campus learners are too volatile to facilitate meaningful data collection. Learners on level four courses were excluded due to the technicality that such courses are part of tertiary education: and therefore, outside of the remit of this investigation. The curriculums of level four courses are set by universities and governing bodies that are solely concerned with HE: level four courses differ greatly from the A-level and BTEC courses of level three. Consequently, the age range of participants is between sixteen and nineteen years (although it is possible for learners over nineteen years of age to be enrolled on a level three course). Due to the eligibility restriction, the majority of these learners are recent school leavers or applicants for undergraduate degree courses in Higher Education.

The survey itself will be administered using quota sampling (Cohen et al. 2013). Where possible fifty percent of the sample will come from learners enrolled in DMC courses and the other half from learners enrolled in non-DMC courses. This is in recognition of the argument made in section 4.1, regarding the notion that all learners on DMC and non-DMC courses are digital-makers. All digital-makers possess the potential to become FDM. Learners enrolled in non-DMC courses greatly outnumber those on DMC courses. It is highly unlikely that a random sampling technique (Cohen et al. 2013) would produce an unbiased representative sample without purposely excluding a

large percentage of the population of learners enrolled in non-DMC courses. Quota sampling is not to be confused with theoretical sampling discussed above. Theoretical sampling will be used for the selection of learners for the second round of data gathering.

The theoretical framework of Chapter Four will be used to chart the position of learners in the discourse of the digital-maker. The hypothesis is then a tool used to gather evidence in support of the notion that the population of learners in the lower stages of the spectrum (play, exploration, and experimentation [lower]) is greater than the population of learners in the upper stages (experimentation [higher], logical instruction and creative expertise). Fewer learners will be identified as FDM. This rationale was expressed by Vygotsky (1931/1984; Smolucha, 1992), and Ribot (1906) and regarding the development of creativity and the imagination as discussed in sections 4.1.1 and 4.1.5.

The questionnaire will be distributed to learners online via the [surveymonkey.com](https://www.surveymonkey.com) website. It is anticipated that Internet-based surveys will collect responses at a faster and greater rate than posted or written paper questionnaires (Deutskens et al. 2004). In addition, to online delivery, I will also deliver the questionnaire in person. Due to the need to target the specific groups mentioned above, I will seek permission from various course tutors to conduct one tutorial session in which learners will complete the survey. This will encourage a high response rate and provide much richer data (Roth and BeVier, 1998). All forty-nine questions of the survey can be completed well within an hour.

Of the forty-nine questions, 31 are Likert scale or multiple-choice questions which learners need only select an option. The other eighteen open questions require typed responses. The responses to these questions will be limited to a maximum of three hundred characters. This limit was chosen as it is anticipated that the majority of learners will be familiar with sending texts via mobile phones and Web 2.0 platforms such as microblogging, instant messaging. Texting and microblogging place similar character limits on messages and the instant messages tend to be of similar length. It is envisaged that the majority of learners should not feel overburdened by the survey.

In addition, to these measures, all questions will be made compulsory. It is acknowledged that such a measure is controversial and has ethical implications regarding voluntary participation (Lisk, 2010). Nevertheless, without this measure learners may decline to answer many questions rendering

the questionnaire redundant. Learners are free to stop at any time if they wish, but it is hoped that the prompts to answer each question will entice learners into providing answers (Lisk, 2010). The principle reason that learners may choose to skip questions is the perception that the questionnaire may be boring or time-consuming. All the same, Lisk (2010) conducted an experiment regarding the use of mandatory questions in an Internet survey and did not find their use to be problematic. Deutskens et al. (2004) investigated several hypotheses regarding Internet surveys including the association between questionnaire length and response rate. The researchers only found marginal evidence in support of shorter questionnaires and greater response rates. Moreover, the researchers were surprised by the high response rates of lengthy questionnaires. The issue of questionnaire length are not anticipated to be problematic. The information gathered by the Likert and multiple-choice questions of the survey will be tallied in frequency tables and triangulated against the information gathered in the open questions. This will enable the discovery of similarities and differences in the digital-making practices of FDM. These similarities and differences can then be placed in the discourse of the digital-maker at their corresponding stages, thereby increasing the accuracy of the spectrum. The remaining open questions will be analysed using thematic analysis (Boyatzis, 1998; Braun and Clarke, 2006):

Thematic analysis is a process for encoding qualitative information. The encoding requires an explicit "code." This may be a list of themes; a complex model with themes, indicators and qualifications that are causally related; or something in between these two forms. A theme is a pattern found in the information that at the minimum describes and organises possible observations or at the maximum interprets aspects of the phenomenon. A theme may be identified at the manifest level (directly observable in the information) or at the latent level (underlying the phenomenon). The themes may be initially generated inductively from the raw information or generated deductively from theory and prior research. The compilation or integration of a number of codes in a study is often called a codebook. (Boyatzis, 1998, p. vi-vii)

Thematic analysis is commonly used by qualitative researchers due to its flexibility in seeking patterns within data using several approaches. Notwithstanding, the most commonly applied are the inductive or deductive approaches (Boyatzis, 1998; Braun and Clarke, 2006; Alhojailan, 2012). Braun and Clarke (2006) favour the inductive approach in which the identification of themes derives directly from research data. This data-driven, bottom-up approach should ensure that the themes present in the theory are sufficiently connected with the research data. Or in other words, the coding frame

emerges from the data (Braun and Clarke, 2006; Patton, 1990; Alhojailan, 2012). The inductive thematic analysis is not dependent on any pre-existing theoretic principles and frameworks. Neither does it attempt to fit themes drawn from research data into pre-existing theoretic principles and frameworks (Patton, 1990; Boyatzis, 1998; Braun and Clarke, 2006; Fereday and Muir-Cochrane, 2006). In the view of Braun and Clarke (2006), other forms of qualitative analysis such as grounded theory are tied to pre-existing theoretic principles and frameworks that limit their utility in comparison to inductive thematic analysis. Braun and Clarke (2006) further argue that other types of qualitative analyses do not strictly adhere to their pre-existing principles and frameworks. Consequently, such analyses bear a closer resemblance to inductive thematic analysis than their intended forms. Conversely, deductive (or theoretical) thematic analysis is driven by pre-existing theoretic principles and frameworks (Patton, 1990; Boyatzis, 1998; Braun and Clarke, 2006; Fereday and Muir-Cochrane, 2006). Here the coding frame is superimposed onto research data. The deductive thematic analysis is considered more interpretive of data than inductive analysis, which tends to be more descriptive.

Still, thematic analysis is prone to poor execution due to a lack of consensus regarding its constitution (Braun and Clarke, 2006). Thematic analysis is often criticised for its perceived lack of rigour (Boyatzis, 1998; Braun and Clarke, 2006) which may be caused by the presence of three factors in the research data: projection, sampling and mood and style (Boyatzis, 1998). Projection occurs, when researchers project their characteristics, emotions, attitudes, and values onto those being researched, especially when the research data is ambiguous. Sampling refers to the extent to which the themes are representative of the research participants. Finally, the mood and style of the researcher may also affect the production and interpretation of themes. There are countermeasures that may minimise the projection, sampling, mood and style of thematic analysis. Many of these countermeasures are concerned with establishing reliability and validity within themes. For an exhaustive account of the countermeasures, please see Boyatzis (1998). The reliability and validity of qualitative research are discussed in the appendix.

Willig (2013) highlights several systematic approaches that may increase the rigour of thematic analysis. Yet, Willig (2013) also states that the decision to use an inductive or theoretical approach is dependent on the purpose of investigation. Braun and Clarke (2006) argue that the rigour of thematic analysis can be significantly improved by adherence to a six-phase process. However, it

can be argued that such a process is limited to the inductive approach given their preference. Willig (2013) observed that several researchers employ a hybrid process that begins with the theoretical approach in the initial organisation of themes yet also allows themes to emerge from the data as in the inductive approach.

Regarding the heuristic case study, I will apply a hybrid thematic analysis to the open questions of the survey. The hybrid approach will involve three to five phases of thematic analysis. The first pair of phases will concern theoretical analysis at the manifest level (Boyatzis, 1998). The remaining three phases will utilise the inductive approach to draw out themes from the data at the latent level (Boyatzis, 1998).

My rationale being that the purpose of conducting the heuristic case study is to test the discourse of the digital-maker, and the digital-maker hypothesis that I created in Chapter Four. The initial codes used in the hybrid thematic analysis will be based on keywords found within the questions of the survey. This will comprise the initial two phases of deductive analysis. It will also provide a pre-existing code frame capable of organising research data in accordance with the theoretical positions of Chapter Four. This is in keeping with the theory-driven code development approach advocated by Boyatzis (1998). From the third phase of analysis onwards, I will use the inductive approach to identify and develop themes emerging from the data. This will ensure that the views of the unit of analysis (approximately five hundred FE learners) will be represented in any identified themes.

5.2.2 Small-scale heuristic case study: Data Generation and Analysis Methods

- Second Round

The second round of data generation will involve semi-structured Focus-group Interviews (Barbour and Schostak, 2005). The focus-groups will address all the refined research questions stated in section 5.1. The focus-groups should also provide an underlying basis for the themes that emerged in the survey (Powell and Single, 1996). One of the aims of this investigation is to address the gap in academic knowledge regarding digital-making (Sefton-Green, 2013) and learners' course choice. Frequent Digital-maker(s) (FDM) identified by the survey will be categorised and interviewed with their peers according to their cohorts where possible. Each interview will last approximately forty-

five to sixty minutes; depending on the number of interview participants which, will be limited at six. The semi-structured approach should allow exploration of unanticipated issues that FDM might discuss during the interviews. Here FDM rationales, experiences, and perceptions of digital-making within the third space will be determined.

Wolff et al. (1993) highlight the complementary nature of combining surveys with focus-groups. The strengths of one method compensate the weakness of the other. For instance, focus-groups can provide the flexibility necessary for understanding data in greater depths (Powell and Single, 1996). Conversely, surveys may provide structures, which allow a point of entry into the study of complex courses. Wolff et al. (1993) and Morgan (1996) discuss four methods of survey and focus-group combination; of interest to this thesis is the use of focus-groups as a means of expanding and exploring themes raised in a survey in much more detail. It should be noted that I am not using focus-groups to corroborate or validate the results of the earlier survey, but rather to discover and explore the divergent views and experiences of participants (Wolff et al. 1993; Barbour and Schostak, 2005). I am seeking to discover the complex issues and motivations that drive FDM uses, perceptions, influences, rationales, choices, and experiences of digital-making and whether these issues and motivations are a significant factor in the decision to participate and engage in a DMC course in FE (Morgan, 1996). In short, I am seeking plausible logical inferences that may form the basis for the transferability of views and experiences into similar research settings and ultimately analytic generalisation (Vaughn et al. 1996; Bengtsson, 1999; Yin, 2009). Group interaction enables the development of complex views that may not otherwise occur in other types of interview (Kitzinger, 1994; Gibbs, 1997; Webb and Kevern, 2001). Consequently, the extent of convergence or divergence between opinions can be observed rather than inferred by researchers. I will use discourse analysis (Gee, 1990 and 1999) to scrutinise the responses of focus-group participants. My rationale is that the discourse of the digital-maker: the theoretical framework upon which my research design is based; derives from the discourse/Discourse concept discussed by Gee (1990 and 1999).

This distinction is meant to do this: we, as “applied linguists” or “sociolinguists,” are interested in how language is used “on site” to enact activities and identities. Such language-in-use, I will call “discourse” with a “little d.” But activities and identities are rarely ever enacted through language alone... When “little d” discourse (language-in-use) is melded integrally with non-language “stuff” to enact specific identities and activities, then, I say that “big D” Discourses are involved.

Gee (1999, p. 6-7)

Throughout, this thesis I have argued that digital-making is both situated learning (Lave and Wenger, 1991; Stein, 1998) and situated practice (New London Group, 1996). The digital and media literacies that enable participation in digital-making are also examples of situated learning and situated practice (Lave and Wenger, 1991; Stein, 1998; New London Group, 1996). The social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) and construction of digital public entities involved in digital-making are inseparable. In short, the language and activities of digital-making are integrally melded. The discourse of the digital-maker which maps the development of individuals within the third space from playful novice to creative expert; is a “big D” and “little d” discourse as defined by Gee (1990 and 1999). Throughout this thesis, I have also argued the notion of learning as the construction of identity. Whenever learners partake in digital-making they are constructing digital-making identities. I suggest that as a “big D” and “little d” discourse: The Discourse of the digital-maker enables insights into the inner working of identities of digital-makers and the digital-making practices in which the identities are enacted. The focus-groups will allow the opportunity to gauge and understand the identities of digital-makers through verbal language when recalling digital-making practices. In short, I will be able to gauge the associations between the practices, identities, and language of digital-makers. In doing so, I anticipate that the views and experiences will correspond with the theoretical framework of Chapter Four.

The model of discourse analysis, described by Gee (1999) significantly differs from other variations described in academic literature, for example, critical discourse analysis (Fairclough, 2013). Rather than focusing on the revelation of power, dominance, inequality, and bias within political speech, texts, and practices as in critical discourse analysis; Gee (1999), is concerned with the identification of situation networks. Gee (1999) engages in an exhaustive discussion of each element of a situation network please see Gee (1999) for details. My intention here is to provide a summary of the elements involved in a situation network.

Gee (1999) begins the construction of a situation network with descriptions of situated meanings and cultural models. Both of which are concerned with observing ‘how speakers and writers give language specific meanings within specific situations’. Situated meanings are observable

patterns found in language and experiences of the world. These patterns tend to be adjectives and nouns that frequently occur during specific situations.

A situated meaning, as we saw in Chapter 3, is an image or pattern that we assemble “on the spot” as we communicate in a given context, based on our construal of that context and on our past experiences.
(Gee, 1999, p. 80)

Situated meanings don't simply reside in individual minds; very often they are negotiated between people in and through communicative social interaction (Vygotsky, 1930-1934/1978) (Vygotsky, 1930-1934/1978).
(Gee, 1999, p. 81)

Cultural models are totally or partially unconscious theories that allow individuals to make sense of the patterns observed in situations. Cultural models fall into three categories:

Cultural models are “storylines,” families of connected images (like a mental movie), or (informal) “theories” shared by people belonging to specific social or cultural groups... Cultural models “explain,” relative to the standards of the group, why words have the various situated meanings they do and fuel their ability to grow more. Cultural models are usually not completely stored in any one person's head. Rather, they are distributed across the different sorts of “expertise” and viewpoints found in the group (Hutchins 1995; Shore 1996), much like a plot to a story or pieces of a puzzle that different people have different bits of and which they can potentially share in order to mutually develop the “big picture.” ... Cultural models link to each other in complex ways to create bigger and bigger storylines. Such linked networks of cultural models help organize the thinking and social practices of sociocultural groups...
(Gee, 1999, p. 81)

We can distinguish between, at least, the following sorts of cultural models in regard to Espoused models, that is models which we consciously espouse; Evaluative models, that is models which we use, consciously or unconsciously, to judge ourselves or others; Models-in-(inter)action, that is models that consciously or unconsciously guide our actions and interactions in the world.
(Gee, 1999, p. 68)

Gee (1999) argues that situated meanings and cultural models are directly linked to the enactment and recognition of Discourses:

Finally, the social languages, situated meanings, and cultural models at play allow people to enact and recognize different Discourses at work (i.e. to see each other and various things in the world as certain “kinds of people” and certain “kinds of things” engaged in certain “kinds of activities”).
(Gee, 1999, p. 86)

The identification of situated meanings and cultural models is essential in the analysis of Discourses. Nonetheless, the construction of the situation network is not yet complete. Reflexivity is the term given by Gee (1999) to the reciprocity between language and the situation in which it is used. Gee (1999) asserts, that language concurrently reflects and constructs reality thereby enabling individuals to understand situations in greater depth.

This question reflects an important reciprocity between language and “reality”: language simultaneously reflects reality (“the way things are”) and constructs (construes) it to be a certain way. While “reciprocity” would be a good term for this property of language, the more commonly used term is “reflexivity” (in the sense of language and context being like two mirrors facing each other and constantly and endlessly reflecting their own images back and forth between each other).” (Gee, 1999, p. 82)

Gee (1999) asserts that a situation is comprised of five aspects these being: semiotic, activity, material, political and socio-cultural.

A semiotic aspect, that is, the “sign systems,” such as language, gestures, images, or other symbolic systems (Kress and van Leeuwen 1996), and the forms of knowledge, that are operative and important here and now. Different sign systems and different ways of knowing have, in turn, different implications for what is taken as the “real” world, and what is taken as probable and possible and impossible, here and now, since it is only through sign systems that we have access to “reality.” (Gee, 1999, p. 83)

An activity aspect, that is, the specific social activity or activities in which the participants are engaging; activities are, in turn, made up of a sequence of actions (Engestrom 1987, 1990; Leont’ev 1978; 1981; Wertsch 1998). (Gee, 1999, p. 83)

A material aspect, that is, the place, time, bodies and objects present during interaction (Clark 1997; Latour 1991; Levinson 1996). (Gee, 1999, p. 83)

A political aspect, that is, the distribution of “social goods” in the interaction, such as, power, status, and anything else deemed a “social good” by the participants in terms of their cultural models and Discourses, e.g. beauty, intelligence, “street smarts,” strength, possessions, race, gender, sexual orientation, etc. (Fairclough 1989, 1992, 1995; Gee 1996; Luke 1995). (Gee, 1999, p. 83)

A sociocultural aspect, that is, the personal, social, and cultural knowledge, feelings, values, identities, and relationships relevant in the interaction, including, of course, sociocultural knowledge about sign systems, activities, the material world, and politics, i.e. all the other aspects above (Agar 1994; Barton and Hamilton 1998; Carbaugh 1996; Gee 1992, 1996; Hanks 1996; John- Steiner, Panofsky, and Smith 1994; Palmer 1996; Scollon and Scollon 1981; Sperber and Wilson 1989; Toolan 1996). (Gee, 1999, p. 83)

Each aspect is inextricably connected. It is the combination of situated meanings, cultural models and reflexivity that form a situation network (Gee, 1999).

All these aspects together constitute a system (an interrelated network) within which each of the components or aspects simultaneously gives meaning to all the others and gets meaning from them. That is, we have another form of reflexivity here, as well. For a shorthand, let us call this system the "situation network... All of the elements in the situation network are like connected threads; if you pull on one you get all the others. Though discourse analysis usually focuses on the language (semiotic) aspect, it can start from any of these aspects of a situation and will, in the end, get right back to all the others.
(Gee, 1999, p. 83)

Regarding the focus-groups, I intend to identify situation networks within the discussions of FDM. Once the situation networks have been identified, I will triangulate them against the theoretical framework. The focus-groups will enable a more nuanced understanding of the perceptions, influences, rationales, choices and experiences of digital-makers and the underlying factors that influence their course choices and decisions within the DMC.

Chapter Six: Results of the Heuristic Case

Study - Survey

6.1 Introduction to the heuristic case-study survey results

It is important to remember, that the primary purpose of the survey was the identification of Frequent Digital-maker(s) (FDM) only. The survey successfully achieved this goal, with the ratio of approximately one FDM for every five infrequent digital-makers as predicted in section 5.1. The survey had a response rate of 95.14% with 20.42% of learners identified as FDM. All scenarios of the modified digital-maker hypothesis of section 5.2, were proved correct. Expanded tables regarding the DMC and non-DMC courses included in the survey; and summaries of learner responses to the Likert and closed and open questions, can be read in the appendix. An abridged account of the pilot study used in the research design is also available in the appendix.

Table 2: Large college overall survey results

Campus	Number of Learners Surveyed (%)	Number of Completed Learner surveys (%)	Number of Uncompleted Learner surveys (%)	Number of Frequent Digital-makers (%)	Number of Infrequent Digital-makers (%)
North	313 (63.36)	301 (96.16)	12 (3.83)	60 (19.16)	241 (80.06)
South	181 (36.63)	169 (93.37)	12 (6.62)	36 (19.88)	133 (78.69)
Totals	494 (100)	470 (95.14)	24 (4.86)	96 (20.42)	374 (79.58)

In this chapter, I will discuss the themes gathered in response to the open questions of the survey as answered by FDM only on Digital-Making Curriculum (DMC) and non-DMC courses; as it is these questions that are most pertinent to the refined research questions of section 5.1. The survey themes provide a general background concerning FDM perceptions, influences, rationales, choices and experiences of digital-making within the third space in the settings of the classroom and the home. The survey responses of the FDM highlight the tensions between fantasy (Vygotsky, 1930/1967; Smolucha, 1992) and pragmatism, which exists in both types of FDM across both campuses. The Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM) tend to exhibit more maturity in fantasy than the non-DMC-FDM whom display more pragmatic attitudes towards digital-making.

I will also seek instances of the four possible learning theories of the third space, as discussed in section 2.2.3; where I argued that a combination of Participatory Cultures (Jenkins et al. 2009) Communities of Practice (Lave and Wenger 1991), Affinity Spaces (Gee, 2004) and the trajectory of the self (Giddens, 1991), characterise digital-making.

6.2 South campus: non-DMC-FDM - summary of thematic analysis of open survey questions responses

The overarching theme in the responses of the south-campus non-DMC-FDM is that of pragmatism. Save for a few lifestyle and personal entertainment pursuits, the south-campus non-DMC-FDM do not hold computers in any sort of high esteem and display almost no interest in other digital technologies. The strength of their pragmatism separates the south-campus non-DMC-FDM from all other FDM on both campuses. In every other section of the survey, save for the construction of digital public entities; the south-campus non-DMC-FDM offer almost no views on their uses of the internet or digital technologies in their courses. The south-campus non-DMC-FDM do not engage much with digital technologies inside or outside of education. There is little to discuss. Nevertheless, they did visit the same top five websites reported by the other groups of learners: these being YouTube, Facebook, Twitter, Google and Tumblr.

In almost every aspect, these learners resemble infrequent digital-makers. I suggest that the south-campus non-DMC-FDM display evidence in favour of the argument I raised in section 5.2; that at the lower stages of the spectrum frequent and infrequent digital-makers are indistinguishable. This is because of the digital and media literacies at the lower stages (play, exploration and experimentation [lower]); are concerned with social interaction (Vygotsky, 1930-1934/1978; Turner, 1988), construction of rudimentary digital public entities and the uses of digital technologies.

Yet these learners possess just enough knowledge of digital and media literacies to enable the construction of digital public entities. The pragmatism of the south-campus non-DMC-FDM does not limit the frequency of their production of digital public entities. Instead, their pragmatism limits the maturity of their fantasy: the ability to imagine, realise and materialise a desired future reality (Vygotsky, 1930/1967; Smolucha, 1992). In section 4.1.1, I argued that FDM possess greater digital and media literacies than the infrequent; and this prompts dissatisfaction which stimulates fantasy. I

suggest that maturity of fantasy may be hampered by pragmatism; just as the 'prosaic side of practical life' hindered the development of creative imagination as discussed in section 4.1.5 (Vygotsky, 1930/1967; Smolucha, 1992). For the south-campus non-DMC-FDM, digital-making is simply a means to an end and nothing else. All the same, this is not the case with all other FDM, and the following sections will offer more insights in response to the refined research questions.

The themes raised by the south-campus non-DMC-FDM are relevant to refined research questions two and four. The rationales of FDM on non-DMC courses contrast and highlight the rationales of the DMC-FDM on DMC courses. If fantasy (Vygotsky, 1930/1967; Smolucha, 1992) is a key driver of choices made by DMC-FDM then pragmatism is the driver of non-DMC-FDM choices; as such fantasy and pragmatism act in opposition. If fantasy is triggered by dissatisfaction, then pragmatism is triggered by satisfaction. In this sense, pragmatism becomes the ability to imagine, realise and materialise a desired present reality. Pragmatists do not lack imagination they simply seek to maintain their present reality. All digital-makers (frequent and infrequent) possess fantasy and pragmatism but not in equal measure. Those with more mature fantasy are inclined to join DMC courses, those with more mature pragmatism opt for non-DMC courses as is the case here. The inference is that within the third space (Bhabha, 1994/2012; Soja, 1996; Gutierrez, 2008; Potter and McDougall) fantasy (Vygotsky, 1930/1967; Smolucha, 1992) is nurtured in the classroom-setting, whereas pragmatism is nurtured in the home-setting. Acts of digital-making that take place in the home-setting are instances of the digital-maker seeking to maintain some aspect of their current identity, environment or reality. Hence, the motivation to join a DMC course must in part be influenced by a desire to alter the identity, environment or reality of the digital-maker. Such an individual must feel that tuition from More Knowledgeable Other(s) (MKO) (Vygotsky, 1930-1934/1978) would be beneficial for this purpose.

The duality of fantasy and pragmatism also addresses refined research question one (Vygotsky, 1930/1967; Smolucha, 1992). Both are present in the constitution of the DMC. In section 4.2, I argued that learners may progress through the lower stages of the discourse of the digital-maker without instruction. This is due to the ease of achieving creative goals. In section 5.2, I argued that frequent and infrequent digital-makers are indistinguishable at the lower stages of the spectrum. I now suggest that pragmatism is developed in the lower spectrum stages and fantasy is developed at

the higher. For learners to engage in the DMC, it must support the pragmatism of its learners before developing their fantasy. Otherwise, learners may disengage or choose not to participate at all in DMC courses. In the constitution of the DMC, the basic aim is pragmatism and the highest aim is fantasy.

6.2.1 North campus: Comparisons of themes from Frequent Digital-maker(s) (FDM) on Digital-Making Curriculum (DMC) and non-DMC courses - Section 1, uses of digital content and technologies

Survey questions 10 - 11: From the outset differences between the two groups of FDM can be seen. The presence and influence of school feature much more regularly in the responses of The Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM); for many schools were vital in fostering initial interests and skills in digital-making. The majority of DMC-FDM were taught lessons in the uses of computers and other digital technologies during their compulsory education years. This early exposure to digital content and technologies is significant not because of their young ages but because the learners experienced some form of logical instruction during their formative digital-making experiences before entering post-compulsory education. By which time many had reasonable understandings of digital and media literacies, under the supervision of educators that presumably would have guided learners through their early experiences.

Based on the responses of the DMC-FDM, schools concentrated their technological lessons on the areas that were of most interest to the learners: image and video editing, photography and animation. Software such as Photoshop features prominently in responses. It is not surprising that the digital and media literacies of the majority of the DMC-FDM are situated in the making/editing; reading/writing and the up/downloading of digital files. These are all digital and media literacies that learners would have been taught formally as part of digital-making exercises in their compulsory education. The DMC-FDM may be more inclined to select DMC courses in which digital-making is favourably viewed. The course choices of DMC-FDM are influenced by the third space in the classroom setting.

The formative period experienced by DMC-FDM is a Zone of Proximal Development (ZPD) (Vygotsky, 1930-1934/1978). The ZPD provided a space in which tutors acting as MKO (Vygotsky,

1930-1934/1978) could structure and extend the existing digital and media literacies of DMC-FDM (Burn and Durran, 2007). Both of these arguments were raised earlier in sections 2.2.1 and 3.2 (Burn and Durran, 2007). Furthermore, the social interaction between MKO and learners appear to significantly influence learners' choices of course in FE. If learning in the DMC is the reconstruction of identity or the self (Giddens, 1991) then within the digital public entities constructed by learners, are the digital and media literacies imparted by their tutors. Nothing in the DMC is constructed in isolation. Learners' identities as digital-makers contain elements of the environments in which their digital public entities are made, including social interaction. This was an argument I made in chapters two and three sections 2.2.1 and 3.2. The views of the DMC-FDM support all of these arguments.

The above themes raised by the DMC-FDM mainly address refined research question three but also touch upon questions two and one. The themes lend further support to the notion expressed in the previous section that within the third space (Bhabha, 1994/2012; Soja, 1996; Gutierrez, 2008; Potter and McDougall) fantasy (Vygotsky, 1930/1967; Smolucha, 1992) is nurtured in the classroom setting. The views of the DMC-FDM gives an insight into how maturation occurs from the perspective of learners. A particularly interesting theme is that schools situated digital-making in the fields that were of most interest to learners. The implication being that learners were immediately able to perceive the utility of digital-making not only in the classroom setting but also the home. For the DMC-FDM digital-making exists in both settings of the third space thus, the DMC-FDM are immersed in digital-making. The maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) is greatly aided by immersion and immediacy. The faster learners can apply newly learnt digital and media literacies to the construction of digital public entities; the faster the pace of maturation of fantasy.

Regarding the constitution of the DMC, schools developed the literacies that were already familiar to learners. None of the DMC-FDM recalled developing complex interactive digital public entities nor did they recall any instances of communicating meaning to an audience through digital public entities. Instead, schools built upon learners' still image editing literacies and extended them into basic moving image literacies. Hence, the transition to more complex forms of digital-making occurs in increments; as stated in the work of Ito et al. (2010) and Rowsell (2013). Consequently, upon leaving school the DMC-FDM are more predisposed to choosing a DMC course in FE.

Regarding the potential learning theories of the third space discussed in Chapter Two. The themes raised by the DMC-FDM do not display much evidence of collaboration with peers as

described in *Participatory Cultures* (Jenkins et al. 2009) and *Communities of Practice* (CoP) (Lave and Wenger 1991). Frequent Digital-Makers do not appear to function in communities, nor do learners seem particularly keen to share their digital public entities with others. Instead, DMC-FDM seem more concerned about receiving instruction from their tutors. Hence, much evidence is found in support of Vygotskian Constructivism (Vygotsky, 1930-1934/1978 and 1931/1984; Smolucha, 1992), in which MKO leads learning within a ZPD (Vygotsky, 1930-1934/1978). The third space itself could also be described as a ZPD, as I stated in section 2.2.3. However, it should be noted that collaboration between MKO and learners does not resemble the co-construction of learning experiences as discussed in Chapter Two. Instead, the relationship between MKO and learners is very much in the mould of Skinnerian Behaviourism (Skinner, 1968). The notion of co-construction may be symptomatic of the following phenomenon; learners have been given more charge, regarding the construction of learning as evidenced by the progression of the DMC itself. Even so, many learners have chosen not to use this latitude, instead choosing to rely on the instructions of their tutors. Tutors are still in charge of the construction of learning experiences. The implication here is that the DMC itself is still teacher-centred (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012), not by design but by learner reluctance (Turner, 2010) to fully participate in the co-construction of learning experiences, other than the receiving of information.

In contrast, many of the non-DMC-FDM initial interests in digital-making originate from personal hobbies outside of school. By "personal hobbies" I mean instances of digital-making that take place in the home-setting of the third space. Here, the learner is free to pursue the development of identity or the self (Giddens, 1991); often characterised as lifestyle and personal entertainment pursuits. I am not suggesting that personal hobbies and school lessons are mutually exclusive but in the responses of learners in this section, this is how the answers transpired. DMC-FDM also have personal hobbies and non-DMC-FDM attended schools which taught digital-making exercises. Notwithstanding, school experiences are recounted far fewer times in the responses of the non-DMC-FDM.

Instead, the non-DMC-FDM mention personal goals which they were able to achieve via digital and media literacies. It should be noted that these personal goals were invariably connected to a personal hobby which was usually some kind of image or video editing. Rather than follow taught

instruction from tutors, the non-DMC-FDM sought information from online sources. Information seeking would become their pre-eminent digital skill even over digital-making. This is significant because it would shape their attitudes towards choosing to avoid the study of DMC courses in future. Consequently, non-DMC-FDM developed a less structured and more pragmatic attitude towards computers and digital technologies.

I suggest that the social interaction between non-DMC-FDM and their tutors did not have the same resonance as those between DMC-FDM and their tutors. This may be due to conflicting personal goals and creative interests between non-DMC-FDM and their tutors. Alternatively, non-DMC-FDM may not have perceived their tutors as MKO (Vygotsky, 1930-1934/1978). Thereby, adding further support for the above argument concerning the influence of social interaction on course choice.

The themes raised by the non-DMC-FDM, address refined research questions one, two and three. In contrast, to the DMC-FDM the fantasy (Vygotsky, 1930/1967; Smolucha, 1992) of the non-DMC-FDM did not mature at an accelerated pace. Despite having the same interests as the DMC-FDM; for the non-DMC-FDM digital-making was not as immersive. Consequently, for the non-DMC-FDM, the third space becomes fragmented and digital-making is viewed as occurring in the home-setting only; in comparison to the DMC-FDM where the classroom and the home merge. I suggest that social interaction with tutors strongly influence the perception of digital-making within the third space. In section 2.2.2 I argued that construction of digital public entities is the 'sum total of the learner's interactions with MKO (Vygotsky, 1930-1934/1978), the use of digital tools, the environment in which the entity is constructed and the learner's capacity for adaption (Piaget and Cook, 1952), assimilation and internalisation (Piaget and Cook, 1952).' The non-DMC-FDM appear to be constructing digital public entities with only minimal interactions with MKO. The digital public entities constructed by the non-DMC-FDM contain fewer digital and media literacies obtained from their tutors. Consequently, the digital and media literacies of non-DMC-FDM are much narrower than those of DMC-FDM. The reason being that by virtue of their structured lessons in compulsory education DMC-FDM were taught a wider array of digital content and technologies. Non-DMC-FDM, do not have this advantage as their digital and media literacies only range as far as their interests permit. Consequently, most of the digital and media literacies of non-DMC-FDM are located in the making and editing of digital files.

Still, the non-DMC-FDM possess one advantage over the DMC-FDM namely, that they are less dependent on tutors in seeking solutions to creative problems. Instead, non-DMC-FDM are content to seek solutions from convenient online sources, for example, video tutorial websites and forums. The search for solutions tends to happen in the home-setting, as non-DMC-FDM recognise that their tutors may not have any interest or possess the type of information required to solve creative problems. This does not mean that non-DMC-FDM are more inclined to solving creative problems, it is just an indication that DMC-FDM are more prone to seek the help of their tutors or others with professional knowledge. This is because DMC-FDM perceive their study of digital-making as a route to higher education and eventually a professional creative career. When working on coursework DMC-FDM are eager to achieve high grades and will, seek the advice of the highest available authority, this is usually their tutors. Yet, if tutors are unavailable or unable to help; DMC-FDM will then resort to seeking solutions from convenient online sources. In such instances, DMC-FDM become very concerned about the validity and authority of information sources.

Regarding refined research questions one, two and three the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) in DMC-FDM appears to come at a cost. Namely, FDM that display the greater maturity of fantasy and also exhibit a far greater dependency on MKO (Vygotsky, 1930-1934/1978). This is because much of the social interactions between tutors and learners are in the form of instruction. Consequently, DMC-FDM become accustomed to receiving digital-making tuition from authoritative sources. In contrast, non-DMC-FDM seem less concerned about the authoritativeness of information, instead, their concern is for its utility, this is reflective of their pragmatism. Two differing learning styles emerge: learning as the imitation of MKO and learning as the achievement of personal goals. The DMC-FDM, subscribe to learning as imitation and the non-DMC-FDM subscribe to learning as personal achievement. I am not claiming that both styles of learning are mutually exclusive, but in the responses of both groups of FDM the division was clear.

Overall the most striking differences between the two groups of FDM have centred around three types of digital and media literacies: the making/editing, reading/writing and the up/downloading of digital files. There is a clear split between these three literacies and the others such as playing digital files, using apps/programs and even listening/watching digital files. The split is very clear in the accounts of the DMC-FDM so much so, that I will divide the literacies into two types: coursework and

lifestyle literacies. DMC-FDM value the coursework literacies of making/editing, reading/writing and the up/downloading of digital files far more than the non-DMC-FDM. This division is significant not only because it echoes the finding of similar studies into learners' uses of digital content and technologies (Ramanau et al. 2010); but also because of the similar ages and levels of education of learners. The majority of learners at the north campus are aged between 16 and 19 years. In a longitudinal study, of first-year university learners uses of ICT, aged 25 and younger; Ramanau et al. (2010) found that the learners placed ICT in two categories: those used for learning and those used for living.

Consequently, the DMC-FDM possess a wider skill set than the non-DMC-FDM, but this is due to the requirements of the coursework for their DMC courses; rather than any form of intrinsic motivation. It is important to note this because one must recognise and understand that the major differences between both groups reside in their schooling. The DMC-FDM are able to recall the influence of school lessons in their technological development much more often in comparison to the non-DMC-FDM. The result of this is that DMC-FDM have a more proactive attitude towards digital content and technologies. By this, I mean that the DMC-FDM are more likely to engage in digital-making in both settings of the third space; in comparison to non-DMC-FDM who tend to engage more in the home-setting. DMC-FDM are also more likely to use digital content and technologies for multiple purposes due to their greater maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992); as opposed to the non-DMC-FDM who display a more pragmatic attitude and are more likely to use digital technologies solely for its intended purpose.

Concerning, refined research question three the differences between the DMC-FDM and the non-DMC-FDM of north campus are in their schooling, but more specifically in their social interaction with tutors during compulsory education. These interactions appear to be more of an influential indication of the choice to join a DMC course in FE; in comparison to the digital-making activities of learners in the home-setting. The learning styles, range of digital and media literacies, the levels of pragmatism and the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) for both groups of FDM are all attributable to their social interaction with tutors.

Regarding the constitution of the DMC, the coursework literacies that appear are the three broad categories of digital-making that appear in compulsory education; these literacies run through the spine of the DMC at all levels of education. Within these categories are a number of more

nuanced literacies situated in various digital-making environments. As FDM participate and engage in the DMC at higher levels of education they acquire much wider ranges of nuanced digital and media literacies.

6.2.2 North campus: Comparisons of themes from Frequent Digital-maker(s) (FDM) on Digital-Making Curriculum (DMC) and non-DMC courses - Section 2: uses of the Internet

In this section, the themes mainly address refined research question two but also touch upon question one. Section two of the survey was designed with the intention of understanding learners' social interaction (Vygotsky, 1930-1934/1978; Turner, 1988), habits and behaviours when in the third space, especially in the home-setting. It was assumed that the presence of digital-making activities among learner responses would clearly differentiate FDM from the infrequent. Yet, this was not the case. There was no discernible difference between the social interaction, habits and behaviours of frequent and infrequent digital-makers; or even DMC-FDM and non-DMC-FDM Regarding digital-making in the home-setting. Both groups of FDM visit the same five popular websites (see section 6.1) for leisure and recreation. Consequently, learners' answers focused on their conduct when socialising or communicating with others when in pursuit of hobbies, leisure and recreation. However, some learners were using websites as a studio space to display and share their digital public entities with audiences and to seek advice and feedback from like-minded individuals. This behaviour is interesting because it is an instance of the desire to share digital public entities with others as described in Participatory Cultures (Jenkins et al. 2009). So far, this is the only instance of FDM behaviour that aligns with any behavioural descriptions of Participatory Cultures.

As part of these communications, learners revealed many insights into their online conduct. The most relevant of these are the dual patterns of communication used by learners when online. It was found that many learners only communicate with others online if they are known first in real life. For the learners, online communication is an extension of offline relationships. When learners speak to their friends online they do so in a friendly manner that resembles their normal communication. Nonetheless, this friendly manner is not extended to other visitors that are unfamiliar in real life. In

these instances, learners display caution, an aversion to confrontation and even distrust, some do not engage in conversation at all.

It was at this point that I began to question the responses of learners that claimed to have little difficulty in speaking to others online. Closer inspection of their responses revealed that the more outgoing respondents were using another pattern of communication. The outgoing learners were using an advisory manner in much more of their communications. Outgoing learners were more likely to give and receive advice from unfamiliar visitors, especially DMC-FDM. Outgoing learners were applying their own 'friendship' criteria to other unfamiliar visitors such as shared interests or even communication over a certain period. It appears that DMC-FDM may deem information from another person as more credible than other sources. Due to their wide range of digital and media literacies, DMC-FDM may be more distrustful of information sources, hence the need for dialogue.

I suggest that the pragmatism and fantasy (Vygotsky, 1930/1967; Smolucha, 1992) of the DMC-FDM are apparent within their online advisory dialogues. When receiving advice, the DMC-FDM act pragmatically, seeking replication of social interaction with tutors. Essentially, DMC-FDM are looking for instructions from an authoritative source, due to their preference for learning by imitation of MKO (Vygotsky, 1930-1934/1978). nevertheless, when unavailable the DMC-FDM will substitute their tutors with the most convenient highest perceived authority. Although, it should be noted that in many instances the authority may be a video or website tutorial or forum. On tutorial websites dialogue, may be in the form of user comments, ratings and questions. The dialogue in this capacity serves as a means of validating the authority of information sources.

Once again, further evidence is generated in favour of the affinity spaces (Gee, 2004) and trajectory of the self (Giddens, 1991) learning theories. These behaviours are mainly demonstrated by the non-DMC-FDM, all the same when their tutors are unavailable the DMC-FDM will behave like non-DMC-FDM. This implies that all FDM instinctively behave like non-DMC-FDM. Therefore, the behaviours unique to the DMC-FDM are learned behaviours obtained from their interactions with tutors in DMC courses. In this sense learning in the DMC very much resembles that of Skinnerian Behaviourism (Skinner, 1968). I am not suggesting that tutors are programming behaviours into learners; but rather that DMC-FDM are voluntarily mimicking the behaviours of their tutors. The fantasy of the DMC-FDM is tantamount to the digital and media literacies of their tutors.

Conversely, DMC-FDM exercise or test their maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) by offering advice to others. Dialogue is used to confirm the effectiveness of digital and media literacies. It also allows DMC-FDM a relatively safe form of experimentation without directly incurring the consequences, if bad advice is given. Ultimately, by offering advice the learner steps into the role of the tutor; advising others is yet another, albeit more advanced instance of learning by imitation. This explains why DMC-FDM are keen to avoid causing confrontation, to do so would greatly hamper their ability to validate information and gather and offer new knowledge. One may question if this is an issue considering the vastness of the Web. However, one should remember that learners are creatures of habit as indicated by learner visits to the same top five websites. One should also consider that websites that facilitate digital-making at the higher stage of the discourse of the digital-maker are in scarce supply.

Regarding the learning theories of Chapter Two, the DMC-FDM now appear to be displaying collaborative behaviours. Even so, once again collaboration does not occur as described by Participatory Cultures (Jenkins et al. 2009) and CoP (Lave and Wenger 1991). Once again collaboration resembles that of the ZPD (Vygotsky, 1930-1934/1978) with FDM alternating between the role of the learner when receiving advice and the role of MKO when giving advice. I raised this point in section 2.2.3. Aside from the desire to share their digital public entities expressed by some DMC-FDM, hardly any themes support the claims of Participatory Cultures (Jenkins et al. 2009) and CoP.

6.2.3 North campus: Comparisons of themes from Frequent Digital-makers on Digital-Making Curriculum (DMC) and non-DMC courses - Section 3: uses of technology on your current course(s)

In response to question 37 the DMC-FDM strongly felt the need to improve their computer knowledge and skills; not only before joining their DMC courses but also in anticipation of their future roles in society. The DMC-FDM share a technological determinist perspective in which one must keep pace with the technological development of society or become obsolete. This perspective manifests as pressure felt by DMC-FDM which, I suggest is a significant factor in choosing to study a DMC course.

In contrast, the non-DMC-FDM feel no such pressure. Much like their DMC counterparts the non-DMC-FDM also recognise the importance of being a technologically literate member of society and yet none felt any compulsion to improve their digital and media literacies. One may argue that the non-DMC courses simply do not place as much demand on the non-DMC-FDM. But both groups of learners are FDM; both use the same websites and exhibit the same behaviours when online; so why is one group affected far more than the other?

A possible reason could be that the DMC-FDM experience the pace of technological change more viscerally due to their participation in DMC courses. DMC-FDM are under the impression that they must use the latest versions of software and are expected to be aware of all the latest innovations of the professional creative fields in which they hope to be employed. This impression is compounded by the continuous updating of creative software used in DMC courses which almost function as visual markers documenting the rapid pace of modernity.

All learners face levels of competition for places in higher education and future employment from their peers. Notwithstanding, this is acutely felt by DMC-FDM, who face unprecedented levels of competition and scrutiny because their work is easily compared to the digital public entities that populate the third space. Consequently, DMC-FDM believe that they are expected to produce digital public entities of near professional quality without the extensive knowledge of digital and media literacies necessary to do so. Within the third space regardless of setting, digital public entities are constantly judged by anyone with access, and DMC-FDM are well aware of this.

The above themes concern refined research questions four and two. Here the pressure felt by the DMC-FDM may be an adverse effect of the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992). In section 4.1.1, I stated that dissatisfaction was the stimulus of fantasy, I now suggest that the maturation of fantasy also increases the amount of dissatisfaction felt by DMC-FDM. The lack of pressure felt by the non-DMC-FDM also supports the theme of adverse effects caused by the maturation of fantasy.

The pressure felt by the DMC-FDM fits well into the descriptions of behaviour described in the trajectory of the self (Giddens, 1991). The DMC-FDM reconstruct their own identities by integrating elements of the past experiences of MKO into their own identities, for a future anticipated purpose. The reconstruction of the self is strongly influenced by the identities of MKO; the act of reconstruction is actually the act of integration. Depending on the identities integrated by the learner their trajectory

can be observed and its destination predicted. For the DMC-FDM integration of their tutors' digital and media literacies will lead to employment in the creative professional industries.

Regarding the computer-based activities of DMC and non-DMC courses, neither group felt restricted in their purview. The majority of learners in both groups spoke of unfettered access to a variety of software and online information. Still, there were small minorities in both groups that had a more nuanced view. The minorities complained of a lack of freedom to experiment and a lack of access to a wider range of online resources. This theme addresses research question one, it implies that the constitution of the DMC is very prescriptive. Earlier discussions of the social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) between tutors and learners were also of a prescriptive nature. Therefore, a few DMC-FDM at or near stage five [creative expertise] of the discourse of the digital-maker may legitimately feel constricted by what they perceive as a regimented curriculum. Yet, many DMC-FDM engage in several activities that may be perceived as time-wasting. They insist that listening to music or watching a video is central to their working practices. Many of the DMC-FDM, seem unable to separate the leisure and recreation activities of their personal hobbies from the digital-making exercises of their DMC courses.

The non-DMC-FDM do not indulge in the same leisure and recreation activities within the classroom setting. Indeed, the majority of non-DMC-FDM are adamant about the use of computers and digital resources in the classroom-setting for study only. One may argue that with limited access to computers the non-DMC-FDM are keen to utilise their time. However, that would contradict their earlier statements regarding unrestricted access. The attitude displayed by the non-DMC-FDM is indicative of a much deeper conviction; namely that the non-DMC-FDM do not hold digital and media literacies in the same esteem as the academic knowledge and skills of their non-DMC courses. The non-DMC-FDM feel that digital-making is an activity to be done at home rather than in the classroom setting. The DMC-FDM see very little distinction if any between the classroom and home-settings of the third space. This is why the DMC-FDM replicate the working practices of their home environment in the classroom-setting and vice versa. Here, research question two is addressed again. The above themes regarding the perception of digital-making and the esteem in which it is held by learners; supports the discussion in section 6.2.1 concerning the fragmentation and merging of the third space. I suggest that the differing attitudes expressed by both types of FDM are reflective of the pragmatism

in the non-DMC-FDM and fantasy in the DMC-FDM. The non-DMC-FDM of the south and north campuses both expressed attitudes that support associations between pragmatic attitudes and aversion to participation in a DMC course in FE.

In terms of the support, learners receive from their tutors the DMC-FDM are given much more help than the non-DMC-FDM. This is as expected due to the nature of the learners' courses. The DMC-FDM ask for help with image and video editing being popular disciplines and the non-DMC-FDM ask for help with information seeking. Even so, many of the DMC-FDM exhibit a strong dislike of the unfamiliar and the uncertain. The frequency by which the DMC-FDM seek assistance from their tutors implies that many learn by following instructions. As such many DMC-FDM dislike any scenario where the desired result is outside the remit of instruction. In short, many DMC-FDM dislike problem solving (Vygotsky, 1930-1934/1978; Bereiter and Scardamalia, 1993) and prefer to outsource finding a solution to others. This avoidance of problem-solving implies that many DMC-FDM are primarily interested in self-expression. By this, I mean that DMC-FDM are eager to create digital public entities that serve their own purposes. DMC-FDM are not necessarily interested in how to solve problems because it is more inefficient than following instructions. DMC-FDM are more interested in the final product than its construction. Problem-solving does not fit well into the trajectory of the self (Giddens, 1991), the learning theory that so far, most resembles DMC-FDM behaviour. The issue with problem-solving is that if the experience of the MKO cannot provide a solution; the learner is at a loss as to how to proceed. It is at this point that DMC-FDM must employ mature fantasy (Vygotsky, 1930/1967; Smolucha, 1992) and experiment to create a new solution. Notwithstanding, many DMC-FDM either do not possess enough maturity of fantasy or are unwilling to engage in experimentation. Consequently, problem-solving is avoided. The trajectory of the self is not a means of maturing fantasy but rather it is a means of replicating the experiences of others. The trajectory of the self does not lead to creative expertise, instead, it produces experienced non-experts (Bereiter and Scardamalia, 1993).

This notion fits well with the means by which much DMC-FDM practice digital-making outside of the classroom. Many use video or website tutorials to create the digital public entities they desire. If it follows that DMC-FDM replicate the working practices of the home when creating digital public entities in the classroom-setting; then the same logic applies to their methods of overcoming

problems. In contrast, the non-DMC-FDM do not share the same anxieties regarding problem-solving, other than finding new sources of information. Consequently, receiving support for computer-based issues is not of major concern in the classroom setting or the home.

Research questions one and two are addressed in the above paragraphs. The dislike of problem-solving exhibited by many DMC-FDM; is surprising considering that the maturation of fantasy requires the identification and achievement of creative goals (Vygotsky, 1930/1967; Smolucha, 1992; Bereiter and Scardamalia, 1993). This is the basis of progression in the discourse of the digital-maker, learners cannot progress to stage five in the spectrum without consistently setting and achieving some creative goals. The majority of DMC-FDM may never achieve the status of creative expertise. An implication here is that as discussed by Vygotsky (1930/1967) and Smolucha (1992) the maturation of fantasy is not a continuous process for the majority of individuals. A further implication is that the majority of DMC-FDM may be using DMC courses as a means of prolonging participation in digital-making. Once these frequent digital-makers are not involved in digital-making it is likely that their pragmatism will rise and curtail further maturation of fantasy. These DMC-FDM will eventually resemble the non-DMC-FDM albeit with a greater range of digital and media literacies. For many, DMC-FDM sustained participation in digital-making will only be possible if employed in the professional creative industries.

Consequently, many DMC-FDM are only concerned with the acquisition of the digital and media literacies that may lead to professional creative careers. For such DMC-FDM, the maturation of fantasy and learning as the construction of an identity are not of paramount importance. These DMC-FDM are the experienced non-experts described by Bereiter and Scardamalia (1993) in section 4.1.4. Just as in the Bereiter and Scardamalia (1993) study the majority of DMC-FDM display an aversion to progressive problem-solving. This also implies that the instructional nature of the DMC does not encourage learners to engage in sustained progressive problem-solving in school or college.

In response to being asked if learners expected their courses to improve their computer knowledge and skills; the DMC-FDM answered yes and the non-DMC-FDM answered no. Both groups gave the same answers to the follow-up question of whether their courses have improved their digital-making literacy.

Overall both groups of FDM felt responsible for the development of their digital and media literacies. Still, it is clear from the above analysis the DMC-FDM feel this more acutely than the non-DMC-FDM. One may think that the DMC-FDM would be keen to develop their skills with as little aid as possible, instead, the opposite is the case, as argued above. The DMC-FDM seek as much help as possible in the development of their skills because many feel overwhelmed by the pressure of maintaining their relevance in an ever increasingly digitised society. This is why the DMC-FDM chose to join their DMC courses. The non-DMC-FDM, in contrast, are content, with the narrower range of digital and media literacies gleaned from their personal hobbies. Consequently, the non-DMC-FDM escape many of the anxieties that beset the DMC-FDM. For the non-DMC-FDM digital-making is a hobby that does not require pursuit of formal instruction in FE, as influenced by their strong pragmatic attitudes.

The views of the non-DMC-FDM generate further evidence of the lack of collaboration between peers as described by Participatory Cultures (Jenkins et al. 2009), CoP (Lave and Wenger 1991). Yet, the non-DMC-FDM also display a lack of collaboration with tutors acting as MKO (Vygotsky, 1930-1934/1978). Instead, the non-DMC-FDM display collaboration with affinity spaces (Gee, 2004) acting as MKO. This is the behaviour displayed by non-DMC-FDM whenever contact with a tutor is unavailable. The non-DMC-FDM seem to be functioning in a manner similar to that described in the trajectory of the self (Giddens, 1991). The non-DMC-FDM are engaging in digital-making as a means of self-reflection (Giddens, 1991). By taking more responsibility for their construction of digital public entities the non-DMC-FDM construct a coherent and rewarding sense of identity. Hence the lack of anxiety and a greater sense of contentment felt by the non- DMC-FDM.

6.2.4 South campus: DMC-FDM - summary of thematic analysis of open survey questions responses

The themes which arose from the responses of the south-campus-DMC-FDM are similar to those of the north-campus-DMC-FDM. However, there were a few slight differences for example, in response to question ten; the south-campus-DMC-FDM expressed that their initial interests in digital-making came from personal entertainment pursuits. This differs from the north-campus DMC-FDM who indicated strongly that their initial interests originated from school activities. It is surprising to see

that schools did not have the same influence on the south-campus DMC-FDM; many of whom implied that they were actively engaged in digital-making from their early childhood. Nonetheless, this difference is insignificant, the reason for this is twofold.

Many personal hobbies of the south-campus-DMC-FDM involve image and video editing, photography and animation. These are the same practices that most interested the north-campus-DMC-FDM. Quinlan (2015) conducted a survey on behalf of Nesta and found that 76% of young people made and edited their own digital pictures. The survey also found that 78% of young people in 2013 and 66% in 2015 predominately learned digital-making while in class at school. The findings from both groups of FDM are in accordance with those of Quinlan (2015). Furthermore, the south-campus-DMC-FDM expressed that their digital and media literacies improved in the areas of making/editing; reading/writing and the up/downloading of digital files; the same areas of improvement reported by the north-campus-DMC-FDM. The south-campus-DMC-FDM exhibited the same preference for coursework literacies over lifestyle literacies (see section 6.2.1) as their north-campus-DMC-FDM peers. The above themes raised by the south-campus-DMC-FDM concern research question two but also address questions one and three. The similarities and minor differences between the south and north-campus-DMC-FDM reinforce the arguments of the previous section; particularly those related to the digital-making practices and the ranges of digital and media literacies held by both groups. The argument regarding the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) is also reinforced here.

Regarding the south-campus-DMC-FDM uses of the Internet, there was again hardly any difference in themes that emerged from learners' responses. The south-campus-DMC-FDM frequently visit the same top five websites mentioned in section 6.2. This further reinforces the point I made in section 6.2 regarding the indistinguishability between the frequent and the infrequent at the lower stages of the spectrum. The south-campus-DMC-FDM motivations for visiting these sites are driven by personal entertainment and interests. This again matches the responses given by the north-campus-DMC-FDM. Nevertheless, the south-campus-DMC-FDM displayed a lesser understanding of the rules and cultures of the websites they visited despite being more outgoing and friendly towards other visitors, in comparison to the north-campus-DMC-FDM. In place of a cultural understanding, the south-campus-DMC-FDM displayed a legalistic awareness of copyright issues and an even stronger aversion to causing offence to other website users.

The following perspectives of both groups of DMC-FDM relate to research questions two and one. With respect to the uses of technologies on their current courses, the responses of the south-campus-DMC-FDM resembled those of the north-campus-DMC-FDM. Both groups have tacitly accepted the premise of the digital natives' meme (Prensky, 2001a and 2001b). All the same, the south-campus-DMC-FDM believe they automatically obtain digital and media literacies by virtue of their lifestyles. The north-campus-DMC-FDM disagree. A possible reason for this could be that the south-campus-DMC-FDM expressed quite general uses of computers on their courses as opposed to the specific uses of computers mentioned by the north-campus-DMC-FDM. This may be indicative of the differences between the institutional characteristics and pedagogies of tutors at both campuses, mentioned in section 5.2; rather than a fundamental divergence in the philosophies of both learner groups, as both view digital and media literacies with high regard. However, the south-campus-DMC-FDM felt that their courses only marginally improved their computer skills, they also felt restricted in their uses of computers on campus. In comparison, the north-campus-DMC-FDM were far more concerned with their freedom to experiment, as many felt they had the opportunity to use computers as they pleased.

Another difference between both groups is that the south-campus-DMC-FDM did not feel obliged to improve their own computer skills instead the learners relied on their DMC courses to do so. This contrasts the north-campus-DMC-FDM who cited the strong influence of schools in their early experiences of digital technologies and then asserted their independence in improving their own digital literacies. This may be a reflection of learners' anxieties regarding the uses of computers on their DMC courses. As the north-campus-DMC-FDM, feel that their uses of computers are quite specific it is logical that the learners may feel the onus for the development of their digital and media literacies. In comparison, the south-campus-DMC-FDM may not feel the same responsibility because of the more generic uses of computers on the DMC courses offered at their campus.

The reliance of the south-campus-DMC-FDM on their DMC courses may appear surprising initially. Even so, I suggest that the social interaction between the south-campus-DMC-FDM and their tutors during their formative period of digital-making experienced in compulsory education were not as intensive as their north campus peers. In short, the ZPD (Vygotsky, 1930-1934/1978) of the south-campus-DMC-FDM contained less scaffolding than the ZPD of the north campus DMC-FDM. Consequently, the south-campus-DMC-FDM feel less confident in their ability to develop their digital

and media literacies; hence their reliance on DMC courses. The effectiveness of social interaction between MKO (Vygotsky, 1930-1934/1978) and learner may be dependent on the amount of scaffolding contained within.

6.3 Summary of survey themes

The themes of this chapter have provided a general background concerning FDM uses perceptions, influences, rationales, choices, and experiences of digital-making within the third space in the settings of the classroom and the home. The themes have also provided evidence in support of the discourse of the digital-maker. One now understands that FDM attitudes towards digital-making are greatly influenced by the social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) between tutors and learners, especially in compulsory education. The result of these social interactions appears to be the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) and pragmatism in FDM.

Learners with more maturity of fantasy lean towards participation in DMC courses; those with a greater maturity of pragmatism lean towards non-DMC courses. DMC-FDM with more mature fantasy do not see any distinction between the two settings of the third space; whereas non-DMC-FDM with strong pragmatic attitudes have a fragmented view of the third space. For these non-DMC-FDM digital-making occurs in the home-setting where it concerns the development of identity and the maintenance of a present desired reality. In the home-setting, all FDM tend to construct digital public entities in very similar pragmatic fashion with minimal interaction with MKO and peers.

Notwithstanding, once enrolled in a DMC course the behaviour of the DMC-FDM begins to change and fantasy begins to mature. Digital-making then becomes the materialisation of a future desired reality. For the DMC-FDM maintenance and materialisation become synonymous. Consequently, the DMC-FDM incorporate aspects of the digital and media literacies of their tutors into their own identities and experiences. This results in the expansion of literacies held by the DMC-FDM and progression towards a desired future, still, it is at the cost of rising dependency on MKO. For the majority of the DMC-FDM, the maturation of fantasy does not lead to creative expertise but rather towards experienced non-expertise. The question here is why?

Of all the possible learning theories, that operate within the third space discussed in Chapter Two, little evidence was generated in support of Participatory cultures (Jenkins et al. 2009) and CoP (Lave and Wenger 1991). Neither, theory explains how FDM construct digital public entities, or how FDM progress through the discourse of the digital-maker. This was quite surprising, yet aside from the desire to display digital public entities as described in participatory cultures; none of the themes raised by FDM resembled any description of learning. Some evidence was found in favour of the affinity spaces (Gee, 2004) and the trajectory of the self theories (Giddens, 1991). While both theories were able to explain FDM digital-making practices from the play to the logical instruction stage of the spectrum; both struggled to explain how FDM reach creative expertise. Of the four possible theories, operational in the third space only two were present and neither could fully account for FDM behaviour (Giddens, 1991, Gee, 2004).

Yet, the learning theories of the previous generations of the DMC were found in the third space; especially Vygotskian constructivism (Vygotsky, 1930-1934/1978; 1931/1984; Smolucha, 1992) and Papertian constructionism (Papert, 1991). This is seen in the integration of aspects of MKO (Vygotsky, 1930-1934/1978) identities into that of the learner and social interaction is once again the means by which integration occurs. All of the differences between DMC-FDM and non-DMC-FDM can be traced back to their social interaction with MKO, namely their tutors.

Scrutiny of these social interactions revealed that far from co-constructing their learning experiences, many DMC-FDM were reliant on instructions from their tutors. Hence, Skinnerian Behaviourism (Skinner, 1968) is also present in the third space. The irony here is that for many DMC-FDM the maturation of fantasy and the development of identity is not their main concern. These learners simply enjoy digital-making and aspire towards a professional creative career. Inheriting the digital and media literacies of their tutors is a more efficient means of acquisition, compared to the experimentation required to solve creative problems. DMC courses reduce the burden of progressive problem solving (Bereiter and Scardamalia, 1993) by providing FDM with for lack of a better term, 'ready-made' literacies and this appears to be an influential factor in the decision to join a DMC course.

In the next chapter, I will explore in greater depth the presence of three themes that were alluded to in the social interaction between tutors and learners these being: learning trajectories, creativity and identity. I suggest that further explanation of these themes may describe how DMC-

FDM can progress from the logical instruction to the creative expertise stage of the discourse of the digital-maker. It is hoped that further insight may be gained as to which combination of learning theories operate in the third space. I also seek to further discover and explore DMC-FDM perceptions, influences, rationales, choices and experiences of digital-making within the third space in the settings of the classroom and the home, in greater depth.

Chapter Seven: Results of the Heuristic Case

Study – Focus-Group Interviews

7.1 Introduction to the Focus-Group Interviews

In section 5.2.2, I chose to use Discourse analysis (Gee, 1990 and 1999) to analyse the language of the Frequent Digital-maker(s) (FDM). Much of this analysis involves the detection of situation networks (Gee, 1999) here, the word situation is used in reference to any circumstance that involves social interaction (Vygotsky, 1930-1934/1978; Turner, 1988). Situation networks are comprised of three broad elements these being situated meanings, cultural models and reflexivity (Gee, 1999). Each broad element contains sub-elements that aid in the understanding of themes present in FDM language. For the sake of clarity:

- Situated meanings are observable patterns found in language and experiences of the world. These patterns tend to be adjectives and nouns that frequently occur during specific situations (Gee, 1999).
- Cultural models are totally or partially unconscious theories that allow individuals to make sense of the patterns observed in situations (Gee, 1999).
- Reflexivity is the term given by Gee (1999) to the reciprocity between language and the situation in which it is used. Reflexivity simultaneously reflects and constructs the reality of the situation (Gee, 1999).

In section 5.2.2 I stated that the answers to all the refined research questions reside in the language used by FDM when discussing digital-making. This assertion was proved correct in Chapter Six; where it was clear that social interaction between tutors and learners were at the root of all the themes from the open survey questions. The focus-group interview responses of FDM should contain not only more instances of social interaction; but also, group interaction which is the comparison, query, explanation, discussion or debate of issues between participants (Morgan, 1996). Both types of interaction will appear as situation networks within the language of FDM. The situation networks will

contain themes that support the discourse of the digital-maker of Chapter Four, in particular, the themes of learning trajectories, creativity and identity will be explored in-depth. I will then use the themes to place the FDM in the discourse of the digital-maker. Thereby, adding further evidence in support of the digital-makers' discourse, which one must remember is a map of the third space: the fourth and current generation of the Digital-Making Curriculum (DMC). This whole chapter will form a situation network (Gee, 1999).

In Chapter Six, the themes were presented according to the groups of DMC and non-DMC learners of the north and south campuses. However, for the sake of clarity, and due to the volume of responses given by FDM during the interviews, this chapter will be organised around the refined research questions. The themes discussed in the previous chapter emerged from the views of the 96 FDM on DMC and non-DMC courses of Large college. Of the 96 FDM, 94 participated in a total of 28 focus-group interviews consequently, a mass of data was gathered. Recordings of each interview can be heard in the appendices. This chapter will focus on the in-depth views of FDM from the following DMC and non-DMC courses. These interviews contained the highest amount of group interaction (Morgan, 1996), FDM responses emerged as authentically as possible, without interference from the interviewer:

- North campus FDM: BTEC level 3, 90 credit and extended diploma - art and design
 Interview Duration: 01:23:05
 Participants: Vaughan 2nd year BTEC Level 3, extended diploma
 Susie 2nd year BTEC Level 3, extended diploma
 Nicola 1st year BTEC Level 3, 90 credit diploma

- North campus FDM: BTEC level 3, 90 credit diploma - computer animation, games and web design (Multimedia)
 Interview Duration: 56:28
 Participants: Archie, Boris, Ken, Bruno, Carly, Blake

- North campus non-FDM: A-Levels: sociology, physics, mathematics, law and English literature

Interview Duration: 34:01
Participants: Ramona: Sociology, Law and English Literature
Ron: Sociology, Physics and Mathematics
Zack: Sociology, Physics and Mathematics

- South campus FDM: BTEC level 3, extended diploma: information technology users (ITU)

Interview Duration: 01:12:17

Participants: Ian, Seydou, Jason, Tevin, Basil

- South campus non-FDM: Btec level 3, 90 credit diploma: sports

Interview Duration: 35:24

Participants: Doris, Keisha, Duke

Based on the language used in the focus-groups by the Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM); the digital public entities produced within their compulsory education revolved around image and video editing, art and animation. It is important to note that many DMC-FDM were engaged in these activities at home. Some DMC-FDM also produced digital music, 3D computer models and basic programs. Nonetheless, schools tended to focus on image and video editing, art and animation; making these the entry-level subjects of the DMC. Once again, the findings of this study are supported by the Quinlan (2015) survey (section 6.2.4). Nevertheless, I will not define a hierarchy of DMC subjects beyond this point as there is little benefit in doing so. I am simply stating that for many FDM image and video editing, art and animation are the initial areas of digital-making in the classroom setting. If an FDM does not have an interest in these areas, it may explain why some do not cite the influence of schools in their early digital-making experiences. This may be the case with many of the south campus DMC-FDM and the non-DMC-FDM.

Instead, the next section of this chapter will focus on the unwritten constitution of the DMC. The constitution is not to be confused with the historical development of the DMC [chapter 1], its learning theories [chapter 2], its digital and media literacies [chapter 3] or even the third space [chapter 4]. The unwritten constitution concerns the ethos of the social interaction between tutors and learners that appears to be the catalyst at the core of the DMC. I am not suggesting that FDM are

aware of the constitution, but confirmation of its existence can be observed in the language of FDM when discussing digital-making especially in the classroom setting. In the next section, I will discuss the situated meanings (Gee, 1999) within FDM discussions of digital-making. These situated meanings exist within the adjectives and nouns used by FDM.

7.2 Refined research question one: What is the constitution of the Digital-Making Curriculum (DMC)?

In the previous chapter, the DMC was characterised as a system of social interaction concerning the digital and media literacies used in digital-making. Social interactions contain scaffolding (Vygotsky, 1930-1934/1978; Bruner, 1985; Hammond and Gibbons, 2005) in the form of instructions from tutor to learner. The instructions are designed to stimulate the progression of Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM) from pragmatism towards the maturation of fantasy (Vygotsky, 1930-1934/1978; Vygotsky, 1930/1967; Smolucha, 1992). This is the learning trajectory of the DMC and it is visible within the situated meanings of DMC-FDM. This analysis was performed using tag clouds and word counts generated in Wordle [please see the appendix]. The most common adjectives and nouns have the largest size in the cloud.

For example, when the art and design DMC-FDM were asked to recall the purpose of computers in their early experiences of digital technologies; the tag cloud and word count indicated that all three were initially unclear as to the purpose of computers and digital technologies. 'Stuff' is the largest word and appears 20 times in their responses. All three used simple artistic programs such as MS Paint to describe digital-making at home, Susie and Nicola also played a lot of games. The word Internet was also used frequently but not in reference to any specific activity.

All the same, when recalling digital-making at school the language of Susie and Vaughan begins to differ from that of Nicola. Broad terms like programs, computers, the internet and stuff were replaced with specific terms like blog, Adobe Illustrator and Photoshop. These specific terms occurred at the latter stages of their compulsory education. Susie and Vaughan experienced their formative digital-making experiences during their compulsory education, unlike Nicola who did not engage in specific digital-making practices in school. The term formative denotes the maturation of fantasy in learners via instruction from tutors. Hence, formative digital-making experiences can only be

experienced within the classroom setting. The social interaction between tutor and learner essentially form a Zone of Proximal Development (ZPD) (Vygotsky, 1930-1934/1978) in which the tutor leads the maturation of fantasy. Formative digital-making experiences cannot exist in the home-setting because here, digital-making concerns the development of identity and this is a pragmatic action designed to maintain a present desired reality. Within the third space, digital-making in the classroom setting and the home are acts of fantasy and pragmatism respectively. Consequently, during their compulsory education, Susie and Vaughan developed a perception of computers and digital technologies as a platform for artistic expression. The learning trajectories of Susie and Vaughan also began to diverge from that of Nicola. The perspectives of Susie and Vaughan demonstrates the constitution of the DMC; namely its highest aim of maturing the fantasy of FDM.

The relationships between tutors and learners are vital in the constitution of the DMC. In the previous chapter, I argued that a difference between DMC-FDM and non-DMC-FDM was the similarities between learners and tutors. The non-DMC-FDM were dissimilar to their tutors and this strongly influenced their approach towards digital-making. It appears that this phenomenon may also affect DMC-FDM with the difference appearing in their learning trajectories. This was the case with many of the south campus DMC-FDM.

When recalling the favourable treatment of knowledgeable learners on their course the art and design DMC-FDM began to show distinct patterns in their language. Vaughan dominated the responses and it became apparent that his treatment of peers and tutors is dependent on his perception of similarities between himself and others. Commonly, mentioned words are people, computers, graphic, work, good, James and Hannah. Vaughan mentioned the names James (friend) and Hannah (tutor) frequently and favourably, both share Vaughan's interest in graphic design. At no point, did Vaughan mention the names of other peers or tutors. The reason being that in response to the previous question Vaughan held most of his peers and tutors in low regard. In short, Vaughan views Hannah and James as similar to himself. This would later affect Vaughan's perception of creativity and his identity as a digital-maker.

In contrast, lesser bias is visible in Susie's language, while Nicola once again does not say much. The implication here is that Vaughan's learning trajectory differs from Susie's based on his interactions with Hannah, his tutor. Vaughan follows an instruction based approach which does not

allow room for experimentation subsequently, Vaughan consistently returns to Hannah for instruction. Vaughan's favouring of Hannah indicates that the instruction based digital-making approach of the DMC is replicated more easily in the learning trajectories of learners that share similarities with their tutors.

The early experiences of Susie, Vaughan and Nicola echo that of the DMC-FDM of the south and north campuses, discussed in the previous chapter. All three are FDM but the language of Susie and Vaughan fits with the specific digital-making experiences in compulsory education recalled by the north-campus-DMC-FDM. Whereas, Nicola's language fits the experiences of the south-campus-DMC-FDM, who recalled the influence of digital-making in their personal hobbies, but not in their schooling. The learning trajectories of the art and design FDM suggest that Susie and Vaughan occupy more advanced positions in the discourse of the digital-maker than Nicola. This would later prove to be the case. For Susie and Vaughan, the third space is an immersive environment in which learners routinely received structured instruction, regarding digital-making. Nicola did not view the third space in the same fashion as evidenced by the lack of adjectives and nouns related to digital-making in her language.

The early digital-making experiences of the multimedia DMC-FDM provide further insight into the constitution of the DMC. Similar to Nicola the language of the multimedia DMC-FDM reflects a lack of social interaction with the tutors of their compulsory education. From the word cloud generated one can infer that none of the multimedia FDM had a concrete idea as to the purpose of computers or other digital technologies. Their language is very generic, stuff and the internet are mentioned five times each, computer and kind are mentioned three times. This is an indication that their early experiences did not have the routine, immersion, and structure of Susie and Vaughan. Much of the digital-making of the multimedia DMC-FDM appear to be acts of play with no extrinsic goal. The multimedia FDM received very little guidance and learners were left to their own devices.

Further down the word count list the following are all mentioned twice: anything, something, games, creative, Sega, MS Paint, IBM and learned. As the multimedia FDM got older their digital-making began to revolve around entertainment and recreation in the form of games and digital art. Yet the lack of clear purpose and focus remains, the fantasy (Vygotsky, 1930/1967; Smolucha, 1992) of the multimedia FDM never developed in accordance with the constitution of the DMC. Unaware of

this, the fantasy of the multimedia DMC-FDM develops without the routine, immersion, and structure of instruction within social interaction with tutors. This is highly significant and would later greatly influence their perceptions of tutors on their DMC course. It would also characterise their learning trajectories, perceptions of creativity and their identities as digital-makers.

In stark contrast to the multimedia DMC-FDM, the adjectives and nouns used by the ITU DMC-FDM indicate that these learners were well aware, of the multiple purposes for computers and digital technologies in their early digital-making experiences. The larger words in the tag cloud are quite broad in range and include everything from entertainment to learning. From a very early age, the ITU DMC-FDM were engaged in learning with computers in addition to playing games and the consumption of entertainment. This is the only group of DMC-FDM where the majority of learners mentioned the ability to learn using computers. This trait was briefly mentioned by the art and design DMC-FDM however, the ITU DMC-FDM expressed more conviction in their recollections. It is interesting that both groups mentioned learning as a purpose of computers, the multimedia DMC-FDM never mentioned this and consequently were unable to define any purpose at all. The fact that the ITU DMC-FDM demonstrated an awareness for learning in their formative experiences is a strong indicator of their intention to study computing at a later stage.

Similar to the art and design DMC-FDM, the language of the ITU DMC-FDM displays progression from general to specific terms associated with computer science such as 'programming' and 'Java'. The situated meaning here is that the ITU DMC-FDM fascination with the internal workings of computers manifested into the drive to formally study programming and software. The result of which is the production of various digital public entities across many fields artistic and otherwise. The ITU DMC-FDM perception of computers as a platform for the general production of digital public entities is similar to the art and design DMC-FDM perception of computers as a platform for artistic expression. These perceptions are the result of social interaction with tutors in both cases, the fantasy (Vygotsky, 1930/1967; Smolucha, 1992) of the DMC-FDM developed from general interest to a specific focus. In contrast, the multimedia DMC-FDM displayed no such progression, due to a lack of social interaction with tutors. Consequently, the maturation of the multimedia DMC-FDM fantasies lacks clarity of purpose and direction and occurred at a slower pace. In short, the fantasy of the multimedia DMC-FDM did not mature in accordance with the constitution of the DMC. Indeed, it is

more surprising that the multimedia DMC-FDM opted to join a DMC course; as the lack of social interaction with tutors is usually indicative of non-participation in DMC courses.

For instance, when asked the same questions regarding their formative experiences of digital-making the A-level non-DMC-FDM differs significantly from the DMC-FDM. From the outset, the notion of computers used in activities for employment or school work is apparent. The A-level non-DMC-FDM also played games and indulged in digital art similar to the DMC-FDM, but the presence of work is distinctive in their language. Words such as Word, Excel and Work do not appear in any of the tag clouds of the DMC-FDM. The implication being that in the classroom-setting the social interaction between the A-level non-DMC-FDM and their tutors did not involve specific instruction about the construction of digital public entities. Hence, the A-level non-DMC-FDM developed a pragmatic attitude towards digital-making.

The sports non-DMC-FDM also display a lack of social interaction with tutors regarding their formative digital-making within compulsory education. Indeed, of all the FDM this group said the least on the topic. Words such as coursework, brand, research, social and games feature prominently. In the home-setting digital-making resembled the entertainment and recreation pursuits similar to the other FDM. Even so, this is the only tag cloud without any mention of digital art. Hence, the sports non-DMC-FDM have a narrow view of the purpose of computers and other digital technologies. In the classroom setting, the sports non-DMC-FDM experiences of digital-making are similar to those of the A-level non-DMC-FDM. Both non-DMC-FDM groups view computers pragmatically in the classroom-setting and this is a strong indication that social interaction with tutors did not contain instruction regarding digital-making. The digital-making practices of the non-DMC-FDM are acts of pragmatism. The non-DMC-FDM are content that their participation in digital-making does not require tutorial instruction.

The DMC has an unwritten constitution that exists within social interaction between learners and tutors on DMC courses only. These social interactions (Vygotsky, 1930-1934/1978) must revolve around specific and structured instances of digital-making and must be delivered routinely. This creates a state of immersion in which DMC-FDM view the third space as a single setting rather than the bifurcated perspective of the non-DMC-FDM. The purpose of the constitution is the maturation of fantasy in learners, via the importation of specific digital and media literacies necessary for the

construction of various digital public entities. The constitution favours the use of teaching through sequential instructions and this approach is also applied to progressive problem solving (Bereiter and Scardamalia, 1993). Notwithstanding, the constitution also tacitly acknowledges the role of experimentation in progressive problem solving (Bereiter and Scardamalia, 1993).

The unwritten constitution is at the core of the DMC and works in collaboration with all its other aspects, as discussed in chapters one to four of this thesis. It is here that the tensions discussed in Chapter Two, are exercised in the social interaction between tutors and learners. It is here that the digital and media literacies of Chapter Three, transfer from tutor to learner. It is here that learners progress through the stages of the discourse of the digital-maker of Chapter Four. All of these aspects of the DMC are held together by social interaction with the purpose of accelerating the maturation of fantasy in DMC-FDM.

The situated meanings of the focus-group interviews mainly addressed refined research question one; although some touch upon the other research questions. To address research questions two three and four one must venture beyond the situated meanings of adjectives and nouns and analyse the cultural models and reflexivity (Gee, 1999) of FDM language. Analysis of cultural models and reflexivity (Gee, 1999) will yield more complex insights into the differing learning trajectories, creativity and identities of the FDM; I will also aim to place each FDM in the discourse of the digital-maker.

7.3 Refined research question two: How are Frequent Digital-maker(s) (FDM) choices within the DMC influenced by their experiences of digital-making in the home-setting of the third space?

In section 6.2.1, I argued that the DMC is still teacher-centred (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012) not by design but due to learner reluctance (Turner, 2010) to fully participate in the co-construction of learning experiences. This is due to the DMC learners' reliance on tutorial instruction. Consequently, DMC-FDM limit their range of available choices within the DMC; by allowing tutors to decide the topics of learning and methods of assessment. (Although, it should be noted that learners have never had much authority if any regarding the assessment of their learning). Therefore, the DMC-FDM choice is limited to the

construction of their identities as FDM. This is the extent of DMC-FDM participation in the co-construction of their learning experiences.

It is important to clarify, that the identities of digital-makers of all descriptions do not equate to types. Indeed, there are only two types of digital-maker, these being the infrequent and the frequent as argued in section 3.1. Digital-maker identities are actually the learning trajectories adopted by FDM in response to social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors. As such, FDM identities can be used to not only view historical trajectories of progression, within the third space; but also, the current positions and anticipated trajectories and destinations of FDM. The differences in the early digital-making experiences of DMC-FDM and non-DMC-FDM discussed in the previous chapter indicated that frequent digital-makers have historically distinct learning trajectories; based on the extent of social interaction with tutors during compulsory education. These, historical learning trajectories significantly affected the decision of whether to participate and engage in a DMC course upon entering FE. It is important to remember that the themes discussed in Chapter Six, arose from the responses to the open questions of the survey. In short, the themes were present in the language of FDM. I suggest that further evidence of FDM identities are present within the cultural models and reflexivity (Gee, 1999) that appear in the language of FDM. Analysis of FDM identities will also reveal FDM perspectives on creativity, particularly progressive problem solving (Bereiter and Scardamalia, 1993) but also including self-expression and the acquisition of expertise. This is important because these choices act as markers that signify the direction of progression through the third space.

7.3.1 The topology of DMC-FDM identities

To address refined research question two, one must understand that within the third space there are two settings the classroom and the home. The classroom denotes digital-making inside formal education, the home denotes digital-making outside formal education. In the classroom-setting digital-making concerns the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992); in the home-setting digital-making concerns the pragmatic development of identity. One pertains to the construction of a desired future reality, the other to the maintenance of a present reality. The DMC-FDM construct and maintain their realities through their FDM identities. For the DMC-FDM reality and identity are the same. Hence, the DMC-FDM perception of the third space as a single environment. Still, DMC-FDM tend to favour one setting more than the other. Hence, the DMC-FDM can be divided

into two categories according to the reflexivity (Gee, 1999) of their speech: those that predominantly develop their FDM identities in the home-setting; and those that predominantly develop their FDM identities in the classroom setting. For the sake of clarity, I will call these groups the home-DMC-FDM and the classroom-DMC-FDM.

The home-DMC-FDM, frequently construct digital public entities in the home-setting, which have no direct connection to the activities of their DMC courses. Consequently, these DMC-FDM develop their own distinctive FDM identities, which they bring into the classroom (Burn and Durran, 2007). Within the DMC, the home-DMC-FDM make choices that align with the characteristics of distinctive FDM identities. The home-DMC-FDM, feel that their pragmatic FDM identities are insufficient or illegitimate, for entry into HE and employment; without the maturation of fantasy obtained from social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors of DMC courses. The home-DMC-FDM expect their tutors and DMC courses to assist in the extension and legitimisation of their existing digital and media literacies, to materialise their desired FDM identities. Yet, the home DMC-FDM are highly protective of their distinctive identities and often vigorously resist any form of unwanted modification or impingement by tutors. In social interactions with tutors, the home-DMC-FDM are only willing to accept the digital and media literacies that align with their existing FDM identities. The choices made by the home-DMC-FDM, focus on the development of identity. In short, within the DMC the home-DMC-FDM, function in the classroom setting in a similar fashion as when in the home-setting.

In contrast, the classroom-DMC-FDM can be further sub-divided into two categories depending on their construction of digital public entities in the home-setting. The first sub-group, I have called the Emulator-DMC-FDM (Emulators) do not frequently participate in digital-making, at the higher stages of the spectrum; unless it is directly connected to their DMC courses. The second sub-group, which I will call the academic-DMC-FDM (academics) rarely participates in any form of digital-making beyond the experimentation (lower) stage of the spectrum. Consequently, in comparison to the home-DMC-FDM, the classroom-DMC-FDM, have much less distinctive FDM identities. However, the FDM identities of the Emulators are more distinctive than those of the academics. The classroom-DMC-FDM, feel that their FDM identities must be constructed by their tutors to obtain the sufficiency and legitimacy, required for entry into HE and employment. Hence, the classroom-DMC-FDM, shift

the onus of constructing an FDM identity onto their tutors or other More Knowledgeable Other(s) (MKO) (Vygotsky, 1930-1934/1978).

The classroom-DMC-FDM, are less resistant towards social interaction with tutors. The classroom-DMC-FDM, are generally more accepting of the digital and media literacies, imparted by tutors within social interaction. Nonetheless, due to their slightly more distinctive FDM identities, the Emulators exhibit a slightly more protective mentality than the academics. The first sub-group needs to perceive the similarity between tutors and themselves; the greater the extent of similarity the lesser the extent of resistance. Hence, when little or no similarities are perceived, the Emulators can become as protective as the home-DMC-FDM. Nevertheless, the academics do not require as great a degree of perceived similarity, and welcome tutorial modification and impingement of their FDM identities. All the same, in some instances, the academics may also become critical of their tutors if they are displeased with the pace or direction of development. In short, within the DMC, the choices made by the classroom-DMC-FDM, generally align with the methods and assessment of fantasy maturation favoured by their tutors, due to a lack of digital-making in the home-setting. In the classroom-setting DMC-FDM function as they do in the home-setting and vice versa.

There are two overall types of digital-maker: the infrequent and the frequent. The infrequent digital-makers are located on the play, exploration, and experimentation [lower] stages of the discourse of the digital-maker. The FDM are in the experimentation [higher], logical instruction and creative expertise stages of the spectrum; due to their greater maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992). FDM can choose to study a DMC or non-DMC course, hence are divided into the DMC-FDM and non-DMC-FDM. The DMC-FDM there can be sub-divided into the categories of home and classroom; depending on their preference of setting within the third space. The classroom-DMC-FDM further subdivide into two sub-groups: the Emulators and the academics depending on their motivation for the construction of digital public entities in the home-setting. In this topology of identity, the home, Emulator, and academics are the lowest classifications of FDM on their respective branches. All DMC-FDM adopt one of these identities. Based on the cultural models and reflexivity (Gee, 1999) of the focus-group interviews; the DMC-FDM were identified as follows:

Table 3: List of DMC-FDM identities

Home	Emulator	Academic
Susie – art and design	Vaughan – art and design	Basil – ITU
Seydou – ITU	Jason – ITU	Nicola – art and design
Ian – ITU	Tevin – ITU	Archie – multimedia
		Boris – multimedia
		Ken – multimedia
		Bruno – multimedia
		Carly – multimedia
		Blake – multimedia

For the sake of clarity, these categories are not absolute. There are some DMC-FDM that slightly overlap into another category. However, each DMC-FDM has been placed into the category that principally aligns with the predominant characteristics, visible in the construction of their FDM identity. The home, Emulator and academic DMC-FDM identities should not be viewed monolithically. There are subtle variations of identities even within each category. These variations are indicative of differing perspectives regarding creativity, progressive problem solving (Bereiter and Scardamalia, 1993), self-expression and the acquisition of expertise. These variations also indicate the current positions of the DMC-FDM within the discourse of the digital-maker, and the projected arcs of anticipated learning trajectories. Evidence of these variations is observable in the cultural models and reflexivity (Gee, 1999) in the language of the DMC-FDM. In the remainder of this section, I will discuss the variations of each DMC-FDM.

7.3.1.1 Susie: the creative expert, home-DMC-FDM

For the sake of convenience, I will refer to Susie as a creative expert. I am not suggesting that she has become an expert in digital creative production; but rather that her FDM identity locates her in the creative expertise stage of the discourse. In section 4.1.2 I discussed the argument of Bereiter and Scardamalia (1993) that creative expertise can only be achieved through progressive problem solving - the setting and achievement of increasingly complex creative goals. When faced with a creative problem Susie's initial instinct compels her to experiment in finding a solution. Susie frequently mentions statements of the following kind: "I will experiment". "I'll figure it out myself". "I'll keep trying until I find something that works". "play with the image, "until I can figure out how to do it". Indeed, most Susie's responses contained several models-in-(interaction) such as the above

statements which, Susie consciously uses to solve creative problems. This approach to experimentation is the same as that of the expert-like learners of the Bereiter and Scardamalia (1993) study of expertise, mentioned in section 4.1.5. Susie regularly sets complex creative goals that cannot be achieved using her existing knowledge, in such instances, DMC-FDM will seek instruction from MKO (Vygotsky, 1930-1934/1978). Even so, Susie recognises that in most of her digital-making the experiences of MKO are unavailable. "If someone's around that I can ask who will know, then I'll ask. But that's not usually the case...". "Half the time they never answer me, so it's a last resort." Both statements are examples of evaluative and espoused models (Gee, 1999) that simultaneously display Susie's compulsion to solve creative problems; and her realisation that experimentation is usually her only recourse.

Unlike, many other DMC-FDM Susie enjoys experimentation, she does not view it as laborious. The Emulator and the academic-DMC-FDM would simply wait for support from tutors or seek an alternative MKO such as a video tutorial. The home-DMC-FDM prefers to experiment before seeking MKO support, therefore their FDM identities are so distinctive. Notwithstanding, when Susie does seek MKO support she prefers to directly ask the creators of digital public entities. For example, "I once actually went on Adobe and e-mailed them and asked them. I jumped through so many hoops to do it...". "If I could get advice from my favourite illustrators, that would be the best thing. But I don't even think half the time they're actually on-." I suggest that both statements reveal an espoused model (Gee, 1999) that recognises creators as the most authoritative sources of expertise. Hence, she tends to disregard much of her social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors, because they are not creators of digital public entities. Consequently, Susie has an even greater reliance on experimentation. Susie exhibits more engagement in experimentation than all other FDM in this study. Susie is in the practice of keeping multiple blogs which she uses exclusively for experimentation. She runs two blogs one displaying personal experiments with digital public entities unconnected to her course, the other showing her DMC coursework. The former blog displays the best of Susie's experiments and digital public entities. The latter changes state between assignments. Susie uses the blog for general experiments, but during an assignment, the experiments become focused on specific topics. In the below statement all three types of cultural model espoused, evaluative and model-in-(inter)action (Gee, 1999) are present. These statements encapsulate her FDM identity and underpin how she makes choices within the DMC.

I pretty much put on everything, every little experiment I've been doing, I've been putting up on there, every little tweak. And if I slightly change it, I'll put it there, if I like. With my personal stuff, it's slightly different, I'll only put the good stuff or what I think is good stuff. I won't put loads of versions of the same thing, I'll put the best one and then if I change it drastically, I'll put that one on. But just sort of-.

(Susie, BTEC L3 art and design)

For me, it's more like I just experiment and if it doesn't work-. I will save loads of multiple copies and I will always go back if I made a mistake, so I'll always have back-ups. I save it at each stage and I will make jpeg's, so I've got something I can post as well, like 'oh, I made this mistake'. So even if I make a mistake, it's not like it's a massive deal for me. But I'll experiment with it, and if that doesn't work, I'll start again and try something else, until I do find something.

(Susie, BTEC L3 art and design)

Susie is carefully cultivating her FDM identity because this is how she learns. Throughout this thesis, I have argued that learning within the DMC is the construction of identity. Susie is an example of this argument. Consequently, Susie has developed an online following ranging from fans to aspiring juvenile digital artists and even a professional graphics company. Her following serves the construction of her FDM identity by providing social interaction consisting of feedback and instruction. Still, Susie never intended to gather a following and is simply experimenting to please herself, for Susie the blogs are a means of learning. I suggest the blogs are literally digital examples of the model-in-(inter)action, cultural model (Gee, 1999). Susie is unconcerned about who views her work yet, she is concerned about social interaction with her following. Susie is displeased with platitudes such as “nice work” or “good job”, instead she prefers specific advice which she then uses in further progressive problem solving (Bereiter and Scardamalia, 1993). Susie replicates this model-in-(inter)action in her social interaction with tutors in the classroom-setting, adhering only to instruction that is useful for the development of her FDM identity. Due to her experimentation, Susie has amassed an understanding of digital and media literacies well beyond that of her peers. She is perceived as an MKO by her following. Susie regularly gives advice and instruction to members of her following. Once again, this was not her intention, I suggest that acting as an MKO also aids the development of her identity. For Susie giving advice is fun, she is not seeking the social goods of power and status (Gee, 1991) that arise from such interaction; yet this is what she has achieved, evidenced by her advanced position in the discourse of the digital-maker. Susie is also recognised as MKO by other members of her household, as is the case with the majority of DMC-FDM. Yet, Susie's recognition goes beyond that of general assistance with use of digital technologies. She taught her

father how to use Adobe Illustrator and he taught her how to use Adobe Photoshop; coincidentally Susie's sister may also be an FDM. In the home-setting Susie is immersed in social interaction with her online following and her family, she is routinely engaged in specific and structured digital-making.

The question here is why is Susie the only DMC-FDM at the creative expertise stage? To understand this examination of her early digital-making experiences in the home-setting is required. When recalling her early experiences of digital-making, the political and social aspects of reflexivity (Gee, 1999) in Susie's speech renders the following reality. Susie participated in digital-making from a very young age. Her parents concerned about the Internet and its lack of child protection placed strict boundaries on its use at home. Susie only used the Internet at school under the supervision of her tutors. At home, Susie was encouraged to play educational games and other programs. I suggest that the actions of her parents and tutors created political and social boundaries; which, wittingly or unwittingly created an environment in which Susie was free to play. It is important to note that Susie does not mention receiving any specific guidance on how to use the internet from her parents or teachers. Instead of being told what to do, Susie was told where the boundaries were, leaving her free to play, explore and experiment in all the areas between. In the home-setting, play was an important part of her understanding of digital-making. In section 4.1.1 I agreed with the Vygotskian argument that play leads to expertise in creative production. I also argued that it is possible for FDM to accelerate the maturity of their imagination and creativity before entering adulthood. I suggest that Susie is an example of such an FDM.

However, all DMC-FDM reported varying degrees of play in their formative digital-making experiences and yet Susie remains the only identified creative expert. I suggest that of all the stages within the discourse of the digital-maker, logical instruction is the only one in which play or experimentation is not the first course of action. This is due to the instructions received from social interaction with MKO. At the logical instruction stage, the Emulator and academic-DMC-FDM are somewhat content, to reduce their reliance on play and exploration in favour of instruction. In contrast, the home-DMC-FDM retains their reliance on play and experimentation as it is how their FDM identities are constructed. This retention is particularly resolute if the home-DMC-FDM frequently engages in progressive problem solving (Bereiter and Scardamalia, 1993) and experimentation in the home-setting. Progressive problem-solving in the home-setting performs a similar function to the tutor

in the classroom-setting; both accelerate the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992). In the classroom-setting, tutors provide efficient ready-made digital and media literacies that much DMC-FDM find appealing. In the home-setting, these literacies must be gathered by the development of identity. This is more time-consuming, less appealing and requires prolonged engagement in progressive problem solving and experimentation. In this study, Susie is the only DMC-FDM that has done this since her early digital-making experiences. Susie has progressed through the discourse at a much faster pace than other DMC-FDM, hence her status as the only creative expert.

7.3.1.2 Ian: the technical modifier, home-DMC-FDM

Ian is currently in an advanced position at the logical instruction stage of the discourse of the digital-maker. He possesses the most knowledge of all the ITU learners and is the closest to becoming a creative expert. Like Susie Ian frequently engages in progressive problem solving (Bereiter and Scardamalia, 1993) and experimentation; nonetheless, both do so for differing reasons, this is where their FDM identities begin to diverge. Susie's engagement is driven by her playfulness, she plays until she discovers a creative problem and then experiments to find a solution. In contrast, Ian's engagement is driven by his inquisitiveness, he deliberately seeks creative problems and then seeks a conventional solution. It is for this reason that I describe Ian as a technical modifier. This kind of home-DMC-FDM enjoys producing the same digital public entities as other FDM, but also has an advanced knowledge of the software programming tools used in creative production. The technical modifier uses this knowledge to modify software tools to enhance the quality and efficiency of production and advance his/her own knowledge. The technical modifier is driven by inquisitiveness and the accumulation of knowledge.

Ian's speech is strewn with cultural models that reveal his technical modifier FDM identity. For example, from the outset of his formative digital-making experiences in the home-setting; Ian developed a broad understanding of the multiple applications of computers. Ian was drawn to computers due to his inquisitiveness just as Susie was drawn to digital arts due to her playfulness. Evidence of Ian's inquisitiveness is observable in the following espoused model (Gee, 1999):

For me, when I first learned about computers, I understood that you can do a lot of things with them. And although At first, they were used only for businesses and business purposes, and then the home computers came out and you could basically do anything you wanted with them, at home. So I just started learning from there, because my fascination started with anything that's complicated any device that's complicated. I've always liked electronics, and when I saw computers and how complex they can be, that's what pulled my interest.
(Ian, BTEC L3 information technology users)

Like Susie, Ian also developed a perception of computers as a platform; in this instance, one for the general production of digital public entities. In response to a question regarding his initial perception of the purpose of computers during his early digital-making experiences, Ian simply replied "studies." The definition of a purpose for digital-making within their early experiences is a trait of the home-DMC-FDM. The purpose essentially marks the start of the learning trajectory that the DMC-FDM will take forwards into formal education. The choices made by Ian in the classroom-setting; reflect those that he makes in the home-setting. For instance, when participating in digital-making in the home-setting Ian is mainly concerned with the enhancement of efficiency. Unlike the creative expert, for the technical modifier, progressive problem solving and experimentation are not inherently enjoyable activities. Both are simply a necessary means of restoring the efficiency of production:

When using the software, a lot of times, if I'm stuck, I can't find the tools I want to use or what buttons to click and stuff like that, then I just say I'm not used to it, so I just need to learn how to use it. I wouldn't blame that as an error or anything. The only time I am disappointed a bit with usage, basically, is with Windows 8. Because the way that they've changed everything It's not that the layout is not nice, but it's that crucial parts that you need are hidden, so you have to mess around to find them. If you want to exit an application, if you don't know how to use a keyboard and press escape, you have to search around and you might not even find it. And then when you want to get to the menu You have to move to a certain point to find the menu and it's not really practical if you want to do things fast.
(Ian, BTEC L3 information technology users)

The above statement is a model-in-inter(action) and an evaluative model (Gee, 1999), that characterises Ian's attitude towards digital-making. This is the reasoning that Ian employs in the classroom setting. Ian dislikes learning at the pace of others slower or less technical than himself: "The only disadvantage is we have to keep in the same pace all together, so if there are learners who learn slower than you, you have to have the same pace, so they slow you down." "I mean, I would if especially if I could go into university faster a few years..." "I would like more technical stuff, but a lot of people find it hard." "All of us have done more advanced research and learned a lot more than what the course can provide us, so we've gone further." Again, the combined model-in-inter(action) and

evaluative models emanate from Ian's digital-making in the home-setting; just as Susie, Ian also replicates his FDM identity in the classroom setting.

The socio-cultural aspects of reflexivity (Gee, 1999) within Ian's speech give rise to the following analogy of the technical modifier. If asked to review the performance of a supercar the technical modifier would discuss its horsepower, torque, and acceleration; as opposed to the feel or experience of driving. In this regard, the technical modifier acts as a mechanic frequently adjusting enhance performance. When faced with a creative problem, the technical modifier experiments just as the creative expert. Nevertheless, if experimentation does not result in an efficient solution the technical modifier will abandon experimentation and then seek an existing conventional solution from MKO (Vygotsky, 1930-1934/1978). All the same, if no suitable solution is found the technical modifier will return to experimentation. The technical modifier resembles the creative expert, but due to their drive for efficiency, the technical modifier does not engage in prolonged experimentation, unless no other option is available. Ian demonstrates this behaviour in the following model-in-inter(action) (Gee, 1999):

I think he's right. First step, you try to resolve it the way you understand it. If you see that you're stuck and you can't figure out a solution then, you just have to search online...If it's something simple, you might figure it out and just do it, but if it's something you've never used before, it's a bit complicated or whatever, other people might have already solved it, so you just search to see.
(Ian, BTEC L3 information technology users)

I don't really do it often, but I think we should be doing it, to help other people with the same problem. In the same way, I wouldn't like to find a problem and nobody knows the answer. It would be unfair for other people to have the same issue and not be able to solve it. So if you found a solution, it's best to share it.
(Ian, BTEC L3 information technology users)

This model-in-inter(action) in the upper statement also guides Ian's social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors. Like Susie, Ian will only engage in social interaction with tutors after experimentation. Ian only accepts the digital and media literacies that align with his FDM identity just as Susie. In the lower statement, Ian is referring to experimentation, it is not his preferred method of solving problems. However, due to his dislike of problems, Ian will engage in experimentation for his sake and others. Ian's learning trajectory may likely progress towards creative expertise. Even so, this will not happen until Ian is faced with a creative problem that requires the creation of a new solution. To achieve this Ian will need to frequently participate in prolonged experimentation, Ian is not yet at this stage.

7.3.1.3 Seydou: the narcissistic and technical modifier, home-DMC-FDM

Seydou is very like Ian both are technical modifiers, both participate in progressive problem solving (Bereiter and Scardamalia, 1993), and both are at the logical instruction stage of the discourse. Notwithstanding, Seydou is in a less advanced position due to a lesser willingness to participate in experimentation and a disdain for others that he views as less knowledgeable. Seydou is a DMC-FDM with a dual identity, on one hand, he is more willing to seek instruction from MKO (Vygotsky, 1930-1934/1978) in comparison to Ian. On the other hand, Seydou disdains others that cannot find their own solutions to creative problems. Regarding the discourse of the digital-maker, I suggest that the duality of Seydou's identity is significant because it indicates that it is possible for DMC-FDM to exhibit traits of two or more FDM identities. While both aspects of Seydou's FDM identity may appear contradictory, I suggest that both aspects are indicative of a narcissistic attitude obtained from digital-making. I define narcissism as, a strong focus on receiving the social goods of power and status (Gee, 1999) that accompany the development of an FDM identity; resulting in an overestimation of one's digital and media literacies. The home-DMC-FDM is prone to narcissism due to their 'self' constructed FDM identities. Susie and Ian also had some narcissistic attitudes and this is most clearly seen in their attitude towards social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors. Still, in Seydou's speech, narcissism is far more prevalent and extends to his social interaction with peers. Throughout the interview, cultural models within Seydou's language assert his self-perceived status as the expert among his peers. Through a mixture of espoused and evaluative models (Gee, 1999), Seydou either projects his views and experiences onto others; or ridicules those of lesser knowledge, thereby placing himself as the expert above his peers.

No, when we was young, I believe when we were young we didn't really look at as a form of we didn't really look at everything, the whole perspective of the technology. Yeah, we just looked at one thing, one fact, we only looked at entertainment reasons. We only looked at you know oh How are we going to play games how are we going to have fun? But as time progressed and as we developed, then you know you see new you start learning developing yourself and then you start learning these new things like education, and you know research, etc.
(Seydou, BTEC L3 information technology users)

In the espoused model (Gee, 1999) above, Seydou was responding to a question regarding what he perceived as the purpose of computers during his early experiences of digital technologies.

By using the word 'we' Seydou promotes himself to the role of spokesperson for the ITU DMC-FDM. At no point, does he seek any consensus with his peers. This is due to the narcissism of his FDM identity which lacks empathy. When asked how he would solve a creative problem, Seydou insists that his initiative can be used to find a solution. But, then resorts to absurdity to describe the approaches of others that do not use their initiative. He offers the following analogy of an elderly woman trying to solve a creative problem:

So, sometimes, for example, you make an error in your work and you don't know how to come out, us technical guys usually just undo and we solve the error for the moment. So I think it depends on your implementation and how the error affects you. Other people would solve it differently. An old lady that doesn't know anything about technology will start bashing buttons and stuff, -... or call the police or something they're going to think that she's gone mad. I think it's about perspective initiative
(Seydou, BTEC L3 information technology users)

The lack of empathy is clear in his stereotypical choice of an 'old lady' as someone that cannot use initiative to solve a digital problem. The suggestion that she would call the police is his estimation of how poor her knowledge of digital and media literacies is in comparison to his own. In social interaction with others, Seydou only accepts instructions or comments that further the power and status of his FDM identity. Consequently, Seydou is more reliant on social interaction for the development of his FDM identity. Seydou needs social interaction to receive the power and status of creative expertise: "We usually When we do something really nice and we think it's really nice, we share it with every- the world really." "I think It's just a sense of accomplishment like you feel better when you do something and you want to show it to people-". "Yes, you need critics. You need them yeah you need them." These statements are Seydou's responses to being asked if he displays the digital public entities of his architectural CAD hobby online. In all these combined evaluative models and models-in-inter(action) Seydou only considers his sense of accomplishment. In comparison to Susie, Seydou is simply seeking praise for his achievements, he is not looking for specific advice on how to improve. The social goods (Gee, 1999) of digital-making fuels the narcissistic elements of Seydou's FDM identity. Yet, the socio-political reflexivity (Gee, 1999) of Seydou's language implies that when faced with a creative problem beyond his knowledge; Seydou displays a reluctance to engage in progressive problem solving and experimentation. Instead, he resorts to instruction from MKO:

So no one else suffers the same problem. That's the only way we're really going to learn from our mistakes, aren't we? and from our errors. If someone has an error and he solved it, if he presents it to the world through YouTube and all these commerce websites, then I'm going to find a solution to my problem as well when I experience it. And then, when I experience a problem, then I can share it once I've solved it. So I think it's a chain reaction.
(Seydou, BTEC L3 information technology users)

The above model-in-(inter)action and espoused model (Gee, 1999) is the basis by which Seydou makes decisions within the DMC. Seydou's knowledge of digital and media literacies derives from his construction of digital public entities; which he enjoys displaying to his online following. Due to the praise received from these social interactions, Seydou believes that his knowledge is more than sufficient and avoids experimentation. When faced with a creative problem Seydou soon realises that his knowledge is insufficient and seeks instruction from MKO and it damages his self-perception of his expertise. Like Ian experimentation is not enjoyable. Upon receiving a solution Seydou then shares it with his following to receive further praise and repair the damage. Seydou appropriates the achievements of MKO as his own, and this is due to the unwillingness to engage in experimentation. When in the classroom-setting Seydou replicates the same cycle of seeking instruction and appropriation. This is how he makes choices within the DMC. The choices made by the home-DMC-FDM within the DMC are guided by their construction of identity in the home-setting. When in the classroom setting, the home-DMC-FDM do not vary from this means of learning. The home-DMC-FDM learns through experimentation in addition to social interaction and this is what separates them from the Emulator and academic-DMC-FDM.

7.3.1.4 The non-DMC-FDM (the leisurely and pseudo-professionals)

The home-DMC-FDM share many similarities with the non-DMC-FDM. Both subscribe to the learning as personal achievement model. Both construct their identities in the home-setting. All non-DMC-FDM are more accurately described as the home-non-DMC-FDM. Yet, to avoid confusion with the home-DMC-FDM, I will continue referring to this group as the non-DMC-FDM. Indeed, the key difference between both groups is the refusal of the non-DMC-FDM to participate in DMC courses. The non-DMC-FDM do not view social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors on DMC courses, as pertinent to the extension and legitimisation of their existing digital and media literacies and FDM identities. One should not assume that the non-DMC-FDM do not seek

future employment as creative professionals. On the contrary, all the non-DMC-FDM included in the focus-groups were actively seeking future careers in which the applications of digital-making are extensive. The differences among the non-DMC-FDM, concern the perceived utility of digital-making in accelerating the access to future chosen careers. Among the non-DMC-FDM, there are two variations of FDM identity: the leisurely and the pseudo-professional.

Table 4: List of non-DMC-FDM identities

Leisurely	Pseudo-professional
Ron – A-levels	Ramona – A-levels
Zack – A-levels	Doris – sports
	Keisha – sports
	Duke – sports

For the leisurely non-DMC-FDM, digital-making is perceived as a useful skill for their future chosen career, but one that will not accelerate their access to it. At this stage in their studies, digital-making is perceived as a hobby to be conducted in the home-setting.

Yes, it is. It's to help you do stuff. I do the creative part on the computer as a hobby, but that's not what I'm going into per se... Because I'm passionate about engineering, so I want to go into engineering. My creative side is purely hobby... When I was doing my little hobby, I wanted to make little 'next' buttons. So to do that, I had to learn basic HTML coding to make little 'next' buttons, so when you click it, you get to the next page of whatever I'm doing... For me, it's more of a hobby. It could get to that level, I don't know, but it's just a hobby at the moment... It's really different. When I was learning from websites, that was for my hobby, not for what I want to go into as a profession.
(Ron, A-level: sociology, physics and mathematics)

All the espoused above models (Gee, 1999) were mentioned by Ron, he is unequivocal in his perception of digital-making as a hobby due to its current lack of utility for his desired career in engineering. It is important to note that Ron does not disdain digital-making. He finds it enjoyable and even engages in progressive problem solving (Bereiter and Scardamalia, 1993) as indicated by his learning of basic HTML. Later, in the interview, Ron states:

Later on, when I go into university, I'm going to need to learn the CAD software for designing programs and things. Then, I'm going to need to improve my knowledge on computers for that software, but at this stage, I don't think I need to improve it, for the subjects I'm doing.
(Ron, A-level: sociology, physics and mathematics)

This evaluative model (Gee, 1999) appears to contradict the earlier espoused models. However, I suggest that no contradiction has occurred, indeed this evaluative model is consistent with

the bifurcated perception of the third space and its settings of the home and the classroom, that I mentioned in section 7.2:

I guess you could think of it, I do all my thinking, at college, for example, my mental thinking at college (Ramona agrees) and at home, I could relax and have a getaway by doing by relaxing on the computer and doing digital art.
(Ron, A-level: sociology, physics and mathematics)

For Ron, the home-setting is for leisure and recreation, digital-making is viewed as a hobby. Here, digital-making provides relief from the stressful activities of A-level study. In the home-setting, Ron is content to develop his FDM identity without social interaction with DMC tutors; believing that his knowledge of digital and media literacies is sufficient for his current construction of digital public entities. This is because Ron's digital-making in the home-setting is unconnected to the activities of his A-levels, hence his apparent blasé attitude. In contrast, digital-making in the classroom-setting is directly related to his future career aspirations hence, the above evaluative model. Zack is of a similar mind to Ron, nonetheless, he displays much less passion for digital-making. Zack is firm in the opinion that digital-making is not worthy of academic study and as such is a hobby. Unlike Ron, he does not recognise the utility of digital and media literacies for his desired career in engineering. I suggest that Zack's lack of perception is due to a lesser engagement in progressive problem solving, for example: "I normally solve it I just turn it off and on again and it works. I don't know if that counts." I suggest that based on their engagement in progressive problem-solving Ron and Zack will develop into different FDM identities upon encountering digital-making in the classroom setting. Ron may likely develop in a similar fashion to Ian and Seydou; the same cannot be said of Zack. It is most likely that he will develop in a similar fashion to the classroom or academic-DMC-FDM; whom I shall discuss in-depth from section 7.3.1.4 to section 7.1.3.9 of this chapter.

The pseudo-professional non-DMC-FDM [pseudo-professionals], possess an advanced understanding of digital and media literacies; obtained from social interaction with MKO in the creative industries. In some instances, social interaction with creative professionals also involves collaboration in the production of digital public entities. Consequently, the pseudo-professionals, produce digital public entities at professional or near-professional standards and some are hired by clients for their expertise. The pseudo-professionals perceive the immediate utility of digital-making in providing access to desired careers. This is the case, with Ramona who produces digital artwork on

commission. Doris, Keisha, and Duke all produce electronic music with and for professional recording artists and labels. The pseudo-professionals are frequently engaged in progressive problem solving. For example, in both models-in-inter(action) below Ramona, Doris and Keisha solve problems in a similar fashion to the home-DMC-FDM, choosing a conflation of experimentation and instruction from social interaction:

I usually go on forums to see how people solved things like that. Yes, because it's more personal. If someone had the same problem as you and then you see all these responses, how people said to solve it and then you try each one if they didn't work... I don't know if this counts, but I have a Tumblr blog, so when I'm trying to find a new theme and then I put one in and I click save and the layout doesn't work, it's not right, it's not how I want it, then I would have to go and find other HTML things, codes, and then I would put them back in... If I have a problem, sometimes I would e-mail them or something and they would e-mail me back a solution.
(Ramona, A-level: sociology, law and English literature)

When I first got the software, when I was about 15, I just I didn't know how to, I know I can play everything but I didn't know how to use it. So I just went on YouTube, typed that 'how do you do this?' 'how do you set up?' a person told me how to do it. I have a problem with just typing Google 'how do you do this?'. Because YouTube shows you how to do it. Google tells you what to do-... And if I really couldn't find it I'd play around until I can get it-... Yes, until you realise how to get it... For me, I'd only feel the problem with programs (inaudible - 00:13:11), so I'd probably just go there first. Because there's people that have done it before-... But usually, I like to find out by myself-
(Doris and Keisha, BTEC L3 sports)

In the last statement of the upper model-in-inter(action) (Gee, 1999) Ramona's use of the word 'them' refers to professional artists. Ramona has access to social interaction with MKO employed in the creative industries. Likewise, Doris, Keisha and Duke also have access to creative professionals ready to provide solutions to creative problems. Herein, resides the difference between Susie and the pseudo-professionals. In section 7.3.1.1, Susie lamented her lack of social interaction with creative professionals. This was the type of MKO from which Susie was eager to receive scaffolding (Vygotsky, 1930-1934/1978; Bruner, 1985; Hammond and Gibbons, 2005) in the form of instruction and feedback, yet she was frustrated by a lack of access and resorted to experimentation to solve creative problems. Furthermore, I suggest that part of her decision to join a DMC course was driven by the desire to engage in social interaction with MKO, in this instance DMC tutors. In comparison, the pseudo-professionals have access to creative professionals and do not feel the need to engage in experimentation with the depth of Susie. The pseudo-professionals can operate at a professional or near level much more rapidly than Susie; and so, do not view participation in a DMC course as necessary for the development of their FDM identities. On the occasions when social

interaction with MKO is unavailable, Ramona, Doris, Keisha, and Duke seek instruction from tutorial websites instead:

And I'll just watch a tutorial, how to play then I would get it in like two minutes. Whereas I had a piano teacher, that took me like a couple of months to learn ???-... Yes, I had a vocal teacher as well and it was never helpful... It didn't work out but when I did it myself I got it in about two minutes... Because they're not exactly there to say 'no you did this wrong', you learn it from yourself-... you learn it by yourself yeah
(Doris, Keisha, and Duke, BTEC L3 sports)

In the above model-in-inter(action) Doris and Keisha indicate their frustration with the type of social interaction associated with formal tuition. Instruction and feedback are judged slow and negative and unhelpful. This element of frustration with tutorial social interaction was also present in the home-DMC-FDM. Susie, Ian and Seydou all complained of similar experiences; Susie questioned the extent of her tutors' knowledge in the upper evaluative model below. Ian resented learning at the slower pace of his peers in section, 7.3.1.2 and Seydou deems himself as his best tutor in the lower evaluative model below.

I don't think they get illustration. When they say illustration, do they mean drawing? When I went to the universities, they were really impressed with the way that I use lots of different media. If I feel like something needs to be 3D, I'll do it, if I can figure out how to do it in 3D, I'll do it in 3D. If I think something needs to be a certain way, I'll do it that way. I think they don't really get that's still-, as long as it's not what it turns out as, it's just, it's illustration because of why I'm doing, not what it is. But yes, the universities got that more and were actually saying if you want to do a 3D model, it's still illustration, as long as you're illustrating, and stuff like that.
(Susie, BTEC L3 art and design)

I think if I had it all on one website-. If we look in a wide respect, if I didn't need a diploma to get into uni or to get a job, if I didn't need it- I probably wouldn't be here. Because I like teaching myself, I think we are the best teachers of ourselves, so I think if I was at home I would do more I would learn more because I know my level of understanding, I'll learn more, read more. But we need a diploma, so we're here.
(Seydou, BTEC L3 information technology users)

The pseudo-professionals and the home-DMC-FDM are both frustrated with the misalignment between their FDM identities and social interaction with tutors. The home-DMC-FDM are willing to endure such frustration; to obtain formal qualifications, through which their FDM identities gain legitimisation. The pseudo-professionals are not content to make the same choice and prefer the immediacy of social interaction with creative professionals. The pseudo-professionals view their experiences of producing digital public entities as the legitimisation of their FDM identities. In terms of their position in the discourse of the digital-maker; the pseudo-professionals are at the logical instruction stage and will most likely become experienced non-experts. All the same, with greater

engagement in progressive problem solving all of the pseudo-professionals, have the potential to become creative experts.

7.3.1.5 Vaughan: the exclusionary, Emulator-DMC-FDM

Vaughan is an Emulator at the logical instruction stage of the discourse. Emulators are one of the two categories of classroom-DMC-FDM. One of the main differences between the home and Emulators are their preferred models of learning. The home-DMC-FDM subscribe to learning as personal achievement. The Emulators subscribe to learning as imitation of MKO (Vygotsky, 1930-1934/1978), usually, tutors or creative professionals with experience of an appealing future career, such is the case with Vaughan.

It is important to state that the Emulators are almost as engaged in progressive problem solving (Bereiter and Scardamalia, 1993) as the home-DMC-FDM. However, due to the differences between the models of learning, both employ different approaches when faced with creative problems. The home-DMC-FDM choose to experiment with creating solutions before seeking social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with MKO. The Emulators choose social interaction with MKO before implementing an existing solution; hence, their preference for learning by imitation. The Emulators tend to think of themselves as members of the groups to which MKO belong. For instance, Vaughan's speech contains several espoused and evaluative models (Gee, 1999) in which he calls himself a graphic designer:

I use it for my future career, really, because I want to do graphic design, I'm going to Central St Martins for graphics... I think with what I do, with what I'm going to do, graphic design, you have to be like that... I can show the graphic designers my work and they will really, really like it, because they know what they're looking for... I'm a graphic designer, so I'll go to Hannah and Louisa, when I get graded by them, they give me the better grades, because they know what to look for... Because I think me and James are the people who use the most Illustrator, on the computer, the only people who do proper graphic design... Because if I had told them to someone who is really good on Illustrator but they were an illustrator, not a graphic designer, there would sort of be a barrier between us, of what they think is good work and what another person thinks is good work.
(Vaughan, BTEC L3 art and design)

For the Emulators to engage in digital-making especially in the home-setting, one must possess a strong sense of identity-based on a future career goal. This self-perceived identity then becomes the primary criteria in the selection of which MKO to engage in social interaction. In short,

Vaughan only engages in social interaction with MKO that resemble himself. Those that do not meet his strict criteria are shunned, as indicated by the word 'barrier' in the above model-in-interaction (Gee, 1999). The metaphoric barrier is a two-phase filter that Vaughan employs specifically for the development of his self-perceived graphic designer identity. In the first phase, MKO must resemble Vaughan and possess great knowledge of 'proper' graphic design; as indicated by the favouring of Hannah, Louisa, and James in the above model-in-inter(action). Even Susie, the only creative expert in this study is not favoured by Vaughan because she does not resemble him. In the statement below, the first mention of 'Illustrator' refers to the Adobe creative software program. The second mention refers to hand-drawn illustration skills. The word 'you' is a reference to Susie, it is an evaluative model (Gee, 1999) in which Vaughan views her as lesser in ability compared to himself. This is despite Susie frequently displaying her considerable knowledge of Illustrator throughout the interview.

I think it's the same people. If the tutor, Hannah, if it's feedback, I normally go to Hannah and Louisa. If I don't have any tutors, I go to James. Because I think me and James are the people who use the most Illustrator, on the computer, the only people who do proper graphic design. You do more Illustrator work.
(Vaughan, BTEC L3 art and design)

In the second phase, of the filter Vaughan, engages in social interaction with MKO. His aim is the obtainment of strategies to employ when engaged in progressive problem-solving. In these social interactions, Vaughan does not ask about the experiences of MKO but rather seeks specific instruction and feedback about the improvement of his own digital and media literacies. By doing this Vaughan only accepts instruction and feedback that align with his self-perceived graphic design identity. This is vital because Vaughan does not engage in experimentation in the same fashion as the home-DMC-FDM. This is viewed in the upper espoused model and model-in-inter(action) of the statements below. In the lower espoused model and model-in-inter(action) Vaughan describes his approach towards progressive problem solving:

I do. I know artists and I know people who sort of like leaving and in (inaudible - 00:29:20) and Saint Martin's and who sort of become are becoming big (inaudible - 00:29:23) and I've been talking to the tutors at Saint Martin's and stuff and they have loads of connections. I've discussed sort of technical stuff. I've discussed more about ideas rather than actual technical programs, honestly. More of my work, my ideas, my processes rather than what program I'm going to do it on or how can I do it? The program is not really into it, I just sort of discuss my work, get feedback and do the work in Illustrator or Photoshop.
(Vaughan, BTEC L3 art and design)

Mine is more in terms of specific. They could say it's nice, but I'll say 'so what do you like about this image, do you like the colours, the lines, the shapes, the placement?'. I think with what I do, with what I'm going to do, graphic design, you have to be like that. If you have a client, you have to be specific, you have to try loads of designs and processes and ideas, you have to think about what you're going to do. And I've sort of talked to a lot of professionals, I don't really talk to young people, I don't see the point in that for me. Not being rude, I just don't think it's going to help me achieve my highest goals. So I'll talk to a professional who's actually been there, done that (Vaughan, BTEC L3 art and design)

By saying “you have to try loads of designs, processes and ideas” Vaughan implies that he experiments to discover an appropriate process to meet the specific needs of the client. Even so, this form of experimentation is not the creation of a new solution employed by the expert-like learners of the Bereiter and Scardamalia (1993) study of expertise. It is the approach of the typical learners who used procedural routines and patterns of best fit to reduce creative problems; so, that their solution was the best satisfactory fit between their existing competence and the demands of the challenge (Bereiter and Scardamalia, 1993). Vaughan’s experimentation is simply deciding which procedural approach to use for a creative problem. Vaughan’s knowledge of which procedures to use is derived from his social interaction with MKO. By asking how to improve his work Vaughan gains new knowledge of how to apply procedural approaches to overcome creative problems which he has previously encountered. Vaughan retains some control regarding the direction and pace of his FDM identity. Vaughan is averse to the experimentation favoured by Susie. The political reflexivity (Gee, 1999) in his language reveals that when MKO are unavailable Vaughan will try experimentation, but he considers it to be cheating and would rather wait for tutorial support:

Yes, I do do that a lot, actually. If I want to make an image a certain way and if I can't go this way, I try and take another route around it, it's sort of like cheating, in a way, but if it works, it works. And if that doesn't work, I sort of leave it alone for a while and wait until the next day and talk to the tutor about it. So that's what I normally do. (Vaughan, BTEC L3 art and design)

The above model and model-in-inter(action) is the basis by which Vaughan participates in digital-making in the home-setting and makes choices within the DMC when in the classroom setting. Vaughan views experimentation as cheating because it is not obtained through his social interaction with MKO. For Vaughan, expertise is in the collection of procedural approaches; the more processes he acquires, the greater his ability to solve creative problems. Additionally, through social interaction, Vaughan reinforces his self-perceived graphic designer identity; by equating his knowledge with that

of select MKO. Vaughan then uses his digital public entities to gain access and membership to select MKO graphic design environments, which also reinforces his self-perceived identity. The following evaluative model and model-in-inter(action) illustrates Vaughan seeking entry into select MKO environments: “I do it for everyone to see, but I focus it more on industry based people.” “Everyone can look, but I normally have links, hashtags.” “Share it on specific art websites or group websites, so they can see my work”. The reinforcement of his self-perceived identity is also visible in statements such as “I’m going to Central St Martins for graphics”. “I’ve been talking to the tutors at Saint Martin’s and stuff and they have loads of connections”; and his earlier use of the word ‘client’.

Vaughan is an experienced non-expert (Bereiter and Scardamalia, 1993). The extent of Vaughan’s digital-making in the home-setting is highly dependent on his social interaction with MKO. Without such interaction, he cannot engage in progressive problem solving, nor construct digital public entities and Vaughan is acutely aware of his dependency on MKO. Vaughan’s anticipated learning trajectory is that of the experienced non-expert (Bereiter and Scardamalia, 1993). Whether Vaughan will achieve his goal of becoming a graphic design professional is also highly dependent on his access to MKO environments.

7.3.1.6 Jason & Tevin: the transitional, Emulator-DMC-FDM

In the previous section, I mentioned that Emulators must possess a strong sense of identity-based on a future career goal. Notwithstanding, I suggest for the Emulators, a strong sense of identity does not emerge until enrolled on a DMC course. Furthermore, DMC courses also aid Emulators in the discovery of specific career goals. Prior to joining their DMC courses Vaughan, Jason and Tevin only possessed a general notion of their intended career aspirations. Vaughan only identified himself as a graphic designer shortly after joining his current DMC course; hence his fervent emulation of graphic design professionals.

I chose to do art and design because I just sort of really liked fine arts, at first, and I’ve always loved art and stuff, but I’ve never even did digital arts before but I sort of I got more into it when I learned more about graphic design in general, when I went to exhibitions, university exhibitions, and actually understanding what graphic design is. Then I started to get interested and I sort of dove straight in and had a knack for it. So that’s how.
(Vaughan, BTEC L3 art and design)

This is also the case, with Jason and Tevin both of whom are described as transitional Emulators. Prior to joining their current course neither had a strong career related self-perceived identity. This is due to a lack of personal digital-making in the home-setting, at the higher stages of the discourse. Jason and Tevin only engaged in a minimal amount of personal digital-making in the home-setting. Just enough to form a core FDM identity that had some connection to computers. When recalling his early experiences of digital-making in the home-setting Jason states:

The same with me, I was 9 years old when I got my first computer and I knew it I would do something with the computer. I even tried something different than I.T., I tried art & design I waste one year of that. But no, no, I.T. is my thing and I came back.
(Jason, BTEC L3 information technology users)

In this evaluative model (Gee, 1999), Jason expresses that the core of his FDM identity is connected to computers; yet he does not state a specific purpose for computing or a related future career ambition. I suggest that Jason did not emerge from his early digital-making experiences with a strong awareness of his FDM identity. I am not suggesting that all DMC-FDM are conscious of their identities, but many choose to participate in a DMC course based on its alignment with their career aspirations. The DMC-FDM initially perceive their identities through their career aspirations and personal enjoyment of the subject. The stronger the initial aspiration the more likely the selection of a complementary DMC course. For example, Ian's response to the same question is:

When I was little and found out about computers, I loved computers, but I had no idea what jobs there are in computers. And then, when I asked somebody, they told me about several different jobs. I was like, okay, what is it like doing those jobs, what are they about? So although at first, I thought networking sounds good, but then when I did the course, I figured out what I really enjoy more. So it gave me the idea of learning what jobs are there.
(Ian, BTEC L3 information technology users)

Ian identified a specific career ambition, his choice of DMC course was made with his career aspiration in mind. In short, Ian retained the onus of the development of his FDM identity. Ian also retained a large portion of the responsibility for the choices he makes within the DMC; by only accepting social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors when their instruction and feedback aligns with his technical modifier FDM identity. I suggest that due to the lack of a specified purpose for digital-making or a related career ambition; Jason has transferred the onus of the development of his FDM identity onto his DMC tutors. Jason also transferred much

responsibility for his decision-making within the DMC onto his tutors. His digital-making in the home-setting is determined by the content of his DMC course. This is demonstrated in the following model-in-inter(action) (Gee, 1999):

A few years ago I was doing an architecture course as a volunteer, so after school there was a it was in Stoke Newington (inaudible - 00:08:13), so that's when I started doing on a Google-Sketch-Up, Photoshop, and then I got a big portfolio with my work, when I started creating, and then the development steps that I've had. Before, I'd do just a square house, and after six weeks I was doing big houses with even small details on them. Then I did a lot of Photoshop and graphics on the computer, I did sixth form (inaudible - 00:08:49) before I came here, so I did art and graphic design, so I've got a big portfolio there as well.
(Jason, BTEC L3 information technology users)

Still, tutorial development of FDM identity is only possible if the DMC-FDM is willing to accept and follow the pace and direction of development. If the Emulators feel that social interaction with tutors does not align with the core of their FDM identities, learning by imitation cannot occur. This is significant because learning by imitation is the preference of the Emulators. If emulation is not possible due to a lack of resemblance between the career aspirations of the Emulators and the knowledge and experience of their tutors; frustration occurs. The Emulators may seek to access and engage creative professionals in social interaction, as is the case with Vaughan. Or the Emulators may leave the DMC course prematurely. Hence, Jason's earlier description of art and design [graphics] as a 'waste of time'. When recalling his social interaction with his former art and design tutors, Jason states:

When I did my AS-level, art and graphic, I was-. We'd have different teachers coming in and we were asking them about the feedback, or what they would like to change what they would like to put extra on the work or something. Most of the time, when they were saying, they were never coming in, they were saying like that the piece of work that you create is basically a reflection of yourself.
(Jason, BTEC L3 information technology users)

The socio-political reflexivity (Gee, 1999) of the above quotation highlights the frustration felt by Jason as an Emulator. By saying that Jason's work reflects himself, his former tutors left Jason with nothing to emulate. Like Vaughan, Jason was seeking specific instruction and feedback for use in progressive problem solving (Bereiter and Scardamalia, 1993). Yet, the advice given was circular comments that left him unable to implement the learning by imitation model. Jason was only able to develop his FDM identity upon joining his current BTEC ITU course. Here, the social interaction with

tutors aligns with the core of his FDM identity; allowing emulation to happen. Jason is in the transition from being an ineffective Emulator to becoming an effective one.

Tevin is very like Jason, both have similar experiences of digital-making in the home-setting. Both prefer to engage in digital-making in the classroom setting. Both did not define a specific purpose for computers or a related career aim based on their early digital-making experiences in the home-setting. Nonetheless, Tevin was not able to emulate his tutors until he completed a module in programming. This suggests that Tevin retained more of the onus and responsibility for the development of his FDM identity and his decisions within the DMC, in comparison to Jason. Tevin required a greater perception of resemblance with his tutors, before the occurrence of emulation. Tevin did not perceive enough resemblance until undertaking the programming module; because it was then that the social interaction aligned with his FDM identity. Tevin is also in transition from being an ineffective Emulator to becoming an effective one. Consequently, Jason and Tevin are at the logical instruction phase of the discourse of the digital-maker. Like Vaughan, both may progress into becoming experienced non-experts; nevertheless, progression will be much more difficult for Jason and Tevin. This is due to their lack of social interaction with More Knowledgeable Other(s) (Vygotsky, 1930-1934/1978) in the home-setting.

7.3.1.7 Basil: the academic-DMC-FDM

The academics prefer to construct digital public entities in the classroom setting. Little if any of their digital-making at the higher stages of the discourse of the digital-maker, takes place in the home-setting. The academics are the most content of the three categories of DMC-FDM; to shift the onus of FDM identity development and the responsibility for decision-making onto their tutors. All the same, one must not assume that the academics are passive recipients of instruction and feedback from social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors. The academics share similarities with Emulators, both require the perception of resemblance between their career aspirations and the knowledge and experience of their tutors before any learning occurs. However, the degree of resemblance is much lesser than that required by Emulators. In some instances, the academics will settle for the perception of tutorial competence, this is the case with Basil. When asked about his current construction of digital public entities Basil responded:

For me, it was basically a bit like Seydou's when I was young, I mainly use computers for entertaining, and then, as time went passed, I realised that there were so many other uses... Me, I use it mainly for entertainment and socialising on Skype, stuff like that. And of course, there's work, I also do that, but that's basically the main thing, there's nothing more to it... I don't. The things that I create are usually just for myself. I don't actually Even if I do share them, I wouldn't really care if they get seen by anyone or not. I kind of do it just for myself.
(Basil, BTEC L3 information technology users)

Above are three evaluative models and models-in-inter(action) (Gee, 1999) which display the progression of Basil's digital-making in the home-setting; from his early experiences to his current practices. In these statements, Basil displays his perception of computers as a platform for entertainment and socialising. Basil claims to engage in personal digital-making in the home-setting, but I suggest that this is directly connected to his DMC course. The reasons being his dispassionate attitude and lack of social interaction with other FDM and More Knowledgeable Other(s) (Vygotsky, 1930-1934/1978). Furthermore, when asked his opinion of a hypothetical website which allowed the BTEC ITU course to be studied in its entirety in the home-setting he responded: "I'd probably prefer the college because it motivates you to do it. If I were to do it at home, I would probably end up not doing it and the studies yeah." This model-in-inter(action) confirms Basil's preference for digital-making in the classroom-setting; which I suggest is indicative of a lack of experimentation during progressive problem-solving in the home-setting: "Yes. If I get any problem, I would just google it first. If I can't find how to fix it, then I'll probably just give it up."

Like the Emulators, Basil shifts his decision-making and identity construction onto his tutors. Even so, when asked about his perception of expertise among his tutors Basil stated: "I have to agree with everyone here. Teachers have a lot of knowledge about things, but there will always be someone who knows more than them." Yet the earlier model-in-inter(action) regarding Google suggests that Basil is reliant on social interaction with tutors, for solutions to creative problems. For Basil experimentation is the obtainment of existing solutions. Yet, unlike the Emulators, Basil is not willing to switch between differing procedural approaches in search of the most satisfactory best fit. Instead, Basil seeks an immediately available solution, if it cannot be provided by Google then he gives up, choosing to let his tutors solve the problem. Basil is at the threshold of logical instruction stage of the discourse. Basil's progression towards experienced non-expertise (Bereiter and Scardamalia, 1993) is dependent on his tutors' ability to provide immediately available solutions.

7.3.1.8 Nicola: the infantile, academic-DMC-FDM

Nicola is referred to as infantile because she is still within her formative digital-making experiences. But also, because she is not willing to invest the time required to construct her own FDM identity. Nor is she willing to take full responsibility for her decision-making. In the home-setting, Nicola's digital-making revolves around blogging. Her construction of digital public entities at the higher stages of the discourse is minimal; as is her participation in experimentation and progressive problem-solving. Nicola is content to let her tutors construct her identity and make her decisions, provided that she can perceive some degree of competence. The following espoused and evaluative models and models-in-inter(action) (Gee, 1999) highlights her current digital-making in the home-setting:

I'm similar, except I don't use Photoshop or Illustrator because they require me to pay. I watch movies and I run a blog on Tumblr and stuff, and for socialising and Skype-ing. It's like a picture blog and then I do my own stuff, like writing my feelings or reviews or all that...I'm really new to Illustrator and Photoshop. I don't really use Illustrator, just Photoshop, and I use that to express my humour. I add really silly stuff on an image and stuff like that, that's just it, really. I find Illustrator really hard, I don't get it... Yes, that's why I don't use Illustrator because I don't have the patience to learn... I don't really remember because I don't really use it often, I'm tactile, I paint and I draw, so I don't use Photoshop that often.

(Nicola, BTEC L3 art and design)

Nicola repeatedly states her disinterest in digital-making in the home-setting due to the difficulty of using creative software. These statements form an admission of her reliance on social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with More Knowledgeable Other(s) (Vygotsky, 1930-1934/1978) to construct digital public entities; at the higher stages of the discourse. Hence her statements regarding her approach to progressive problem solving (Bereiter and Scardamalia, 1993):

If I'm in school, I'll ask a tutor, if I'm at home, I'll ask Yahoo! answers, because I like to know that other people had the same problem as me, and then they explain it and I'll just go through that... I just look for the questions that people have asked... Yes, I get pissed off and give up... Or I ask my friends and classmates who use and are familiar with the software or the program... If they are a tutor, I'd expect them to know everything. Because if I want something, I want them to tell me right away, so I expect them to know everything.

(Nicola, BTEC L3 art and design)

In all the above models-in-inter(action), Nicola is seeking an immediately available solution from MKO. If one is not provided she gives up, just like Basil. Nicola's approach to digital-making in the home-setting is replicated in the classroom-setting. Her reliance on MKO is further demonstrated in the models-in-inter(action) below:

I was first introduced to Photoshop by Sarah, and she's a professional photographer, so it's good to know that she's knowledgeable about that, so I know who to go to, Sarah and Hannah, because she's a graphic designer as well, so I just go to them... No, not really. What do you mean, if they weren't professionals, would I still go to them in confidence?... No, not really. To know that they're being paid to do stuff and they're well known for their expertise, I would go to them, but if they don't and they confuse me, or something, then that's because they're not really good at it... I would be a bit more doubtful.

(Nicola, BTEC L3 art and design)

Nicola's approach towards her choices within the DMC is encapsulated in the above statements. Her last statement is of interest; here she absolves herself of any blame if she feels confused or unable to construct digital public entities. For Nicola, the perception of expertise in her tutors is based on their professional experience. Once this has been perceived Nicola is content to accept nearly all instructions from social interaction with tutors.

Nicola then displays her digital public entities online to receive constructive criticism and feedback. She claims that doing so aids the development of her work. "I think all comments are appreciated. Because first it strokes your ego if it's a good comment, but if it's specific, it's going to help you. But all comments are appreciated." Enhancing her ego is the sole aspect of her FDM identity retained by Nicola. She is not necessarily looking for specific comments, rather she is seeking approval to counteract the frustration felt during progressive problem-solving. Ego enhancement provides Nicola with the motivation to engage in digital-making. Nicola is at the threshold of the experimentation [higher] stage of the discourse of the digital-maker. I suggest that the forms of experimentation displayed by Basil and Nicola are situated in the experimentation (lower) stage. Here experimentation is the search for an immediate solution. The academic-DMC-FDM experiment by choosing which MKO to engage in social interaction. This judgement is based on the perceived expertise of the MKO. I suggest that this basic form of experimentation then becomes more sophisticated at the experimentation (higher) stage. Where the academics are more discerning in their social interaction with MKO; choosing to follow MKO that loosely resemble their own FDM identities, this is the projected trajectory of Nicola. Due to her intransigence regarding the more advanced forms of experimentation favoured by Susie and Vaughan; it is unlikely that Nicola will progress to the logical instruction stage. For this to occur she must engage in more advanced experimentation.

7.3.1.9 Multimedia: the Maverick-academic-DMC-FDM

The multimedia DMC-FDM are the most monolithic in terms of their early experiences of digital-making in the home-setting. Thus, I will discuss the multimedia DMC-FDM as a group rather than as individuals. The multimedia DMC-FDM had very little to no engagement with computers or other digital technologies; aside from basic digital art software and games consoles. Carly stated that she never used computers. The multimedia DMC-FDM never understood or defined a purpose for digital-making at the higher stage of the discourse during their early experiences. In short, their early experiences had little to no support, guidance, or boundaries from MKO (Vygotsky, 1930-1934/1978) regarding the solving of creative problems. Consequently, the multimedia DMC-FDM shun progressive problem solving (Bereiter and Scardamalia, 1993), more so than all other DMC-FDM, including Basil and Nicola. All the multimedia DMC-FDM are content to shift the burden of progressive problem solving onto MKO. The following espoused models and models-in-inter(action) (Gee, 1999) are statements made by Ken, Carly, Blake, and Boris:

I could never learn anything from a textbook, I hate textbooks! Learning from people, learning from the internet is so much easier it's more fluid!...

I'm usually quite good at following instructions, so I'd rather have it just laid out in front of me to tell me what to do...

And they explain everything in so much detail that you don't need it, whereas if you're talking to a person, they'll tell you the short and sweet tips, essentially, that just get you done...

If it's trying to say something that you know, if it was a person, you were telling me something, I'd be 'no, no, no, I know that I want to know this.

(Ken, Carley, Blake and Boris, BTEC L3 multimedia)

All the above statements bear a resemblance to those made by Basil and Nicola regarding the search for immediately available solutions to creative problems. The multimedia DMC-FDM display, even more, impatience here specifically demanding that MKO curtail social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) to the most efficient instructions only. The multimedia DMC-FDM are not seeking an immediately available solution but rather; an immediate specific solution. This is the extent of experimentation and progressive problem solving tolerated by the multimedia DMC-FDM. None are particularly interested in switching between procedures, the approach favoured by the Emulators. Nor are they interested in choosing which MKO to engage in social interaction, espoused by Basil and Nicola. This is due to the lack of engagement in progressive problem solving during their early digital-making experiences. Consequently, the multimedia DMC-FDM build their FDM identities through self-expression. For the multimedia-DMC-FDM, progressive

problem solving is inefficient and obstructs their self-perceived innate creativity. It is marginalised to spend more time focused on self-expression; hence, the desire to obtain an immediate specific solution. In response to being asked the best means of pursuing a professional career in the digital industries, Ken, Blake, Boris, and Archie responded:

Never let anybody tell you how something's supposed to be done, if you think there's a better way of doing it, do it yourself...

The best are always people who've really pushed themselves, not got told what to do...

Yes, it conflicts with wanting to be creative and wanting to be your own artist and whatever...

I wouldn't say that because it teaches us the skills it just doesn't let us use the skills in the way we want.

(Ken, Blake, Boris and Archie, BTEC L3 multimedia)

These espoused models (Gee, 1999) appear to contradict the statements previously made by some of the same Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM). None mentioned the study of a DMC course. One may assume that participation in a DMC course is germane to the attitudes held by the multimedia DMC-FDM. Notwithstanding, this is not the case, the multimedia DMC-FDM are frustrated by their DMC course because it involves engagement in progressive problem-solving. The 'it' mentioned by Boris and Archie refers to the DMC course. In this regard, the statements made by Ken and Blake are better interpreted as references to social interaction with MKO that contain extraneous information. In saying "if you think there's a better way of doing it, do it yourself" Ken is expressing his desire to limit social interaction with MKO to the provision of immediate solutions only. The same sentiment is echoed by Blake "not got told what to do," Boris, "be your own artist..." and Archie "it just doesn't let us use the skills in the way we want." These statements seek to avoid experimentation, because it hinders their self-perceived natural self-expression, for instance:

I don't think you have to learn something creative...

Creative stuff is more, you have to want to do it...

You shouldn't have a cage on creativity; it should just be your free mind. So you know- they can show you the application, but it should be you who really expresses yourself...

Morris really tries to strip us of our creativity, he takes it all away and says 'it must be done like this, it must be like this... That's always been the problem with every art course I've encountered, it's always-. It doesn't matter what you like, it matters what I like because I'm the one marking it (Group agrees) ...

I feel like if people tell me how to draw something or tell me how I should be doing that when I know that I can do it a different way that I prefer, I feel like I can't be bothered to do it anymore.

(Boris, Blake, Bruno, Ken Archie and Carly, BTEC L3 multimedia)

Self-expression is how the multimedia DMC-FDM retain some degree of autonomy over the development of their FDM identities and decision-making within the DMC. In contrast, to Basil and

Nicola, it is not the absence of an immediately available solution that prompts the urge to give up, it is any attempt to alter the creativity of the multimedia DMC-FDM in a manner that does not immediately serve their self-expression. This is the sentiment expressed in the above models-in-interaction and espoused models (Gee, 1999). Consequently, the multimedia DMC-FDM limit their ability to find creative solutions. On the occasions when they engage in progressive problem-solving in the home-setting; the multimedia DMC-FDM simply reapply whatever procedure they were following:

Well, if it's a fixable thing, I would try to fix it. If it was an audio issue, I would try and go back to the original audio file and re-do what I was trying to do...

You go through the steps and see what you did wrong the first time... We lost footage once, our idea fixing that was just make a video to say 'we lost footage!
(Ken and Archie, BTEC L3 multimedia)

In the above models-in-inter(action) Blake, Ken and Archie do not question the utility of the procedural approaches; instead, all question their application of procedures at no point, was an alternative course of action sought. This is because such behaviour would resemble experimentation which is deemed an inefficient means of producing digital public entities. As implied in the last statement above, the multimedia DMC-FDM display and share their work online. Still, much like Seydou in section 7.3.1.3, this is done in search of praise as a justification of the self-expression within their FDM identities. Specific feedback is not sought because it may challenge their self-perceived creativity. The collective mantra of the multimedia DMC-FDM is "I want to do things my way, not yours." Hence, the addition of Maverick to their academic-DMC-FDM title. This statement was made by Carly, but it encapsulates the socio-political reflexivity (Gee, 1999) present in all the statements made by the Mavericks. Yet, it is ironic that despite their mantra, all six Mavericks are at the logical instruction stage of the discourse, however, they are not in an advanced position, all are quite far from creative expertise. Due to their unwillingness to engage in experimentation; the Mavericks will find progression towards experienced non-expertise, frustrating.

This is particularly the case with Ken, due to his narcissistic attitude towards digital-making. Like Seydou Ken is more concerned with the social goods of power and status (Gee, 1999) associated with creative expertise. Like Seydou, Ken elevates his position among his peers by belittling the knowledge of others while promoting his own.

When I was 14 and I kind of learned that my ICT teachers were completely useless, so I learned to program in Java... Because they don't know anything about computers. They only know

how to use Microsoft Word and how to send an e-mail... To be honest, at first, I thought kind-modelling on computers is kind of hopeless because I learned on a tool called ProDesktop and it's completely terrible for making anything... I like to teach others stuff that I know to do. So on Maya, I will show someone else how to do something that I've learned. I get enjoyment out of, teaching others to do something, see how their skills develop as well... I'm not going to be a teacher, though... Well, using a computer helps you-. Say you are very creative in drawing and that, whereas if you're using something like Maya, you can kind of use it for your own creativity, you can build something.
(Ken, BTEC L3 multimedia)

In these evaluative models (Gee, 1999), the lack of empathy present in the language of Seydou is even more abundant in Ken's speech. His tutors are harshly criticised as is the software that Ken is being taught. Indeed, when asked whether he feels a personal connection to creative software Ken responded: "We hate each other it never does what I want it to do-." To allay his anxiety, Ken places himself in the role of the tutor and then describes his delight at seeing his knowledge helping others progress, criticism of the software has also disappeared. Furthermore, in the last statement above Ken appropriates the scaffolding within creative software as his own ability (Vygotsky, 1930-1934/1978; Bruner, 1985; Hammond and Gibbons, 2005). This is indicated by the words 'your own creativity'. Seydou performed a similar appropriation regarding the creative solutions of MKO (Vygotsky, 1930-1934/1978). When combined with an unwillingness to engage in experimentation Ken may likely encounter more frustration in progressing through the discourse of the digital-maker.

7.3.1.10 Summary of refined research question two

It appears that the extent of digital-making in the home-setting is proportional to the extent of decision-making within the DMC. It is in the home-setting that the DMC-FDM establish their decision-making criteria and responsibility for the development of their FDM identity. If there is a lack of digital-making in the home the DMC-FDM cedes the development of their identity and the responsibility of decision-making to MKO (Vygotsky, 1930-1934/1978) in the classroom setting. The major difference between the home, Emulator and academic-DMC-FDM appears to be, the willingness to shift the development and responsibility onto tutors. The extent of the shift is based on the alignment of social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with FDM identities developed in the home-setting or lack thereof. The home-DMC-FDM are the least willing, the Emulator-DMC-FDM are more willing, and the academic-DMC-FDM are the most willing. Research question two is addressed by all the discussions within section 7.3 of this thesis. This is How FDM choices within the DMC are

influenced by their experiences of digital-making outside school (or in the home-setting of the third space). In the next section, I will discuss digital-making within the classroom setting.

7.4 Refined research question three: How are Frequent Digital-maker(s) (FDM) influenced by their prior experiences of digital-making in the classroom-setting of the third space?

Once again for the sake of clarity, the third space is the fourth and current generation of the DMC. The third space consists of two settings: the home and the classroom. The home-setting represents digital-making that occurs in any informal setting outside of education. The classroom represents digital-making within formal education. In the home-setting digital-making concerns the pragmatic maintenance of identity, in the classroom setting, it concerns the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992). The DMC-FDM perceive the third space as a whole and view both settings as complementary to each other. Given that the home is the setting in which decision-making is developed and FDM identities are constructed; the DMC-FDM tend to use the classroom-setting to address any deficiencies in their decision-making and FDM identities that were not addressed in the home-setting. In short, the DMC-FDM use the classroom to supplement the development of their FDM identities. Invariably, such deficiencies are addressed in the classroom-setting through social interaction with MKO (Vygotsky, 1930-1934/1978), namely DMC tutors. This may range from scaffolding (Bruner, 1985; Hammond and Gibbons, 2005) in the form of MKO instruction and feedback to decision-making and the construction of an FDM identity by MKO. The refined research question above concerns the social interaction between DMC-FDM and MKO in the classroom setting; and particularly, the supplementary effects of social interaction on the identities of the DMC-FDM.

7.4.1 The home-DMC-FDM

It is important to restate that of the three categories of the Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM); the home-DMC-FDM, retain the most control over their decision-making and the development of their FDM identities. When in the classroom setting, the home-DMC-FDM seek social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with More

Knowledgeable Other(s); to expedite the maturation of fantasy (Vygotsky, 1930/1967, 1930-1934/1978; Smolucha, 1992) and supplement any deficient areas of their FDM identities. Due to the presence of tutors, social interactions, in the classroom-setting are more convenient than those conducted with other MKO in the home-setting. Nonetheless, in many instances social interaction with tutors in the classroom-setting, do not align with the identities of the home DMC-FDM; nor does it expedite the maturation of fantasy. Consequently, the home-DMC-FDM tend to associate the classroom with basic digital-making activities. This is the case with Susie:

I kind of have like-. I mean, yes, they're an expert with the graphics and Illustrator, they do know more about the computers, but normally, if they know something that I don't, I will listen to it. But normally, most of the stuff, I already know, because I've taken the time to learn it with my own time. I've had Illustrator and Photoshop since I was about 10 since I've been able to use a computer. And I got a graphics tablet about four years ago, which has sped up my learning, and I'm a really fast learner, once I've done something, I'll be able to do it again. So a lot of stuff, I just remember when it comes to that. So I don't really-. Unless it's, and everything else that isn't really important, that I can use specifically, I just zone out. So if there is something new to learn, I'll learn it, but normally they don't know anything that I don't already know like specifically to do and the stuff that I would do, so I don't really go to them as much for that. Like for my actual illustrations and advice on that, I will, but not so much on the digital stuff.
(Susie, BTEC L3 art and design)

In the above evaluative model (Gee, 1999), it may appear that Susie is critical of her tutors' lack of digital-making knowledge. Nevertheless, I suggest that her tutors are not lacking in knowledge and this is recognised by Susie in the first sentence of the statement. Susie states that "they're an expert with graphics and illustrator... they do know more about the computers." Furthermore, Susie is willing to listen to her tutors as she is seeking instruction and feedback in the areas of digital-making where her knowledge is deficient, as evidenced by "if they know something that I don't, I will listen to it." Similarly, Ian and Seydou also recognise the knowledge of their tutors and display a willingness to learn:

...I believe the teachers we have are good at their job teach us well and everything, but as a level of expertise, I think there's people that know more details as to how the systems work and everything. And like Jacob says, the people that actually made things, they are the ones that are ahead from everyone, because if they've designed a system, they know everything about it.
(Ian, BTEC L3 information technology users)

That's a hard one because you can't really say someone's an expert for something, you can't really say for anyone. I mean there's a different level of understanding. I would say they are obviously better than us because they are teaching us, but I wouldn't say they are the best, experts. I'd just say they know what they're talking about, really.
(Seydou, BTEC L3 information technology users)

The evaluative models stated by Ian and Seydou appear contradictory to their earlier statements made in sections 7.3.1.2, “all of us have done more advanced research and learned a lot more than what the course can provide us” and 7.3.1.4 “we are the best teachers of ourselves.” The issue here is not the quality of scaffolding (Vygotsky, 1930-1934/1978; Bruner, 1985; Hammond and Gibbons, 2005) within social interaction, but rather its relevancy to the identities of the home-DMC-FDM. The fact that Susie already knows the digital and media literacies that her tutors are trying to impart to her; is more evidence of their compatibility. In short, her tutors are the MKO that she sought to engage without success when participating in digital-making in the home-setting. Likewise, Seydou and Ian are compatible with their tutors; as both already possess much of the knowledge their tutors are communicating through social interaction. The question is then why do Susie, Ian and Seydou disregard much of their social interaction with their tutors?

I suggest that the reality of digital-making in the classroom setting is that social interaction with MKO are representative of the environment in which they occur. In sections 2.2.2 and 2.2.3 I argued that: ‘When engaged in the construction of a public entity the designer is influenced by the culture of the setting in which construction occurs. In short, a public entity must convey the meaning and understandings of the communities in which it is situated... A learner may choose which communities suit their own interests, but once a learner engages in the community the flows of information present within are not set by the learner... Consequently, learners must socially interact in the manner stated by the community and any construction of digital public entities must reflect the new literacies present in the community. Learners cannot obtain any type of new literacy that is not present in the community.’

Both quotations make the same argument that a learner cannot construct a digital public entity that is unrepresentative of the environment in which it is situated and the digital and media literacies within. I now suggest that the same principle applies to MKO. Therefore, MKO must also socially interact in a manner congruent with the inhabitants and environment. In the classroom setting, the social interaction of MKO must align with curricular objectives and the identities of the majority of DMC learners. It is important to remember that the home-DMC-FDM are only a small fraction of all DMC learners. Even within the DMC-FDM, they remain a small fraction. One may even argue that the home-DMC-FDM are on the fringes of the environment; and will not find much social interaction with MKO expedient or supplementary for the development of identity or maturation of fantasy. Therefore,

Susie states in reference to social interaction with her tutors: “But normally, most of the stuff I already know... everything else that isn't really important, that I can use specifically, I just zone out.” Susie’s statements are her observation of the basic and general digital and media literacies present within much her social interaction with tutors. In short, Susie does not receive enough social interaction with MKO that meets her specific FDM identity as a creative expert. Hence, her reliance on experimentation and engagement in progressive problem solving (Bereiter and Scardamalia, 1993), in the home-setting. Consequently, Susie associates the classroom with basic and generalised digital-making; as do Ian and Seydou.

The association of the classroom with basic and generalised digital-making is reinforced in much social interaction between the home-DMC-FDM and MKO. All the same, I suggest that the association was formed during the digital-making experiences of the home-DMC-FDM within compulsory education. Susie is the only home-DMC-FDM that discussed her digital-making experiences within compulsory education. However, due to the similarities shared with Ian and Seydou; I suggest that Susie’s experiences are applicable to both. When discussing her digital-making experiences during compulsory education; Susie is only able to recall activities such as using a search engine. In section 1.4, I mentioned the Curriculum Matters 15 report (Her Majesty’s Stationery Office, 1989) which concentrated on building a general set of competencies regarding the gathering and handling of information. Learners learnt how to use software, but had no insight into its capabilities to produce digital public entities. Digital-making in her early compulsory education was situated in the lower stages of the discourse of the digital-maker. In comparison to the home, digital-making in the classroom-setting appeared as basic to Susie: “No, not primary school. No one would even focus on Photoshop in primary school. I mean like year eight or nine, because then you can get all that silly prank stuff out of the way”. This evaluative model is significant because as she stated earlier in this section, Susie was using creative software such as Photoshop in the home-setting, during her early compulsory education. Even in the above evaluative model, she associates digital-making in secondary education with ‘silly pranks’; which is her term for trivial applications of digital-making. For Susie, the digital-making in the classroom-setting is only beneficial for the establishment of basic practices, for the expedition of more serious learning:

Maybe, but what I'm saying it's kind of like when you're in secondary school in primary school, you learn the colour wheel and basic art stuff like shading, and you may not be liking art, but when you take it into college, you still remember how to mix green and you still know how to shade an object from where the light is coming from and stuff like that. And you just learn how to do it better and you carry on with that. I think if you just teach them the basics, it will be easier for them to learn things like Flash and Illustrator.

(Susie, BTEC L3 art and design)

Yes, exactly! If you get all that silly stuff out of the way, you can focus on actually learning how to use it professionally and stuff. Another thing is it's not so important if you lose a picture or something when you're in primary school, so they can teach that straight away, that you've got to save everything like it's a double. When you save something in Photoshop after you've made a drastic change, you save that and you still keep the original photo, stuff like that. And teaching the basic stuff, always have a copy, always-. So that when you're 12 or 13 when you cock up-. But now, it's like oh, crap, I've lost it completely, I've got to start again type of crap. If they did it then, it would be like 'oh, well, okay, I'll make a copy of it', and they'll know that straight away, it will something just engraved, like the colour wheel or something like that, it will just be engraved in their mind. The thing is you learn straight away how to do colour and stuff like that, it just becomes habit.

(Susie, BTEC L3 art and design)

From Susie's perspective, her tutors are supposed to teach basic digital-making practices to their learners, to more easily facilitate advanced digital-making in the higher levels of education. Even so, her perception of digital-making in the classroom-setting is only possible if basic habits are first established in primary education. Her frustration, with digital-making in the classroom-setting, does not stem from her social interaction with tutors; but the slow pace of tutors engraving basic digital-making habits into the minds of learners. The home-DMC-FDM, view basic digital-making habits as repetitive series of decisions regarding good practice in the construction of digital public entities. Susie, Ian and Seydou perform these habits automatically without great effort, through their engagement in experimentation and progressive problem solving in the home-setting. Each is able to reduce the burden of decision-making and re-allocate their mental resources to the more complex construction of digital public entities.

Bereiter and Scardamalia (1993) use the analogy of learning to drive to illustrate the re-allocation of mental resources; and the production of expertise through investment beyond normal methods of learning (section 3.2). Bereiter and Scardamalia (1993) discuss three such methods of investment: the first being, 'reinvestment in learning'. Here the spare mental resources that are freed once an activity has become routine or automatic; are continually reinvested into the activity in order to improve learning and performance. The second method of investment is, 'seeking out more difficult

problems'. The rationale being that individuals only develop a sufficient amount of expertise to meet the demands of the environment in which the expertise is applied. In order to gain further expertise, one must seek environments that are more demanding. The decision to seek a new more difficult challenge usually occurs at the point where activities become routine or automatic. The third investment method is 'tackling more complex representations of recurrent problems'. Based on bounded rationality (Simon, 1957) Bereiter and Scardamalia (1993) argue that the limitations of mental resources require individuals to simplify real-world problems which would otherwise be too complex to process. By using normal (routine or automatic) learning methods to solve simplified representations of problems, individuals are able to apply their spare mental resources to less simplified versions of problems. Over time, individuals develop the experience to solve complex representations of recurrent problems.

Regarding the home-DMC-FDM, each method of investment (Bereiter and Scardamalia, 1993) encapsulates their dilemma with digital-making in the classroom setting. The 'reinvestment in learning' represents the approach of the home-DMC-FDM towards digital-making. Through, experimentation and progressive problem solving the home-DMC-FDM continuously re-allocate their mental resources. Thereby, expediting and supplementing the maturation of fantasy and the development of their FDM identities. 'Seeking out more difficult problems' represents their view of what digital-making in the classroom-setting is supposed to be. The classroom is supposed to be the more demanding environment which elevates their knowledge of digital and media literacies above those attained in the home-setting. The home-DMC-FDM want the classroom to expedite and supplement the maturation of fantasy and their FDM identities, through the teaching of complex digital and media literacies. In short, the classroom should offer the convenience that makes learning such literacies difficult in the home-setting.

Notwithstanding, too often the home-DMC-FDM find that digital-making in the classroom-setting resembles 'tackling more complex representations of recurrent problems'. The home-DMC-FDM, find that too often digital-making in the classroom-setting is focused on the establishment of basic habits that were not addressed previously within compulsory education. Instead of 'seeking out more difficult problems'; the home-DMC-FDM find that social interaction with tutors focuses on simplified versions of recurrent problems. The issue here is that the home-DMC-FDM have already overcome much of these problems through the 'reinvestment in learning'; and consequently,

disregard much social interaction with tutors. This is how the choices of the home-DMC-FDM are influenced by their prior digital-making experiences in their compulsory education. This pattern was established in their prior compulsory education and is reinforced in their current DMC courses.

Still, social interaction in the classroom setting is not limited to tutors, the home-DMC-FDM also interact with their peers. For Susie peer-to-peer social interaction is of limited utility due to her proclivity for experimentation and progressive problem-solving. Susie only consults her peers for assistance, when she perceives their knowledge of a specific topic as comparable to her own. It is highly significant that throughout the interview Susie only mentioned the word 'help' six times and none were requests for assistance from peers. In contrast, Ian and Seydou find peer-to-peer social interaction is of greater utility. Both are viewed as problem solvers by their peers, leaving both feeling ambivalent. On one hand, both are glad to receive the social goods of power and status (Gee, 1999) conferred onto them by peers, especially Seydou. On the other hand, both feel distracted and annoyed by constant requests that hinder the completion of their own coursework. Some requests are very extensive, even to the point of being offered money to complete the coursework for others. Yet, Ian and Seydou continue to offer help as a form of currency; exchanging one favour for another:

Yes, some people are advanced, some people are intermediate, so when they don't really- some people are good at one thing and some are good at another. Because they don't know what you're- how good you are at one thing, they- sometimes they need your expertise, so you got to like help them. And one day, when you need help from them, they'll help you- (Seydou, BTEC L3 information technology users)

One must remember that Ian and Seydou are technical modifiers, their capacity for experimentation is not as extensive as Susie's. Therefore, providing assistance to others in exchange for help at a later time is an efficient means of solving creative problems. In section 2.2.3 I discussed concerns regarding the notion of communities within the classroom. I suggest that peer-to-peer social interaction may resemble a network, in which learners' access various parts according to their FDM identities and progressive problem-solving needs (Bereiter and Scardamalia, 1993).

7.4.2 The non-DMC-FDM (the leisurely and pseudo-professionals)

The digital-making experiences of the non-DMC-FDM, within compulsory education, are the same as their DMC-FDM counterparts. The non-DMC-FDM, have noticed similar issues regarding digital-making in the classroom setting. For instance, the leisurely non-DMC-FDM, recall basic and general digital-making activities, involving information handling and gathering (Passey, 2014).

Well, I'm sort of talking about back, in primary, then we were using stuff like Word or basic Excel, just to do basic things. And that's mainly our first use of computers, excluding stuff like at home, like playing a game on it...

I think people have a pretty round knowledge of computer based skills already, I don't think it needs to be taught at a college, specifically at A-levels. Maybe earlier on, like at primary school, but I don't think at this stage you would need computer guidance...

People generally know enough to get them passed, that they learn in secondary school. I'm not sure they need to learn anything. I don't know anyone that's lacking, my age and using the computer.

(Ron and Zack, A-level: sociology, physics and mathematics)

I suggest that the above evaluative model (Gee, 1999) offers further evidence that much digital-making on non-DMC courses in the classroom-setting is situated in the lower (play, exploration and experimentation lower-tier) stages of the discourse of the digital-maker. As I argued in section 4.1, the creative goals of the lower stages are simple, short-term and achievable without extensive instruction. Much of these literacies may be obtained through use in everyday life as described by Ramanau et al. (2010). Consequently, the leisurely non-DMC-FDM have concluded that digital-making is relatively simple rather than worth pursuing in post-compulsory education. The evaluative models present in the language of the pseudo-professionals; highlighted their discontent with digital-making in their compulsory education. The concerns of the pseudo-professionals begin with social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) in which the knowledge and competence of their tutors are less than extensive. For example, Doris and Keisha recall the following:

... my music teacher, when I was in year 11, we had a software a composition software and then he didn't know how to do it he was like OK. He had to hire someone to come and tell us what it was, and it wasn't that hard, it was quite simple. but he was the music teacher...

Yes, I had a vocal teacher as well and it was never helpful-
(Doris and Keisha, BTEC L3 sports)

One must remember that in the home-setting, the pseudo-professionals produce digital public entities at near-professional standards. The perception of gaps in tutorial knowledge leads to scepticism regarding the quality of digital-making in the classroom-setting. Additionally, the pseudo-

professionals felt that tutorial social interactions were inordinately inefficient and critical, hence the preference for constructing digital public entities in the home-setting. Subsequently, the pseudo-professionals begin to question the utility of pursuing DMC courses in post-compulsory education:

I didn't see myself progressing like-. Because I had opportunities to study like music production as an A level... I was going to study music production A-level technology what do you call it? and I just thought what is the point of me studying that? ... music production as long as other A-levels and then um, um like I didn't see myself progressing and getting a real-life job. Because I thought why would I need to study something I already have enough knowledge about-, and probably not get a good job... Music production, I have a friend who does it, he's studying it, but I don't see what he's going to do. Right, he can get a job as a in a studio, but it's not like okay, I'm going to become a big artist if I study music. So I thought what is the point?
(Doris, BTEC L3 sports)

Perceptions of disconnection between DMC courses and creative professional careers are commonplace in the literature about ICT education and subject choice. Yet Doris' concern is more nuanced, she feels unable to progress. The question here is, considering that Doris has already acknowledged that her understanding of music production is sufficient, why does she feel unable to progress to a post-compulsory DMC course? The implication here is that digital-making in the classroom-setting concerns more than just the production of public digital entities. There is also a certain degree of academic study attached to digital-making in the classroom-setting; such as reports, reflective essays and written research hence, Doris' reluctance. Some of the pseudo-professionals may find the academic elements of digital-making not only off-putting but also prohibitive to progression:

I did, I did get a option but, I wasn't necessarily music production, it was like. When I was going to secondary school, when I was about in year 8 I had the opportunity to go to a private school through a music scholarship- ... but your grade house would have to be on top, not just music, everything would have to be top grades. I just thought- what am I going to do with it?
(Doris, BTEC L3 sports)

The academic requirements that accompany digital-making in compulsory education may contribute to a lack of confidence in some pseudo-professionals. From the perspective of the pseudo-professionals, digital-making in the classroom-setting is not only more basic than in the home; it is also accompanied by extraneous requirements. Both of these factors exacerbate the perception of distance between DMC courses and creative professional careers.

7.4.3 The Emulator-DMC-FDM

The Emulators are the first of the two classroom-DMC-FDM subgroups. To a large extent, the Emulators, are content to shift the onus of constructing an FDM identity and decision-making, onto their tutors or other MKO (Vygotsky, 1930-1934/1978). However, the shift is dependent on the perception of similarity between the career aspirations of the Emulators and the knowledge and experience of their tutors. This perception is gauged through satisfaction with tutorial social interaction (Vygotsky, 1930-1934/1978; Turner, 1988). The greater the level of satisfaction the stronger the perception of similarity. Nonetheless, if the Emulators are dissatisfied with tutorial social interaction, they may seek interaction with other MKO such as creative professionals, or even disengage from their DMC course. Both of these scenarios occurred with the Emulators, of this study. Part of Vaughan's self-identification as a graphic designer stems from his discontentedness with tutorial social interaction. In reference to his tutors, Vaughan's language contains many evaluative models (Gee, 1999) that criticise their knowledge of digital-making and their dissimilarity to himself:

The two main tutors, the main tutors for art on our design course aren't, they're not 3D. There's two side ones (inaudible - 00:36:15), there's Hannah, she's really good at Illustrator, she's actually a graphic designer. And Louisa, she's an illustrator, so I have them to fall back on. The other two, Jane and Travis, they don't really know a lot about these things.
(Vaughan, BTEC L3 art and design)

I can show the graphic designers my work and they will really, really like it, because they know what they're looking for, but on the other side, with the 3D, like Jane, they wouldn't like it at all, they would penalise me, 'we don't know this, we don't know this', but I don't do that. I'm a graphic designer, so I'll go to Hannah and Louisa when I get graded by them, they give me the better grades because they know what to look for, whereas my other tutors, they don't really appreciate it much, they don't really understand as much.
(Vaughan, BTEC L3 art and design)

In the above statements, it is important to note the differences in Vaughan's social interaction with his tutors. Louisa and Hannah, are viewed positively, Vaughan is reliant on the instruction and feedback that both provide; indicated in his use of "I have them to fall back on". Vaughan is content to emulate Louisa and Hannah in the construction of his FDM identity and his decision-making in the classroom setting. Both tutors are representative of the professional graphic designers to which Vaughan aspires. Vaughan does not question the instruction and feedback provided by Louisa and Hannah; because he ascribes their knowledge to their creative professional backgrounds, not their status as tutors. Similar to the home-DMC-FDM, Vaughan associates the classroom with basic digital-making. The home-DMC-FDM viewed digital-making in the classroom-setting as the place in which to

apply basic digital-making habits learnt in the home-setting. Vaughan's view differs slightly as he perceives the classroom as the setting for learning basic digital-making habits. This is his expectation of his tutors:

I would expect a very high standard-. If they do it as a profession, I would expect really high standards. I won't expect them to know everything, because even the highest artists don't know everything on Illustrator, because it's so complicated, everyone uses it differently, but I'd expect a high enough standard so you can learn the basics and a bit more and you can, at the level I'm at, intermediate, at the start of university, have all the knowledge I need, for them to give to me. If I was higher, I'd probably struggle a bit for them to give me information. I'd be a bit iffy If I was at the high level. But I'm not, so I'm fine with it.
(Vaughan, BTEC L3 art and design)

In the espoused model above (Gee, 1999) Vaughan esteems the knowledge of creative professionals above those of tutors. In section 7.3.1.5, Vaughan mentioned his dislike of discussing digital-making, with young people due to their lack of knowledge and utility. Vaughan applies the same principles to his tutors; his emulation of Louisa and Hannah is not based on admiration of their backgrounds, but rather on the expedition of his progression towards professional employment. He simply expects his tutors to provide enough basic information to ensure progression into higher education. Once, his knowledge has surpassed theirs, Louisa and Hannah will cease to be of use, hence: "If I was higher, I'd probably struggle a bit for them to give me information." I suggest that Similar to the home-DMC-FDM, Vaughan has also observed the basic and general digital and media literacies present within the majority of his social interaction with tutors. Jason and Tevin also associate the classroom with basic digital-making. Neither expects their tutors' knowledge to be comparable to that of creative professionals:

I think because they're teaching at college, they're not that professional like the teachers in university because obviously, they need to know more to teach more, in the higher level... They're middle level.
(Jason and Tevin, BTEC L3 information technology users)

One must remember that the Emulators are regularly engaged in complex digital-making in the home-setting. Nevertheless, the Emulators, view the home as the setting for the application of basic digital-making habits learnt in the classroom-setting. It appears that frequent engagement in digital-making in the home-setting enables the home-DMC-FDM and Emulators to perceive the limitations of social interaction with tutors in the classroom-setting. Regarding the Emulators; the

limitations of tutorial social interaction become even more apparent when little resemblance is perceived in their tutors.

For instance, in comparison, to Louisa and Hannah, the other art and design tutors, Jane and Travis are perceived negatively by Vaughan. Both are described as disliking of Vaughan's digital-making, even to the extent of penalising his work. Vaughan questions the extent of their knowledge and even derides Jane and Travis by paraphrasing their social interactions as "we don't know this, we don't know this." Jane and Travis are deemed of little utility to Vaughan. In section 7.3.1.6, Jason expressed similar discontentedness with his former art and design tutors describing his experiences as a 'waste of time'. I suggest that the association between the classroom and basic digital-making held by the Emulators is reinforced in social interaction with tutors. I further suggest that similar to the home-DMC-FDM, this association was formed during compulsory education. When recalling his early digital-making experiences Vaughan states the following espoused models (Gee, 1999):

But also in that sense, you could put people off If you did it in primary school (inaudible - 01:14:12) and this is one teacher teaching everyone, on Photoshop and they think it's boring. That's what happened with lots of art. Secondary school, primary school people think 'ah, this is really boring'. When you go to college, it's completely different, the way they teach. So in schools, they're going to teach differently, that's going to put so many people off. Photoshop at my secondary school put me so much off art.
(Vaughan, BTEC L3 art and design)

That's one of the reasons why I went into graphic design. It wasn't because I got taught it. I could have been taught it and still hated it. I think it's because of the artists who were doing something completely different with the programs, because the teacher is like 'this is this, this is this', step by step by step. Or even if they try-, 'oh, you can do this differently', I didn't really like it.
(Vaughan, BTEC L3 art and design)

I suggest that from the mention of the word 'boring' one may infer that Vaughan's social interaction with tutors during his compulsory education; resemble his social interaction with Jane and Travis. When Vaughan mentions the different style of teaching in college it is a reference to his social interaction with Louisa and Hannah. Similar to the home-DMC-FDM, the Emulators find the reality of digital-making within the classroom-setting does not meet their expectations. For instance, in response to a question about the best way to become a creative professional Vaughan offers the following evaluative models (Gee, 1999):

Practice, really. Using it more and more, getting more feedback, be surrounded with people who actually use it as well, be surrounded by the people, be surrounded by graphic designers, people who are using it, people who want to get into the profession, be surrounded by that community. So be in a community and use it a lot.

(Vaughan, BTEC L3 art and design)

There's about four or five of us in our class who are really, really good at computerised stuff. Most of the people never go on computers or don't really touch computers... but when they need something with computers, they come to us. 'Can you help me with this? Do you know how to do this?'. So that's how, and we basically help them.

(Vaughan, BTEC L3 art and design)

Similar to the home-DMC-FDM, Vaughan wants the classroom to be the setting which expedites the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) and the development of FDM identity. Vaughan wants the classroom to be populated by a community of like-minded digital-makers; thereby delivering the convenience of social interaction with MKO (Vygotsky, 1930-1934/1978) that is difficult to replicate in the home-setting. But in reality, the classroom is not populated with FDM. In section 6.1, I stated that the ratio between infrequent and frequent digital-makers on DMC courses is five to one. Additionally, Vaughan views tutorial social interaction in the classroom-setting as too sporadic, basic and general:

Even if there's a professional, you can't go around five people. I think it needs to be more individualised. It's hard if there's only one tutor, they kind of go around everyone, that's where the problem is, I think. The way it works is if you need help, you just go ask the tutor and they just come to you. I don't like everyone having a class and doing one thing. They teach one thing and there's five of us in class wanting different things, it's going to get messy.

(Vaughan, BTEC L3 art and design)

In section 7.3.1.5, I argued that Vaughan's engagement in experimentation consists of choosing which procedural approach to apply in the solution of creative problems. In his social interaction with creative professionals, Vaughan obtains multiple useful procedures. One may infer, that in his social, interactions with tutors Vaughan does not receive an equivalent variety of procedures. He is, therefore, limited in his solution of creative problems and the construction of digital public entities, in the classroom-setting. Vaughan is unable to implement the learning by imitation model, thereby hampering his decision-making and the construction of his FDM identity. This manifests as off-putting boredom and frustration, rendering Vaughan unable to engage in the emulation of creative professionals. Vaughan's discontentedness with tutorial social interaction echoes those of Jason regarding his former art and design course and Tevin before the programming module of his current DMC course, in section 7.3.1.6.

Peer-to-peer social interaction is of very limited utility for Vaughan. He shares the same ambivalence as Ian and Seydou in section 7.4.2. All the same, Vaughan is consistent in his

application of his two-phase filter, described in section 7.3.1.5. Vaughan only consults peers that resemble himself: “But I talk to James about, me and him do exactly the same thing.” The network of digital-makers available to Vaughan in the classroom-setting is severely reduced by his exclusionary Emulator identity. Jason and Tevin perceive peer-to-peer social interaction, in the same manner as Ian and Seydou. Both trade the assisting of others for help when requested, due to the recognition of differing expertise among their peers, as Jason states: “We've got someone maybe better in programming but they don't know about the other unit, and the person you help may be better than you in different units, so you help them, they help you.” This is yet another instance of learners in the classroom-setting operating as a network rather than a community. The only obligation of the network is that assistance is provided regularly when requested.

7.4.4 The academic-DMC-FDM

The Academics are the second of the two classroom-DMC-FDM subgroups. The Academics have the least engagement with digital-making in the home; and some do not engage in any form of complex digital-making at all, outside of their DMC courses. The Academics are the most content to shift almost totally the onus of decision-making and the construction of their FDM identities onto their tutors. For this shift to occur, the Academics, only require the perception of competence in their tutors, through social interaction (Vygotsky, 1930-1934/1978; Turner, 1988). The shift implies that the Academics are satisfied with the scaffolding interaction (Bruner, 1985; Hammond and Gibbons, 2005) present within tutorial social. The shift also implies that the Academics are the least critical of their tutors in comparison to the home and Emulator-DMC-FDM. Basil of the BTEC ITU course is one such example of an Academics satisfied with tutorial social interaction. Basil chose to join his current DMC course based on his enjoyment of IT in secondary school. His most harsh criticism of his current tutors is as follows: “I have to agree with everyone here. Teachers have a lot of knowledge about things, but there will always be someone who knows more than them.” One can infer that Basil is at least satisfied with his tutorial social interaction, in both compulsory and post-compulsory education.

However, Basil's experiences are not common among the other Academics. The language used by Nicola of art and design and the Mavericks of multimedia contain many espoused and evaluative models (Gee, 1999) that express strong discontentedness with their digital-making experiences in the classroom-setting. Much of the discontentedness originates from a lack of

participation in digital-making; and negative social interaction with tutors during compulsory education or a previous DMC course. For instance, none of the Academics including Basil recalled any digital-making experiences from their primary education. Nicola's, recollections distinctly highlight her lack of participation in digital-making during her secondary education:

Not like primary school, because that would definitely kill it... I feel like Photoshop should be taught in secondary school. (Susie agrees) Then we all know more, and we're in college we can be taught Illustrator because it's much more harder. When you're introduced and at an early age you'll know more and develop your work and-... I think just teach Photoshop just before art GCSE, so they know that there's a variety of stuff that you can use and access for your art, and then you can see your potential and your artistic side, so when you choose GCSE and you choose it for college, you know what you're doing and then you can learn Illustrator in college, because it's a lot more harder and that's like another step above Photoshop.
(Nicola, BTEC L3 art and design)

This espoused model (Gee, 1999) highlights Nicola's motivation for shifting her decision-making and construction of FDM identity onto her tutors. She does not feel adequately prepared for digital-making in the classroom-setting on her current DMC course. Consequently, she finds digital-making difficult, hence the need to perceive the creative professional work experience of her tutors, in section 7.3.1.8. Nicola is dependent on her DMC tutors' digital-making experiences to compensate for the lack of her own, during compulsory education. Nicola perceives the classroom as the setting in which to learn basic digital-making:

As long as you're introduced to it, though, on the first day of the course when you're doing the basics and everything-... Let me stick up for my-my classes and that was how it helped me, and that was really important for me. But now, it's quite individualised like she said... I didn't know about it back then, but when I passed to my course because they're on second year, I was in first year so I was quite new, it's much more structured now. We had a whole two months, every week we'd have a lesson in Photoshop to teach us what we could do with it. They made sure we were on the same page with each other and we knew that we covered that unit and this and that was great for me. But I don't know how they taught you guys.
(Nicola, BTEC L3 art and design)

In section 7.4.1, I discussed the dilemma faced by the home-DMC-FDM in that; too often digital-making in the classroom-setting is focused on the establishment of basic habits that were not addressed previously within compulsory education. So far, all of the home and even the Emulator-DMC-FDM have been disappointed with the basic and general digital and media literacies present within the majority of social interaction with tutors. One may infer from Nicola's defence of her tuition, that she is satisfied with her tutorial social interaction. For Nicola, the classroom is fulfilling its purpose and she is receiving the basic and general digital and media literacies that were absent in her

compulsory education. It is important to note that her satisfaction with tutorial social interaction is based on not only the lack of a previously defined FDM identity; but also, little to no engagement in progressive problem solving (Bereiter and Scardamalia, 1993). Nicola, gladly accepts whatever, identity is constructed by her tutors on her behalf. I suggest that at present, Nicola is willing to forgo self-expression in exchange for the basic and general literacies. Once Nicola gains confidence she will seek more control over her decision-making and the construction her FDM identity. This is indicated by her use of the words: "Then we all know more... you'll know more and develop your work... there's a variety of stuff that you can use and access for your art, and then you can see your potential and your artistic side...". Nicola intends to exert her self-expression far more in future.

Self-expression is the most important aspect of digital-making for the Maverick-Academic-DMC-FDM (Mavericks); all of whom strongly dislike progressive problem solving (Bereiter and Scardamalia, 1993) as discussed in section 7.3.1.9. One must remember that during their early digital-making experiences the Mavericks, received little to no support or guidance regarding the solution of creative problems. Many of the Mavericks, also have little engagement with digital-making in the home-setting; and all view the classroom as the setting for the application of their self-expression.

Even so, as I argued earlier digital-making in the classroom-setting often concerns the establishment of basic habits for the purpose of simplified problem-solving. The Mavericks are often frustrated in their social interaction with tutors, as they do not want to approach digital-making in this fashion. I suggest that the Mavericks believe that self-expression is the most expedient means of accelerating the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) and the development of FDM identity. This belief is contrary to all other DMC-FDM, whom view experimentation and progressive problem solving (Bereiter and Scardamalia, 1993) as the most favourable means of expedition. Consequently, the Mavericks, are often frustrated by their social interaction with tutors; as they are not willing to compromise their self-expression. For example, in section 7.3.1.9 Ken described his former secondary school ICT tutors as 'useless' and then claimed that he taught himself how to program in Java. In the evaluative model and model-in-inter(action) (Gee, 1999) below, Blake makes a similar claim about teaching himself how to use Photoshop.

Exactly. It's like creative stuff-. When I was doing GCSE Art, my teacher was always like 'put Photoshop work in there, blah, blah, blah', and I was the only person that did Photoshop work with my artwork. But I had to just sit down at a computer and learn Photoshop myself. I knew all the other skills. Creative stuff is more, you have to want to do it.
(Blake, BTEC L3 multimedia)

The dismissal of tutorial social interaction in the classroom-setting was established during their compulsory education. In both statements, Ken and Blake assume the position of the tutor and follow their own instructions. The Mavericks are not making their choices within the DMC; instead, they are trying to redefine the DMC as they see fit through their decisions. Much like all other DMC-FDM, the Mavericks' attitudes and perceptions of digital-making in the classroom-setting; were formed during their compulsory education and carried forward into their post-compulsory DMC courses. Before joining their current BTEC multimedia course several of the Mavericks participated in other DMC courses. In each instance the Mavericks reported similar frustrations with tutorial social interaction:

I did an engineering course beforehand at a point and it feels like they're using the exact same sort of marketing, they are just marketing it like that, but you can't compare them. How can you compare games design to engineering? One is calculations, one is using your imagination and creativity.
(Ken, BTEC L3 multimedia)

Okay, I've got a U in my old sixth form right, not because I didn't do the work, I did quite a bit of work, I built this massive table, I put so much time into it right, but they were like 'oh, no, you clearly don't have enough paperwork here'. And it took me-. I have one of the biggest projects in my old sixth form and I still got a U. And even in the exam, I wrote everything I could, and no, still not good. I think the work I did for that table, for me to get a U, it's like, really? Wow!
(Bruno, BTEC L3 multimedia)

In both statements, the same evaluative model and model-in-inter(action) persist. Neither Ken nor Bruno is willing to engage in progressive problem solving. Both are more concerned with displaying their self-expression. It is important to note that both have extended their frustrations with tutorial social interaction towards the assessment of their coursework. Both are openly critical of digital-making in the classroom-setting. Consequently, the Mavericks, are scathing in their recollection of social interaction with tutors on their current BTEC multimedia course:

Yes, it conflicts with wanting to be creative and wanting to be your own artist and whatever. But at the end of the day, you have to do what they say, so you can pass the course and get the grades...

That's always been the problem with every art course I've encountered, it's always-. It doesn't matter what you like, it matters what I like because I'm the one marking it (Group agrees) ...

Yes, look even Morris he keeps telling me I'm too literal, but sometimes it's the way I think. And I like doing things a certain way, I think it looks nice, and it's my creative-. I mean, I can go more

creative, but it's going to kind of look more messy. If I do it my way, I think it looks neat, it's a nice quality. But I don't like doing my work, I think it looks good, and then someone coming to me and telling me 'oh, that's too literal.

(Boris, Archie and Bruno, BTEC L3 multimedia)

In section 6.2.1, I argued that the DMC is still teacher-centred (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012) not by design but due to learner reluctance (Turner, 2010) to fully participate in the co-construction of learning experiences. The Mavericks dislike the prescriptive teacher-centeredness of digital-making in the classroom-setting; as has been their experiences of digital-making in education. I suggest that much like all the other DMC-FDM the Mavericks have also noticed the basic and general digital literacies present in the majority of their social interaction with tutors. Notwithstanding, being Mavericks their attempt to overcome this issue differs from that of all other DMC-FDM. The Mavericks are trying to establish a more exploratory learner-centred approach towards digital-making in the classroom-setting. The Mavericks view learner-centred digital-making as more facilitative of their need for self-expression. Instances in which tutorial social interaction appears to encourage a learner-centred approach, are praised by the Mavericks. In these cases, the Mavericks are content to shift the onus of decision-making and FDM identity construction onto their tutors:

Where I was in music it was the opposite. The creative work that we did, the composition and stuff, they were performed in front of the other sixty people on the course, and then there was feedback and that's how it was marked. And then, the technical stuff, you did one on one with your tutor, you showed what you'd be working on. They didn't just have a marking sheet, you'd learnt it, you had to really show it and explore it.

(Boris, BTEC L3 multimedia)

Some schools will have an exhibition for their artwork and at the end of the year, as a marking format, it seems to work well, they give it public opinion, which is what our course should have.

(Archie, BTEC L3 multimedia)

There was one time when a teacher, called Morris, let me use my own creativity. It was to make a board game. It started off as a simple idea and it turned out to be really cool, but simple at the same time. The actual time he let me use my creativity, he couldn't say a bad thing about it. Yet, he still wants to limit what I can do.

(Ken, BTEC L3 multimedia)

The Mavericks prefer the learner-centred approach towards digital-making in the classroom-setting because; it offers an appraisal of their self-expression, rather than a critique of their lack of engagement in experimentation and progressive problem-solving. In short, the Mavericks feel validated by the learner-centred approach and this is when they will make choices within the parameters of the DMC. Unfortunately, for the Mavericks their desired perception of digital-making in

the classroom-setting is rendered, short-sighted; by their intransigence regarding experimentation and progressive problem-solving. Self-expression alone is an inefficient means of expediting the maturation of fantasy and the development of identity; because it attempts to construct digital public entities independently of the environment in which it is situated. When faced with a creative problem beyond their knowledge, the Mavericks become reliant on tutorial instruction, as discussed in section 7.3.1.9.

The notion of DMC learners functioning as a network rather than a community is most apparent in the peer-to-peer social interaction of the Academics. In response to a question about how learners with a wide knowledge of digital-making are treated by their peers, Nicola stated:

For me, it depends on my opinion on, other people's work and what I want to do. So, if I see something that I like, I'm like 'oh, that's really cool, how do you do that?', obviously, I ask them. But otherwise, my friends or someone close to me.
(Nicola, BTEC L3 art and design)

Her answer may appear strange; still, I suggest that Nicola is content to treat her peers in the same manner as her tutors. She engages in progressive problem solving by making requests for instant solutions. She is content to ask anyone close to her for a solution because of her prior lack of participation in digital-making during her compulsory education. The network available to Nicola in the classroom-setting is much more extensive in comparison to Susie and Vaughan. Likewise, the Mavericks also approach progressive problem-solving in the same fashion:

They are like the go-to person. For if you don't know- If something's gone wrong or you don't know what to do next, you usually ask that person...

Because we all are very good at specific things, but we still have abilities in other things as well. So I think we can all help each other out, so if one person doesn't know, they go to the other and if the other person doesn't know, they go back to the same person...

Basically, we're a team. By ourselves, we're kind of scattered, we don't know everything, but when we work together it's a lot better...

Everyone's had that one stage where they're like 'I don't know what to do'. And say if you answered it online, you just do that. But, then you have- instead, you have people in front of you who you know for a fact that they have them like say on Maya if you're stuck and you've got someone next to you who is ahead of you, you know that they have the answer-...

You just say 'how did you do that bit?' and they'll say oh 'I did this and this'.
(Blake, Bruno, Ken, Archie and Boris, BTEC L3 multimedia)

In all of the above models-in-inter(action) (Gee, 1999) the DMC-FDM act as if part of a network; in which different learners possess knowledge of differing yet specific digital and media literacies used in the solution of creative problems. Unlike the home and Emulator-DMC-FDM, the

network available to the Academics is extensive it is not curtailed by their FDM identities. Requests are made on the basis of achieving a creative goal. Requests may be made multiple times to any learner with the desired knowledge.

7.4.5 Summary of refined research question three

In the first and second chapters of this thesis, I argued that the DMC began as a teacher-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012); but in each new generation has been steadily migrating towards a learner-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012). Yet, in section 6.2.1, I argued that the DMC is still teacher-centred not by design but due to learner reluctance (Turner, 2010) to fully participate in the co-construction of learning experiences.

From the perspective of the DMC-FDM digital-making within compulsory education should focus on the establishment of basic habits. In post-compulsory education, digital-making should focus on the tutorial conveyance of the digital and media literacies used in the construction of complex digital public entities. In the post-compulsory classroom, tutorial social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) should be individualised according to the identities of the DMC-FDM. Thereby, accelerating the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) and the development of FDM identities. The classroom is viewed by the DMC-FDM as the setting in which to learn the digital and media literacies used to construct complex digital public entities, through social interaction with tutors. Tutorial social interaction should supplement any deficiencies regarding experimentation, progressive problem solving (Bereiter and Scardamalia, 1993), decision-making and identity construction. The DMC-FDM want digital-making in the classroom-setting to be teacher-centred.

Nonetheless, for the majority of the DMC-FDM, digital-making in the post-compulsory classroom; focuses too much attention on the establishment of basic digital-making habits previously unaddressed in compulsory education. Consequently, the majority of the DMC-FDM are dissatisfied with tutorial social interaction. For many, this discontentedness began in their compulsory education and was carried into their current DMC courses. I suggest that each category of DMC-FDM, responds to discontentedness by trying to reconstruct learning experiences in the classroom-setting according

to the traits of their FDM identities. The home-DMC-FDM chose to ignore instructions and feedback that is not useful for progressive problem solving. The Emulators only choose to accept instructions and feedback, if a resemblance between themselves and their tutors is initially perceived. The Academics only require the perception of tutorial competence before choosing to accept instruction and feedback. All categories of DMC-FDM seek more learner-centred learning experiences through their choices within the DMC. The Mavericks adopt the most radical approach via the mantra of “I want to do things my way, not yours.”

Peer-to-peer social interactions are another attempt by the DMC-FDM to foster a more learner-centred learning experience in the classroom-setting. In their interactions with peers, the DMC-FDM are far less demanding and more readily accept limitations concerning knowledge of digital-making. For instance, Boris of the Mavericks states: “There's not one person that you would go to for help, there isn't one person that knows literally everything and you can ask them. Everyone kind of knows different things-.” Throughout this chapter, the DMC-FDM have not viewed their tutors as experts, yet have become dissatisfied with the limitations of tutorial social interaction. The majority of DMC-FDM attribute their discontentedness to gaps in tutorial knowledge, for example, Ken's description of his former ICT tutors as ‘useless’. Only a few DMC-FDM such as Vaughan and Boris recognise that tutorial social interaction is constrained by the environment of the classroom: “I really don't think he's trying to limit what we can do. I think he's trying to help us get the criteria for this specific course.” Learners on a DMC course function as a de facto support network that fulfils in part the role of the tutor in the classroom-setting, in response to their discontentedness.

Ken: Plus, if we were just doing it at home, we wouldn't have a whole class community, which is how we strengthen each other because we build upon each other.
(Ken, BTEC L3 multimedia)

The network offers the DMC-FDM a quick and convenient means of temporarily shifting the burden of progressive problem solving onto their peers. In some cases, learners may even gain digital and media literacies not present in their social interaction with tutors. For the sake of clarity, DMC-FDM may also choose to include favoured tutors within the de facto network. For, example Vaughan's favouring of Louisa and Hannah in sections 7.2 and 7.3.1.5. Nevertheless, the inclusion of tutors is not the primary purpose of the network.

7.5 Refined research question four: What are Frequent Digital-maker(s) (FDM) rationales for and against participation in Digital-Making Curriculum (DMC) courses?

To a large extent, this question has been answered in the discussions for refined research questions two and three. All the same, the DMC-FDM and the non-DMC-FDM did state specific rationales for their choices of DMC and non-DMC courses. The majority of the DMC-FDM are in pursuit of a future creative career and view the qualifications offered by DMC courses as obligatory in the least or essential at the most. The DMC-FDM view social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors as vital to the expedition of learning the digital and media literacies used to construct complex digital entities. The DMC-FDM also simply enjoy digital-making. Such rationales are unsurprising and may be commonly found in the literature concerning ICT related subject choice. The focus of this section will be on the reflexivity (Gee, 1999) present in the language of the DMC-FDM, which not only reflects their individual FDM identities but also constructs learning trajectories leading towards future desired realities.

7.5.1 The rationales of the non-DMC-FDM, against participation in DMC courses

The rationales of the leisurely non-DMC-FDM against involvement in DMC courses were stated in section 7.4.2. Ron and Zack are both of the opinion that digital-making is a stress relieving hobby, not to be studied formally. The rationales of the pseudo-professionals are more complex for instance Ramona states:

I did do art for A-level, but then I wanted to do art A-level here, but then they didn't do it, so I didn't really know I wanted to go down the creative route when I started AS, so I just picked basic subjects. But now I do want to do a creative degree, so I might do a foundation year after my A-levels. (Ramona, A-level: sociology, law and English Literature)

Ramona is a pseudo-professional due to the lack of an equivalent A-level art course at Large college. However, it is significant that despite her pseudo-professional identity, Ramona was not sure if she wanted to pursue a creative course. In this sense, she shares similarities with Jason who made the opposite decision in section 7.3.1.6. Her description of her A-levels as “basic subjects” and her

interest in a creative degree imply that similar to Jason she is also dissatisfied with studying courses that do not align with her FDM identity. Her decision to choose other non-DMC A-levels is then an example of political and sociocultural reflexivity (Gee, 1999). Ramona was either unwilling or unable to change from the study of A-levels to that of a BTEC; I suggest due to the perception that A-levels are perceived more prestigiously. The social goods associated with A-levels for example more favourable entry into HE influenced her choice of study more strongly than her FDM identity. Keisha of the BTEC Sports course made a similar decision:

Like before this, I studied Psychology, English literature and Business. But then as I did like one year and I thought I don't really want to do this anymore. Because it was just like because They told us we had to choose a range, so we could have like different opportunities and careers. But I all I really wanted to do was sports, so I could focus on one thing and get all the qualifications for that one thing-
(Keisha, BTEC L3 Sports)

Similar to Ramona, Keisha was presented with a range of options by others. The implication in both examples is the lack of recommendations to study a DMC course in the social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) of the individuals that advised Ramona and Keisha. Within the options presented to Ramona and Keisha the significance of DMC courses was either downplayed or not expressed. Potential DMC learners may not be aware of all their available options. It is significant that despite her extensive musical experience in which she had a music recording contract with Sony records, Keisha opted to study sports instead. Once again, I suggest that her language includes political and sociocultural reflexivity:

You see how there's academies for football-... If there were music academies where-... That's what I mean, the possibility of it. So If there were more of those, where you knew you were going to get somewhere by the end of it, because like here we know there's going to be-, depending on how hard we try, there's somewhere to go at the end of it. So, in music, if there was something like that, then more people would-. Because, loads of people are going to go to Brit school and I thought, do I really want to do that?... Through sports, if we don't make it professionally, we'll still can be like... Yeah, we'll still have a job like we can work in schools, we can become coaches and work our way up through that way.
(Keisha, BTEC L3 Sports)

Keisha's choice to join her current course is rooted in pragmatism, sport is the safer option when compared to music because she can more easily perceive the connections between education and professional sporting careers. In section 6.2, I argued that pragmatism is the driver of non-DMC-FDM choices. The decisions made by Ramona and Keisha reflect their identities as non-DMC-FDM.

Likewise, Duke also produces digital music at a near professional standard but chose to do sports; when asked why Duke responded:

Whatever flies- at me... If you get slapped with a contract, of either one... So if you get slapped with a contract for Tottenham... Obviously, you will take up that course- F like forget about football I would take that forget about thing out of all I'd take that that's my day job now, that's my day job. So obviously Whichever one comes first, and I'll be like 'cool!' deep, deep. That's how it is with me.
(Duke, BTEC L3 Sports)

Initially, Duke ponders accepting a contract to play football for Tottenham Hotspurs; but then states that he would quit football if he was offered a publishing contract with a music recording label. He is content to accept whatever offer he receives first due to his pragmatism. Similar to Keisha, Doris also struggles to see the connections between education and creative professional careers as discussed in section 7.4.2. Even so, she regrets her choice to discontinue her study of music, similar to Duke she would quit if offered a music publishing contract:

yeah- I wish I did take that option now, though. I do wish-. I love sport but... I would do it.-I would be like bye everyone... And now it's back to music, at the moment- I wouldn't even do sports. So forget sports-
(Doris, BTEC L3 Sports)

It appears that the rationales of the non-DMC-FDM reflect their identities but do not construct learning trajectories related to professional creative careers, despite their desires to become creative professionals.

7.5.2 The rationales of the home-DMC-FDM, for participation in DMC courses

Susie's identity as a creative expert home-DMC-FDM permeates her rationale for enrolling in the BTEC art and design course:

Pretty much the same except I kind of knew I wanted to be an illustrator, but I didn't want to be pinned down, I wanted to try other stuff and know for sure that I wanted to be an illustrator first. But it was more like I was more used to working in pen and ink and I just thought to learn to improve on that sort of thing, and I would normally use digital stuff to touch up and then I started working with Illustrator and stuff like that. I happened to be good at it, so I carried on learning and I just got better and better.
(Susie, BTEC L3 art and design)

One of the definitive characteristics of her FDM identity is her reliance on experimentation for the solution of creative problems. It is important to note that Susie's tendency to experiment was at

the core of her FDM identity before she joined her current DMC course. The words “I didn't want to be pinned down, I wanted to try other stuff and know for sure that I wanted to be an illustrator first” are an example of semiotic reflexivity (Gee, 1999). These words construct a learning trajectory by which Susie will achieve her goal of becoming an illustrator. It is also important to note that at no point does Susie refer to tutorial social interaction in her rationale. It was never her intention to engage in much tutorial social interaction in the expedition of her learning trajectory. Reflecting her identity as a creative expert; her interest in the art and design course was with its creative software for the purpose of experimentation. This is an example of the activity aspect of reflexivity (Gee, 1999) and it reflects her reality before she joined art and design. Susie was already in an advanced position on the discourse of the digital-maker. She did not join her course to obtain political social goods (Gee, 1999) as this is not her concern as argued in section 7.3.1.1. Therefore, Susie's rationale aligns well with her FDM identity. In section 7.3.1.2 I stated that the technical modifier is driven by inquisitiveness and the accumulation of knowledge. Both of these characteristics are present in Ian's rationale:

Yes, to broaden my idea. When I was little and found out about computers, I loved computers, but I had no idea what jobs there are in computers. And then, when I asked somebody, they told me about several different jobs. I was like, okay, what is it like doing those jobs, what are they about? So although at first, I thought networking sounds good, but then when I did the course, I figured out what I really enjoy more. So it gave me the idea of learning what jobs are there.
(Ian, BTEC L3 information technology users)

Similar to Susie, Ian's rationale contains semiotic reflexivity which here; signifies the learning trajectory Ian will utilise to learn more about jobs in IT. Ian intends to engage in tutorial social interaction more than Susie this is indicated by the words “Yes, to broaden my idea... when I asked somebody, they told me about several different jobs... what is it like doing those jobs, what are they about?” In sections 7.3.1.2 and 7.3.1.3 I mentioned that technical modifiers are less inclined towards experimentation in comparison to creative experts. Technical modifiers are more dependent on social interaction for the solution of creative problems. Notwithstanding, Ian is still a home-DMC-FDM and retains the onus for his decision-making and the development of his identity. Tutorial social interaction is only useful in presenting previously unknown information. The final decision about possible career paths will be made by Ian as indicated by the terms “I figured out what I really enjoy more”. This is significant because it reflects Ian's current reality before participating in the BTEC ITU course. The sociocultural reflexivity (Gee, 1999) of the previous statement highlights Ian's perception of the role of

his tutors in the learning process. Tutors are there to extend and expand learning but are not to decide the course of learning. One may also argue that the previous statement is also an example of political reflexivity (Gee, 1999); in that Ian has deemed tutorial social interaction to be a social good (Gee, 1999) distributed by tutors towards learners. Political reflexivity was not as apparent in Susie's rationale, as she had little intention to engage in tutorial social interaction. In contrast, political and sociocultural reflexivity (Gee, 1999) are prominent in Seydou's rationale:

Yes, I.T., I think it's one of the most important courses on the planet, really, right now, after like science and stuff it is a part of science. But technology is developing so much, it's never going to end, it's always going to develop, so the world needs people with technical knowledge to implement stuff and make things work together. Take a look at science, you're a biologist, you look at only Biology, you're a chemist, you look at Chemistry, but with technology, it's a wide aspect it's just a big route. And even in science they use technology, so you're going to have to develop things to them as well. So it's limitless, really, you're going to; you're definitely you're bound to find a job, bound to. (Seydou, BTEC L3 information technology users)

Unlike Susie and Ian, Seydou does not mention a specific career choice, because he deems himself as so important that he cannot be unemployed. Seydou's rationale is based on what he perceives as a guaranteed career in IT upon the completion of his education. To an extent, he is correct in saying that technology will continue to develop and that individuals with technical knowledge will be in demand. Still, I suggest that terms such as "one of the most important courses on the planet" and "so the world needs people with technical knowledge to implement stuff and make things work together" reflect the narcissism of Seydou's FDM identity and current reality.

Seydou's global view of the importance of technology education is actually a projection of his importance in his future desired reality. Seydou is attracted to the power and status of being one of the few indispensable people on the planet with the technical knowledge needed by the world. At the start of the rationale, Seydou acknowledges the importance of science but then dismisses it by the end. I suggest that Biology and Chemistry are metaphorical representations of individuals with lesser or limited technical knowledge; by highlighting the dependence of science on technology Seydou is, in essence, magnifying his power and status. Much like the manner in which he elevated himself above his peers in section 7.3.1.3. The learner becomes greater than the tutor hence his statement in section 7.3.1.4 "we are the best teachers of ourselves." Seydou's learning trajectory is that of self-reliance similar to Susie and Ian. As a home-DMC-FDM, Seydou retains the responsibility for

decision-making and identity development; yet Seydou makes no references to experimentation or tutorial social interaction, due to his narcissism.

7.5.3 The rationales of the Emulator-DMC-FDM, for participation in DMC courses

The rationales of the Emulators are examples of activity and material reflexivity (Gee, 1999). In the rationales given by Vaughan and Jason their current FDM identities did not begin until both had entered an environment that facilitated their preference for learning by imitation:

I chose to do art and design because I just sort of really liked fine arts, at first, and I've always loved art and stuff, but I've never even did digital arts before but I sort of I got more into it when I learned more about graphic design in general, when I went to exhibitions, university exhibitions, and actually understanding what graphic design is. Then I started to get interested and I sort of dove straight in and had a knack for it. So that's how.
(Vaughan, BTEC L3 art and design)

The same with me, I was 9 years old when I got my first computer and I knew it I would do something with the computer. I even tried something different than I.T., I tried art & design I waste one year of that. But no, no, I.T. is my thing and I came back.
(Jason, BTEC L3 information technology users)

Each of these rationales highlights the dependency of the Emulators being in an appropriate environment. In section 7.4.1 I argued that a learner cannot construct a digital public entity that is unrepresentative of the environment in which it is situated and the digital and media literacies within. I also argued that MKO (Vygotsky, 1930-1934/1978) must also socially interact in a manner congruent with the inhabitants of the environment. Social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) appears then to magnify the appropriateness or inappropriateness of the environment for the Emulators. Therefore, the language of the Emulators is limited in its construction of future desired realities. By this, I mean that the rationales given by Vaughan and Jason could not have been foreseen by either. Both rationales are judgements of prior dissatisfactory MKO social interactions within an inappropriate environment. Neither rationale could have been conceived before entering the inappropriate environments. Due to the Emulators' preference for learning by imitation and their need to perceive a resemblance between their career aspirations and the knowledge and experiences of their tutors. Neither rationale contains much semiotic reflexivity (Gee, 1999) when compared to those of the home-DMC-FDM. The language of the Emulators can only reflect their present reality. Without prior experience of an environment the rationales of the Emulators become explorative:

I chose this course the same as Ian, to broaden my knowledge about I.T. and to find out what I like the most and what I'd like to do as a career.
(Tevin, BTEC L3 information technology users)

Tevin's rationale appears to resemble Ian's, yet it lacks specificity. Tevin does not name a specific job before joining the BTEC ITU course. Nor does he make any references about social interaction, because he cannot do so until he has entered and experienced the environment of the DMC course. Once the Emulators have experienced the social interaction, materials and activities of an environment their rationales become more specific:

That's one of the reasons why I went into graphic design. It wasn't because I got taught it. I could have been taught it and still hated it. I think it's because of the artists who were doing something completely different with the programs, because the teacher is like 'this is this, this is this', step by step by step. Or even if they try-, 'oh, you can do this differently', I didn't really like it.
(Vaughan, BTEC L3 art and design)

The above rationale could only occur after experiencing the discontentedness of tutorial social interaction on his current art and design course, as I discussed in section 7.4.3.

7.5.4 The rationales of the Academic-DMC-FDM, for participation in DMC courses

The rationales of the Academics are the most straightforward of the DMC-FDM. Many of their rationales are unsurprising such as those mentioned in section 7.5. For example, Basil chose to join the BTEC ITU course because he enjoyed IT GCSE during his compulsory education; as I stated in section 7.4.4:

I just personally really enjoyed I.T. in secondary school, so that's why I chose it, mainly. And there's a lot of future in it, with careers and stuff. So that's one of the reasons.
(Basil, BTEC L3 information technology users)

The semiotic reflexivity (Gee, 1999) of Basil's language simultaneously reflects his Academic identity and constructs a learning trajectory leading towards a desired future reality in which he is an IT professional. In section 7.3.1.8 Nicola stated that she engaged in digital-making to express her feelings. One must remember that Nicola has considerably less experience of digital-making, in

comparison to all the other Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM). She is still within her formative digital-making experiences and she is the most reliant of DMC-FDM on her tutors for decision-making and identity construction:

I just drew on Portrait when I came into the art course, but when I got introduced to Photoshop and digital softwares and finding out that I could express my personalities through them made me take an interest in it.
(Nicola, BTEC L3 art and design)

Nicola's rationale may appear similar to Basil's, in terms of her enjoyment, nonetheless, the reflexivity (Gee, 1999) of her language concerns material and activity. Her interest is piqued when she becomes aware that complex digital public entities can communicate messages, instructions, symbols, meanings and understandings; as I discussed in section 3.2. Her rationale reflects her FDM identity, but it does not construct a learning trajectory because Nicola is reliant on her tutors to construct one on her behalf, therefore, her language does not contain much semiotic reflexivity. In contrast, the rationales of the Mavericks heavily feature semiotic reflexivity. The language of the Mavericks is almost entirely focused on the construction of learning trajectories for instance:

It doesn't bother me, it's not like I'm paying for this course and this course is going to grab me a qualification which looks good in the industry, whereas if I learn something online, I'm not going to be able to put that in my CV, saying I know how to do this. But if I say I've got a qualification in this, it takes me further.
(Ken, BTEC L3 multimedia)

If anything, I say it's helpful, because you're now got the experience, and you've got experience firsthand from the people, you've got experience, and they've told you where you've gone wrong and where you've gone right. And even if the stuff is available at home, you're still not going to be able to master it as you were, both technology and human.
(Archie, BTEC L3 multimedia)

She got in, she's working in the industry now because she met Morris. She wouldn't be doing that if she just learned online. She'd be at the job centre.
(Boris, BTEC L3 multimedia)

Of all the DMC-FDM, the Mavericks were the most radical in seeking the establishment of more learner-centred (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012) tutorial social interaction (Vygotsky, 1930-1934/1978; Turner, 1988). In each of these rationales, the Mavericks are expressing their hopes of where tutorial social interaction will lead. The Mavericks want tutorial social interaction to lead towards a desired future reality; in which they are creative professionals with mastery of digital-making. The rationales do not focus much on their

current FDM identities because the Mavericks are still in the process of discovery; due to their commitment to self-expression over progressive problem solving (Bereiter and Scardamalia, 1993).

Throughout, chapters six and seven, I have argued that engagement in progressive problem solving is vital for the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) and the development of identity. The Mavericks are resistant to problem-solving (Vygotsky, 1930-1934/1978; Bereiter and Scardamalia, 1993; Gee, 2003) and prefer to shift this responsibility onto their tutors and this is evident in their rationales. The Mavericks are still defining their FDM identities, aside from their preference for digital-making in the classroom-setting to avoid the burden of problem-solving. Therefore, the language of the Mavericks can only reflect their FDM identities to the degree to which it is defined. For example, the narcissism of Ken's identity is present in his rationale indicated in the term "this course is going to grab me a qualification which looks good in the industry." Once again Ken is partly motivated by the social goods (Gee, 1999) of prestige and status. None of the other Mavericks was concerned with social goods other than the distribution of digital and media literacies from tutor to learner through social interaction.

7.5.5 Summary of refined research question four

The rationales of the DMC-FDM and non-DMC-FDM share the same common trait, all chose to join courses that aligned with their current FDM identities. In section 7.3.1.6 I argued that the DMC-FDM initially perceive their identities through their career aspirations and personal enjoyment of the subject. I suggest that the majority of rationales stated by both groups of FDM support my argument. Nevertheless, in the cases of the non-DMC-FDM and to some extent the Emulator-DMC-FDM; career aspirations and personal enjoyment were not included in the rationales, or only appeared after a prior dissatisfactory experience.

I suggest that the reflexivity (Gee, 1999) within the language of Both FDM groups accurately reflects their identities; of which the learners have an awareness. In short, DMC-FDM and non-DMC-FDM are well attuned to their present realities, via their understanding of their capabilities as FDM. The choice for the DMC-FDM, of course, is not based on the maintenance of their present reality but rather their desire to manifest a favourable future reality through the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992).

In section 6.2, I argued that the motivation to join a DMC course must in part be influenced by a desire to alter the identity, environment or reality of the digital-maker. I now suggest that the desire for alteration was more apparent in the rationales of the DMC-FDM in comparison to the non-DMC-FDM. The reason being that the reflexivity (Gee, 1999) of the non-DMC-FDM struggled to construct learning trajectories leading towards a future desired reality, due to their greater maturity of pragmatism. With the exception of the leisurely non-DMC-FDM, in each instance of the decision to join a non-DMC course or even an inappropriate DMC course pragmatic attitudes were displayed.

7.5.6 Summary of situation network

In section 7.1, I stated that this chapter would form a situation network that will support the discourse of the digital-maker discussed in Chapter Four. For the benefit of the reader, a situation network is the combination of situated meanings, cultural models and reflexivity (Gee, 1999). I suggest that the combination is most apparent in the social interaction between the DMC-FDM and their tutors and other MKO (Vygotsky, 1930-1934/1978). Commenting on Gee (1999) Bøilerehaug (2004) observed that:

When we construe the “situation” network in certain ways (and not in others), we carry out six building tasks referring to the reciprocal process by which language both creates institutions and is created by institutions (Gee 1999: 11) ...Through the tasks we use language to construct what Gee calls the situation network, and the six tasks include: - semiotic building (semiotic (communicative) systems) - world building (situated meanings regarding “reality”) - activity building - socioculturally-situated identity and relationship building - political building (establish what is social goods – such as status and power) - connection building (concerning past and future connected to the present) ...In other words, the building tasks form or construct six different aspects of “reality”. (Bøilerehaug, 2004, p. 8-9)

I assert that within the social interaction of the DMC-FDM and their tutors all six building tasks are present. In the context of this chapter, I suggest that semiotic building relates to the feelings of satisfaction or discontentedness felt by the DMC-FDM and non-DMC-FDM as a result of tutorial social interaction. These feelings are the most rudimentary signs of the FDM identities possessed by learners and the learning trajectories they will adopt in the settings of the home and the classroom. For example, the satisfaction of Basil and Nicola was a sign that both were Academics. The identity most appreciative of the knowledge and experiences of their tutors. The Academics are also the most willing to adopt the model of learning by imitation.

World building refers to the construction of FDM identities by learners and tutors. For instance, in section 7.3.1, I stated that reality and identity are one and the same, for the DMC-FDM. The identities discussed in this chapter are accounts of the differing realities of digital-making in the home and the classroom-settings, as experienced by each focus-group participant. Within the discourse of the digital-maker six situation networks are present: the home, Emulator, and Academic and Mavericks; and the leisurely and pseudo-professional non-DMC-FDM.

Activity building relates to the construction of digital public entities, especially the differing approaches towards creativity in the forms of experimentation, self-expression and progressive problem-solving in the home and classroom-settings. For example, the home-DMC-FDM differ greatly in their creative approaches in comparison to the Academics. Consequently, neither group experiences digital-making in the same fashion.

Sociocultural-situated identity and relationship building refers to the home and classroom-settings of the third space. In particular, the influence of both settings on the historical formation of FDM identities and the relationship of such identities with MKO inside and outside of education. For instance, traits possessed by the home-DMC-FDM can only occur if decision-making and construction of identity are situated in the home-setting. There is no other way to develop this FDM identity. The choice to situate their FDM identity in the home-setting is influenced by not only their personal enjoyment of digital-making but also a historical discontentedness with tutorial social interaction during their compulsory education.

Political building relates to the relationship between the DMC-FDM and their tutors, both of whom vie for the role of MKO within their social interactions. The DMC-FDM are only content to confer power and status onto tutors that expedite progressive problem solving (Bereiter and Scardamalia, 1993) and the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992). The criteria for power and status varies in each categorisation of DMC-FDM and non-DMC-FDM. The power struggle between learners and tutors is most apparent in the experiences of the Emulator and Mavericks. Both groups seek to impose their notions of digital-making onto their tutors, by excluding or even rebelling against dissatisfactory tutorial social interaction.

Connection building refers to the connection between FDM identities and uses of learning trajectories. The group that has the most tenuous connection is the pseudo-professionals. These learners are comparable to the home-DMC-FDM in terms of knowledge and experience, of digital-

making. All the same, due to the greater level of pragmatism in their FDM identities, the pseudo-professionals cannot perceive the benefits of the learning trajectories within the DMC.

Through tutorial social interaction, situated at the core of the DMC six realities have emerged. Each reality giving a different account of digital-making in the settings of the home and the classroom; within the third space for learners on DMC courses and non-DMC courses. The chapter has explored how the choices made by the learner within these realities are affected by their informal experiences of digital-making outside of education. The chapter has also discussed the prior experiences of digital-making in compulsory education and its effect on the choices made by learners, including the rationales for and against further study on DMC courses. In the next chapter, I will discuss the meanings of the research findings presented in chapters six and seven.

Chapter Eight: Discussion

8.1 The relationship between formal and informal digital-making and prior experience of digital-making in the settings of the home and classroom

In this chapter, I will discuss the meanings of the themes that emerged from the results of the survey of Chapter Six, and the focus-group interviews of Chapter seven. Some of the emergent meanings were discussed in both chapters, I will expand on those discussions and focus on new meanings that were previously undiscussed. The major theme of both results chapters is the relationship between a) formal and informal digital-making in the settings of the home and the classroom, and b) prior experience of digital-making in both settings and choice of Digital-Making Curriculum (DMC) or non-DMC courses. I suggest that the nature of the relationship between a and b differs depending on which setting of the third space the Frequent Digital-maker(s) (FDM) prefer to situate their digital-making, the home or the classroom.

In sections 6.2 and 7.3.1.10, I argued that the Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM) establish their criteria for decision-making and FDM identity construction in the home-setting. The definitive differentiator between the home and classroom-DMC-FDM is the extent to which they are willing to cede autonomy in decision-making and FDM identity construction to their tutors. The home-DMC-FDM prefer to retain as much autonomy as possible. The classroom-DMC-FDM are more willing to relinquish their autonomy.

For the classroom-DMC-FDM, these being the Emulators and Academics, the relationship is rather straightforward. Positive experiences of digital-making during compulsory education favourably influence the decision to join a DMC course in post-compulsory education, such is the case with Basil in section 7.5.4. Conversely, the lack of exposure to digital-making during compulsory education may also positively influence the choice to enrol in a DMC course, as in Nicola's experience in the same section above. In both cases, the absence of negative prior experiences of digital-making in the classroom-setting is highly significant. Basil and Nicola had no reason to disdain DMC courses based on their previous experiences. One must remember that the Academics do not engage in much if any at all digital-making in the home-setting situated in the higher stages of the discourse of the digital-maker: experimentation [higher], logical instruction and creative expertise. For the Academics in the

home-setting digital-making would most likely concern personal entertainment and lifestyle pursuits (section 6.2). Basil and Nicola are inclined to view digital-making favourably.

However, one must also remember that Basil and especially Nicola were the only FDM that implicitly and explicitly expressed satisfaction with tutorial social interaction (Vygotsky, 1930-1934/1978; Turner, 1988). In Nicola's case, satisfactory social interaction with tutors only occurred after she had joined her BTEC art and design course. For the rest of the classroom DMC-FDM, the dissatisfactory tutorial social interaction was the norm, for example, Vaughan's experience in Section 7.5.3. One must remember that the Academics enjoy digital-making, even so, their enjoyment is situated in the constructed digital public entity and not in its processes of construction, as I argued in Section 6.2.3. The most prominent example of enjoyment is the self-expression of the Maverick-Academic-DMC-FDM (Mavericks) in section 7.4.4. Self-expression is used by the Mavericks to justify their self-perceived innate creativity and to avoid engagement in progressive problem solving (Bereiter and Scardamalia, 1993).

The classroom-DMC-FDM dislike progressive problem solving and prefer to let More Knowledgeable Other(s) (MKO) (Vygotsky, 1930-1934/1978) provide convenient solutions (section 6.2.3). I suggest that the discontentedness felt by the classroom-DMC-FDM is not greater than their dislike of progressive problem-solving. Hence the classroom-DMC-FDM opt to join DMC courses in the hope of receiving expeditious and efficient ready-made digital and media literacies (section 6.3) available through tutorial social interaction (chapters six and seven sections six 6.3 and 7.3.1.1).

In section 4.1.1, I argued that dissatisfaction is the stimulus for fantasy; I elaborated on this argument in section 6.2.1 when I stated that the cost of the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) is a greater dependency on MKO. I suggest that classroom-DMC-FDM are willing to bear the cost of dependency. Their discontentedness with the tutorial social interaction on their current DMC courses; is due to a perceived lack of ready-made literacies or 'coerced' engagement in progressive problem solving (Bereiter and Scardamalia, 1993), as implied in the classroom-setting experiences of the Mavericks in section 7.4.4.

With the exception of the leisurely non-DMC-FDM, the relationship between a and b is less straightforward for the home DMC-FDM and the pseudo-professional non-DMC-FDM (pseudo-professionals). The leisurely non-DMC-FDM view digital-making as stress relief from the tensions of

A-level study, (section 7.3.1.4). Regardless of their prior experiences of digital-making in the home or the classroom-setting, the decision to join a DMC course is illogical. The same cannot be said of the home-DMC-FDM and the pseudo-professionals, both of whom view digital-making much more seriously. Both groups are skilled in digital-making and both aspire to become creative professionals. Notwithstanding, only the home-DMC-FDM choose to enrol in DMC courses and this is peculiar considering the shared characteristics of FDM that situate their digital-making in the home-setting.

I suggest that the decisions of the pseudo-professionals and the home-DMC-FDM most illustrate the tensions between pragmatism and fantasy (Vygotsky, 1930/1967; Smolucha, 1992). In section 6.2, I argued that pragmatism is nurtured in the home-setting, whereas fantasy is nurtured in the classroom-setting. One must remember that the digital-making experiences of the home-DMC-FDM and the pseudo-professionals in the classroom-setting are comparable. Both were dissatisfied with tutorial social interaction during their compulsory education despite their enjoyment and aptitude for digital-making. Still, in section 6.2.1 I argued that the DMC-FDM recalled the influence of school much more often than the non-DMC-FDM in their recollections of digital-making in compulsory education. I suggest that the home-DMC-FDM recall the influence of school more than the pseudo-professionals because more of their social interaction with MKO occur in the classroom-setting than in the home-setting. In sections 7.3.1.1 and 7.3.1.4 I mentioned Susie's frustrations with her lack of access to MKO in the home-setting. Ian and to a lesser extent Seydou also had little social interaction with MKO in the home-setting. All three home-DMC-FDM were inclined to complainingly acknowledge the expertise of their tutors as MKO in section 7.4.1. In sections 2.2.2 and 7.4.1 I argued that a learner cannot construct a digital public entity that is unrepresentative of the environment in which it is situated and the digital and media literacies within. Regardless of their discontentedness, social interaction with their tutors contributed to the maturation of fantasy in the home-DMC-FDM. The home-DMC-FDM possess greater maturation of fantasy in comparison to the pseudo professionals.

In section 6.2.1 I argued that the non-DMC-FDM constructed digital public entities with only minimal social interaction with MKO. I now wish to revise this claim, minimal MKO social interaction only applies to the leisurely non-DMC-FDM. The pseudo-professionals all frequently engage in social interaction with MKO in the home-setting, this is implied in their title. Ramona, Doris, Keisha and Duke produce digital art and music at professional or near-professional standards (section 7.3.1.4). In the home-setting all four are functioning as the creative professionals they aspire to be. For instance,

Ramona spoke in detail about the process by which she creates portraiture for her clients. Doris has produced music for Maxtor a popular recording artist. Keisha was formerly signed as a recording artist to Sony records and Duke knows the famous music producer Richard Roundtree. Based on their experience it is reasonable to conclude that the pseudo-professionals have encountered professional artists and musicians and other MKO in their construction of various digital public entities. Therefore, the pseudo-professionals have a greater maturation of pragmatism through social interaction with MKO in the home-setting.

In section 6.2 I stated that pragmatism is the ability to imagine, realise and materialise a desired present reality. In contrast, fantasy is the ability to imagine, realise and materialise a desired future reality (Vygotsky, 1930/1967; Smolucha, 1992). I suggest that the pseudo-professionals are more content with their FDM identities in comparison to the home-DMC-FDM, this is in keeping with the Vygotskian perspective (Vygotsky, 1930/1967; Smolucha, 1992). The decision to join a DMC course is also a statement of the intention to evolve their FDM identities through the digital and media literacies of DMC courses. Due to their contentment, the pseudo-professionals do not seek to evolve their FDM identities and subsequently do not seek to join DMC courses. The pseudo-professionals are already functioning in a capacity like that of creative professionals and seek learning trajectories that will maintain their current FDM identities until professional status is conferred upon them. Yet, the pseudo-professionals, realise that such trajectories are risky and so choose non-DMC courses as a safety offset, (section 7.5.1). I suggest that when non-DMC courses are selected as a 'safe' option the pseudo-professionals, engage in yet another act of maintenance of their present realities.

I suggest that like the classroom-DMC-FDM, the discontentedness of tutorial social interaction is lesser than the desire to accelerate the manifestation of a future reality in which the home-DMC-FDM have obtained careers in their chosen creative fields. Hence, the home-DMC-FDM opt to join DMC courses.

In short, the choice of whether to join a DMC course becomes that of its perceived utility in providing learning trajectories that promote fantasy or maintain pragmatism. This choice is greatly influenced by the setting in which the majority of MKO social interactions occur, regardless of previous experiences of digital-making during compulsory education. The relationship between a and b is summarised in this choice.

8.2 The DMC-FDM perceptions of digital-making in the classroom-setting versus the realities

The DMC-FDM perceive the classroom as the setting of the third space in which complex digital-making occurs (sections 7.4.1, 7.4.3 and 7.5.3). The home, Emulator, Academic and Maverick-DMC-FDM all chose to join DMC courses for the purpose of accelerating the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992). The DMC-FDM experiences maturation as the extension and legitimisation of their existing digital and media literacies, as I argued in section 7.3.1. These literacies are then aligned by the DMC-FDM or their tutors with the existing FDM identities and are extended into learning trajectories that will lead towards desired future realities. One must remember that in section 7.3, I stated that the digital-maker identities are actually the learning trajectories adopted by FDM in response to social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) with tutors. I suggest that the learning trajectories are most apparent as the approaches towards progressive problem solving (Bereiter and Scardamalia, 1993) exhibited by the home, Emulator, Academic and Maverick-DMC-FDM as discussed throughout the previous chapter. The DMC-FDM, expect DMC courses and tutors in compulsory education to achieve the above purpose. The questions here are then what are these digital and media literacies and why is there so much discontentedness with tutorial social interaction? To answer these questions, I offer the following diagram:

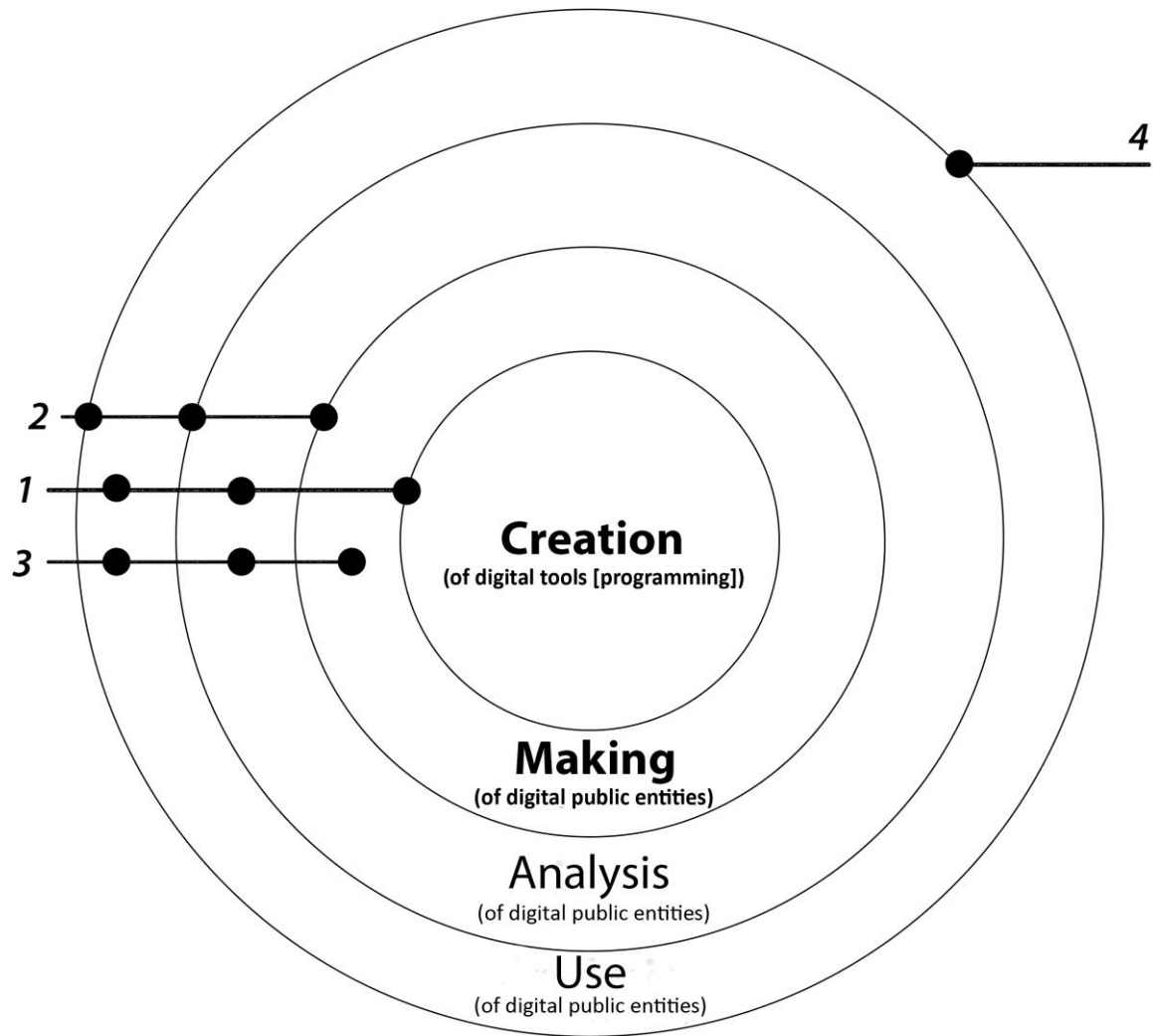


Figure 2: The spectrum of the digital and media literacies in DMC courses

Key

1. DMC: BTEC level 3 – Information Technology Users
2. DMC: BTEC level 3 – Art and Design
3. DMC: BTEC level 3 – Computer Animation, Games and Web Design (Multimedia)
4. Non-DMC: BTEC level 3 – Sports
4. Non-DMC: A-level – Sociology, Physics, Mathematics, Law and English Literature

In chapter 3, I discussed the existence of digital and media literacies as a spectrum (Buckingham, 2003; Belshaw, 2014). Rather than creating an exhaustive list of literacies, I find it more beneficial to create a spectrum instead. The circles represent groupings of digital and media literacies that concern the use, analysis, making and creation of digital public entities and digital tools. The dots

represent the scope of tutorial social interaction on each of the DMC and non-DMC courses discussed in chapters six and seven. The literacies of the outermost circle are the most common and straightforward to obtain. The literacies of the innermost circle are the least common and most difficult to attain. When enrolled in a DMC course the learner will begin at the outermost circle and travel inwards via social interaction with tutors. Tutorial social interactions, define the environment of the DMC or non-DMC course. In section 7.4.1, I argued that a learner cannot construct a digital public entity that is unrepresentative of the environment in which it is situated and the digital and media literacies within. In the classroom-setting, the learner cannot obtain literacies that are not within the scope of tutorial social interaction. In section 6.2.1, I argued that the transition to more complex forms of digital-making occurs in increments as stated in the work of Ito et al. (2010) and Rowsell (2013). Therefore, the learner cannot obtain literacies beyond the pace of tutorial social interaction.

For example, learners on the non-DMC-FDM courses cannot obtain literacies regarding the analysis, making and creation of digital public entities and digital tools within the classroom. These learners must then obtain such literacies in the home-setting, as is the case with the pseudo-professionals. The scope of tutorial social interaction is simple, the literacies regarding analysis, making and creation are not the dominant or fundamental focus of the curriculum. Digital-making only extends to the use of software on non-DMC courses.

However, regarding DMC courses the obtainment of digital and media literacies is more complex. The complexity does not stem from the scope of tutorial social interaction but rather the dominant and fundamental focus of the curriculum. Of the three DMC courses analysed in-depth in this thesis, only the BTEC ITU course focuses on the creation of digital public entities and digital tools. The other DMC courses focus on the use of digital tools for the creation of digital public entities. The difference is subtle but profound.

For example, given the brief to create a website the BTEC multimedia course would focus on the look and layout of the website; the goal is to create a visually engaging user-friendly website. The BTEC ITU course would focus on the features and functions of the website; the goal is to create an interactive and engaging user-friendly website. I am not suggesting that one type of website is better than the other and there is no reason both websites cannot have equal visual appeal and interactivity. I am merely highlighting the favoured approaches of both courses.

In sections 7.4.1 and 7.4.5 I argued that MKO (Vygotsky, 1930-1934/1978) social interaction must be in a manner congruent with the inhabitants of the environment. Therefore, MKO social interaction is constrained by the environment of the classroom. Tutorial social interaction can only convey literacies in accordance with the focus of the DMC course and the FDM identities of the majority of learners. One must remember that the DMC-FDM are in the minority of learners on DMC courses, (section 6.1). I suggest that discontentedness with tutorial social interaction in the classroom-setting; occurs whenever the DMC-FDM try to obtain literacies:

- beyond the scope of tutorial social interaction
- beyond the pace of tutorial social interaction
- outside the curricular focus of the course

In these instances, the digital and media literacies sought by the DMC-FDM must be acquired in the home-setting through social interaction with other MKO. For instance, in section 7.3.1.1, I mentioned the extent to which Susie resorted to achieve a creative goal. During the focus-group interview Susie, the creative expert home-DMC-FDM gave the following models-in-interaction (Gee, 1999):

For me, very quickly, in a couple of days, really, I got really good at using Illustrator with the brushes, rather than using boxes and stuff like that. I would just do drawing, straight on, with the brushes. The brushes that I found my one's is really old, it's like Illustrator 10. And there was this brush, this sort of inky like one. I normally use inks and brushes and pens and all sorts of stuff like that, watercolours, so it was kind of similar to what I was already used to in the way it looked, so I just sort of learned to use that and I learned different ways of using it. I learned how to change the opacity and build up layers and make these cool textures. And then I found out that the new one didn't have it, so now everywhere I go, I have to have it on my USB so I can transfer it to whatever new one.
(Susie, BTEC L3 art and design)

If it's something about, if there's a problem with the program, it's not something that I can actually do. Like something specific to the program that no one knows, because mine is so old. I once actually went on Adobe and e-mailed them and asked them. I jumped through so many hoops to do it, but I ended up having to e-mail them and ask them 'what do I do?'. And I sent them some pictures to show them exactly what I was trying to do on the new one and they did answer and give me some advice with that one. But it's not like a it's already a permanent solution it just sort of.
(Susie, BTEC L3 art and design)

In figure two the scope of tutorial interaction on her BTEC art and design course does not extend to the creation of digital tools. Susie cannot obtain a solution to this problem in the classroom-

setting and must seek social interaction with MKO in the home-setting. Due to her engagement in experimentation and progressive problem-solving in the home-setting, Susie's acquisition of digital and media literacies exceeds all the boundaries specified above. Susie is frequently involved in situations in which tutorial social interaction cannot be used in the achievement of her creative goals. Hence her tendency to 'zone out' and disregard tutorial social interaction) as discussed in section 7.4.1. Indeed, every instance of discontentedness with tutorial social interaction is an occurrence of the FDM trying to obtain digital and media literacies as specified above. In every instance, the FDM either seeks the instruction of other MKO in the home-setting or gives up on the creative goal.

In section 7.1, I stated that social interactions between tutors and learners are situated at the core of the DMC. The amount of discontentedness expressed by the DMC-FDM may imply that the DMC is problematic at its core. Nonetheless, in section 7.4.5 I stated that the DMC-FDM view compulsory education as the setting for basic digital-making and expect post-compulsory education to be the setting for complex digital-making. Nevertheless, in sections 7.4.1, 7.4.4, and 7.4.5 I argued that digital-making in the post-compulsory classroom is focused on the establishment of basic habits that were not formed during compulsory education. I suggest, that the instances of discontentedness are observations of the schism between the reality and expectations of digital-making in the post-compulsory classroom.

Furthermore, there is a second schism, present within DMC-FDM discontentedness with tutorial social interaction; namely the co-construction of learning experiences (Nunan, 1988; Elen et al. 2007 Bostock and Wood, 2012). Despite the steady migration towards a more learner-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012) discussed in chapters one and two; the DMC is still a teacher-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012). The DMC-FDM perception of the post-compulsory classroom as the setting for complex digital-making is also a tacit request for DMC tutors acting as MKO to lead the maturation of fantasy.

All the same, due to the first schism the DMC-FDM attempt to assume the position of MKO; thereby resolving the first schism by establishing more learner-centred tutorial social interaction according to the traits of their FDM identities, (section 7.4.5). The DMC-FDM place themselves in conflict with their tutors, as both parties cannot occupy the role of MKO within the DMC. This conflict is present in all of the FDM identities, especially the Mavericks discussed in sections 7.3.1.9 and

7.4.4. In the classroom-setting the co-construction of learning experiences is not a collaboration, it is more accurately described as the dual construction of learning experiences. One that is teacher-centred and led by tutors, and another which is learner-centred and led by the DMC-FDM. One must remember that the DMC-FDM form the minority of learners on DMC courses. The majority of DMC learners and even some of the Academics (Basil and Nicola) are content with a teacher-centred curriculum.

To some extent, the DMC-FDM will always perceive a disparity between their expectations of digital-making in the classroom-setting and its realities. This disparity is due to DMC-FDM dissatisfaction with aspects of their current identity, environment or reality (Vygotsky, 1930/1967; Smolucha, 1992). Dissatisfaction is the stimulus of fantasy as I argued in section 4.1.1, the more fantasy possessed by a learner the more likely the choice to join a DMC course.

8.3 The DMC-FDM perceptions of DMC tutors as More Knowledgeable Other(s) (MKO)

The expedition of the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) is one of the principal rationales for the decision to join a DMC course. The role of the tutor as an MKO (Vygotsky, 1930-1934/1978) is viewed by the DMC-FDM as essential to the expedition. Consequently, all the DMC-FDM demand that their tutors meet their expectations. However, in sections 7.4.1 to 7.4.5, all the DMC-FDM, especially the Emulator-DMC-FDM (Emulators) perceived their tutors as lesser in the knowledge and experiences of digital-making in comparison to creative professionals. DMC tutors are perceived as competent in the basics of digital-making but lacking in the ability to solve creative problems. All the DMC-FDM identities discussed in Chapter Seven are learning trajectories adopted by the DMC-FDM in response to their discontentedness with tutorial social interaction (Vygotsky, 1930-1934/1978; Turner, 1988). The issue here is that the DMC-FDM are not convinced that their tutors possess the creativity or expertise, necessary to obtain the digital and media literacies beyond the three boundaries stated in section 8.2.

I suggest that for the majority of DMC-FDM the evidence of expertise is in the demonstrable performance and creation of digital public entities, not the accumulation of knowledge. This view was expressed repeatedly throughout Chapter Seven, by all the DMC-FDM especially by Vaughan and the

Mavericks. Among the DMC-FDM, there exists a hierarchy of expertise with the creators of creative software placed at the top (sections 7.3.1.1. and 7.4.1). Creative professionals are placed on the next level down for their perceived knowledge and experience of digital-making, (sections 7.3.1.8 and 7.4.3). DMC tutors are placed on the level below creative professionals for their knowledge of digital-making, (sections 7.4.1 and 7.4.3). Tutors in HE, are perceived as more knowledgeable than tutors in FE, and tutors in compulsory education are perceived as the least knowledgeable. Even so, much of this knowledge is credited to the tutors' previous employment as a creative professional; in some cases, the DMC-FDM only view tutorial knowledge as marginally better than theirs, (sections 7.3.1.4 and 7.4.3). Finally, the DMC-FDM place themselves at the bottom of the hierarchy simply because they are learners, (sections 7.4.1. and 7.4.3). The DMC-FDM do not doubt their tutors' abilities to follow procedures, instead, they doubt their tutors' abilities to solve problems when the procedures do not work. It is the ability to expedite progressive problem solving (Bereiter and Scardamalia, 1993) that the DMC-FDM seek in their tutors. Every instance of discontentedness with tutorial social interaction reinforces the position of DMC tutors in the hierarchy as lacking the experience to solve creative problems.

I suggest that discontentedness also means that within the home-setting the DMC-FDM are encountering more complex forms of digital public entities than in the classroom-setting. This is significant because it implies that experimentation and progressive problem solving (Bereiter and Scardamalia, 1993) is not actively encouraged within the DMC, as I argued in section 6.2.3. Many of these procedures are repetitive and narrow in their scope, as they are determined by the curricular objectives and assessment methods of DMC courses. The Mavericks strongly complained about these issues on their BTEC multimedia course (section 7.4.4). Factors such as time, resources and the demands of teaching large learner cohorts (section 7.4.3) also place limits on the approaches to progressive problem-solving.

In the classroom-setting, the DMC is still teacher-centred (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012) and procedural in its approach to progressive problem-solving. One must remember that learner-centred (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012) digital-making in the classroom-setting is driven by the discontentedness of the DMC-FDM. Despite the migration of the DMC towards a more learner-centred curriculum, the identities of the FDM were unanticipated; because the identities developed as

different reactions to discontentedness with tutorial social interaction. The question here is would all the discovered DMC-FDM identities exist if learners were satisfied with tutorial social interaction?

Hypothetically, based on the discussions in chapters six and seven; It is likely that the number of Academic-DMC-FDM (Academics) may increase, as this is the group most willing to shift the responsibilities of decision-making and identity construction. Indeed, Basil and Nicola both of whom are Academics were the only ones that expressed satisfaction with tutorial social interaction, (section 7.4.4). One must remember that the basis for the satisfaction of Basil and Nicola is the provision of immediate solutions within tutorial social interaction. Notwithstanding, the Academics identities of Basil and Nicola implies that the creative problems encountered by the pair are either fairly simple; or more likely commonly occur within the contexts of digital-making in the classroom setting. These common creative problems are then solvable using procedural approaches.

If the number of Academics was to increase it is likely that some would be former Emulators. Greater satisfaction with tutorial social interaction may reduce the need to perceive a resemblance between their career aspirations and the knowledge and experiences of their tutors. The reduction of resemblance would then become the perception of competence required by the DMC-FDM. Still, I suggest that the reduction would be dependent on the strength of the career aspirations of the Emulator. For instance, Vaughan clearly identifies himself as a graphic designer (section 7.3.1.5). Vaughan continues to assert his identity as a graphic designer by rejecting social interaction with anyone that does not resemble himself 7.4.3. Due to the strength of his self-perceived graphic designer identity, it is unlikely that he will switch to the Academic identity. Instead, greater satisfaction with tutorial social interaction would most likely assuage the feelings of 'cheating', mentioned by Vaughan regarding experimentation for progressive problem-solving (section 7.3.1.5). It is also unlikely that Vaughan will be satisfied with the procedural approaches presented by tutors in the classroom-setting; considering his preference for choosing a procedural approach from a wide selection (section 7.3.1.5).

In contrast, in sections 7.3.1.6 and 7.5.3, Jason and Tevin did not identify any specific IT-related career ambitions. Subsequently, their need for resemblance is not as stringent as Vaughan's, as indicated by their implied emulation of their current BTEC ITU course tutors.

Similarly, the home-DMC-FDM would also struggle to relinquish their autonomy regarding decision-making and FDM identity construction. It is likely that greater satisfaction with tutorial social interaction may prompt the home-DMC-FDM to construct even more digital public entities in the home-setting. For example, Ian and Seydou may spend less time in experimentation thereby increasing their efficiency in construction, (sections 7.3.1.2 and 7.3.1.3). Conversely, Susie would continue to experiment as it is the basis of the home DMC-FDM identity; although, she is not aware of her identity as a creative expert home-DMC-FDM. She is aware that her continued development as a digital artist is reliant on experimentation, (section 7.3.1.2). I suggest that all the identified DMC-FDM identities would still exist even if all the DMC-FDM were satisfied with tutorial social interaction.

It is most likely that the increase among the Academics would come from the infrequent digital-makers that form the majority of learners on DMC courses. If it is the likely case that the DMC-FDM identities would still exist then, tutorial social interactions positive or negative are vital in the development of DMC-FDM identities, (section 7.2 and section 8.1 of this chapter). I suggest that the third space facilitates the co-construction of learning experiences; in accordance with the historical migration of the DMC towards a more learner-centred curriculum, as I argued in sections 2.1 and 2.2.2.

8.4 The third space: the 4th and current generation of the Digital-Making Curriculum (DMC)

In section 6.2.1, I stated that the third space itself could also be described as a type of Zone of Proximal Development (ZPD) (Vygotsky, 1930-1934/1978), both theories share several similarities. Both are based at their core on the creation of meaningful learning experiences through social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) between a learner and an MKO (Vygotsky, 1930-1934/1978). In both theories, social interaction is simultaneously a situated practice and situated learning (Lave and Wenger, 1991; Stein, 1998; New London Group, 1996), in essence, social interaction is used to convey authentic activities which mimic real-life experiences. In the ZPD social interaction is located in the space between the actual developmental level and the potential development of the learner. In section 6.1, I stated that the basic aim of the DMC is the pragmatic maintenance of FDM identities and present desired realities. The maintenance of pragmatism is akin

to the maintenance of learners' existing knowledge of digital and media literacies prior to social interaction with an MKO. In the same section and in section 7.2, I stated that the highest aim of the DMC is the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) which is the development of FDM identities and future desired realities. The maturation of fantasy is akin to the understanding of new digital and media literacies after social interaction with an MKO. In both theories problem solving is used by MKO to lead learners from the actual/pragmatic to the potential/fantasy level. In both, learners use learning trajectories to follow MKO from the actual/pragmatic to the potential/fantasy level. The distinctive features of the third space are based on Vygotskian principles.

Yet, the third space does not behave like the ZPD, for instance, in section 2.2.3 I mentioned that the ZPD closes once the learner has achieved the skill taught by the MKO. In contrast, the third space does not close when the DMC-FDM achieve their creative goals. In section 4.1 I stated that the discourse of the digital-maker is a spectrum that maps the progression of digital-makers within the third space. The discourse consists of five stages as discussed in sections 4.1 to 4.1.6. In essence, each stage of the discourse is also a miniature ZPD in its own right. Learners must progress through each stage sequentially and the maturation of fantasy does not begin in earnest until the learner reaches the experimentation higher stage. In section 6.1 I stated that the ratio between the FDM and infrequent digital-makers was one to five, therefore the majority of learners on DMC and non-DMC courses do not progress beyond the experimentation lower stage of the discourse. The progression of the majority will remain at this level until learners become willing to engage in the maturation of fantasy. Learners may then progress to the higher stages of the discourse these being: experimentation higher, logical instruction and creative expertise.

However, very few learners will achieve creative expertise and many will become experienced non-experts (Bereiter and Scardamalia, 1993); due to their unwillingness to engage in extensive experimentation. In this study, Susie is the only FDM of the twenty to achieve creative expertise. The potential level is not set by the MKO, but rather by the FDM identity of the learner and the subsequent learning trajectory adopted by the learner. The role of the MKO is to expedite the progression of the learner to the potential level only and not necessarily through the entire discourse. Even if a learner achieves creative expertise (Bereiter and Scardamalia, 1993) the third space still does not close. The creative expert will continue to set and achieve complex creative goals thereby extending their knowledge of the digital and media literacies used in the construction of digital public entities. In short,

there will always be one more creative goal to achieve, the learner keeps progressing and the third space does not close.

The third space also incorporates elements of Papertian Constructionism (Papert, 1991) affinity spaces (Gee, 2004) the trajectory of the self (Giddens, 1991) and Networks of Practice (Seely-Brown and Duguid, 2000). These elements are most visible in the de facto networks formed by the DMC-FDM, (section 7.4.5). In section 2.2.2 I argued that while Papertian Constructionism itself may not possess an inherent structure; it is useful for the generation of meaning and understanding, the analysis of system behaviour and the formation of networks.

One must remember that the de facto network which I am now renaming the Digital-making Network (DMN) primarily exists as a means of overcoming DMC-FDM discontentedness with tutorial social interaction. Nonetheless, the DMN is not an alternative model of the maturation of fantasy in learners; rather it is a supplementary method used by the DMC-FDM which enables their peers to temporarily function as an MKO, thereby avoiding experimentation and expediting progressive problem solving (Bereiter and Scardamalia, 1993).

The topological structure of the DMN is as follows: DMN consist of hubs and spokes. Hubs represent MKO, reliable sources of digital and media literacies. A hub could be another DMC-FDM or affinity space (Gee, 2004) such as a forum or video tutorial website. Spokes represent the social interactions that connect the hubs, this is often in the form of requests for information, feedback and solutions to creative problems.

Every DMN has a central hub which is representative of an individual learner. Through social interaction, the central hub will seek outer hubs (MKO) that he/she perceives to have a greater understanding of the digital and media literacies in which the central hub is lacking. It is important to note that any central hub can also be an outer hub in another individual's DMN. Social interaction is always initiated by the central hub. Requests for information flow outwards from the central hub towards the outer hubs perceived to be most beneficial in providing a solution. The requests do not travel to all hubs concurrently or sequentially instead they are intentionally aimed and co-ordinated by the central hub. Upon receiving a request, the outer hub will then respond with the appropriate information, feedback or solution.

Some hubs are larger than others; the size of a hub reflects its importance to the central hub in terms of the perceived usefulness of its information. If the central hub perceives the information to be beneficial, the size of the central hub itself increases reflecting an improvement in the digital and media literacies of the individual. The outer hub that provided the solution also increases in size to reflect its utility as an MKO. The strength of connections between hubs is determined by the frequency of social interaction. If the frequency of requests and responses diminishes then it is possible for a connection to become weak, broken or even lost entirely.

DMN have fluid structures that are not time specific or dependent, they do not disband when the central hub has achieved a creative goal, overcome a technical problem or even found a new means of self-expression; instead, they continue to exist much like the third space. A DMN can survive for many years albeit in ever-changing forms in accordance with the FDM identity of the learner in the central hub. A DMN is a supplementary learning trajectory shaped by the identity of the DMC-FDM at its centre. Similar to the trajectory of the self each DMN is a unique construct.

For example, the art and design DMC-FDM have greatly differing DMN which reflects the variations present in the FDM identities as a creative expert, infantile and exclusionary DMC-FDM. For instance, the DMN of Susie reflects her identity as a creative expert, she is a large hub that provides responses to many other hubs. Consequently, there are many connections to other DMN seeking her guidance, (section 7.3.1.1). But the requests from her hub to the outer hubs are much fewer due to her high level of skill, lack of access to MKO and preference for experimentation. Therefore, social interaction is mainly in the form of requests travelling towards the centre of Susie's DMN.

In comparison, Nicola's DMN is much larger. Nicola is a small hub with several requests connecting her to numerous larger hubs. Nicola is content to ask anybody for guidance as she is still within her formative digital-making experiences and desires immediate solutions to creative problems, (section 7.3.1.8). Vaughan's DMN is very small because he excludes outer hubs that do not resemble his self-perceived identity as a graphic designer. Consequently, Vaughan's DMN contains numerous requests more so than in Nicola's nevertheless, he is connected to much fewer outer hubs. Additionally, Vaughan severs connections to hubs that do not facilitate his progression towards becoming a professional graphic designer (section 7.4.3).

The spectrum of digital and media literacies provided in section 8.2, also differentiates the third space from the ZPD. When tutorial social interaction is unavailable the DMN provides social interaction with other MKO, thereby, reinforcing the importance of social interaction in the third space. I suggest that DMN provides further evidence in support of the historical migration of the DMC towards a learner-centred curriculum and this is another distinctive differentiator of the third space from the ZPD.

8.5 Summary of discussion

In this chapter, tutorial or MKO social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) has continued to underpin all other themes, as it did throughout chapters six and seven. All the same, the discussions in this chapter highlight facets of social interaction which enable its influence to be viewed at each stage of an FDM journey through the DMC. The discussion of section 8.1 marks the beginning of engagement with the DMC. The choice of whether to join a DMC course is heavily influenced by the FDM experiences of the relationship between a and b. The nature of this relationship changes depending on the locality of the majority of MKO social interaction. If situated in the home-setting, social interaction promotes pragmatism leading towards the development of non-DMC-FDM identities. Consequently, the FDM is more likely to select a non-DMC course.

Conversely if situated in the classroom-setting social interaction promotes fantasy (Vygotsky, 1930/1967; Smolucha, 1992) leading towards the development of DMC-FDM identities, the FDM is more likely to opt for a DMC course. Social interaction is representative of the environments in which they occur; just as I argued in section 7.4.1. The locality of social interaction is significant in the initial shaping of an FDM identity.

In section 8.2, once an FDM has joined a DMC course the scope, pace and curricular focus of tutorial social interaction, plays a vital role in the continued development of FDM identity. The home, Emulator, Academic and Maverick identities are all responses to tutorial social interaction reflecting varying degrees of satisfaction and discontentedness. One must also remember that the DMC-FDM identities are learning trajectories; as such, tutorial social interaction is also highly influential in providing learners with destinations for their trajectories. For example, a destination may be a DMC course in HE or a particular creative career. Tutorial social interaction also possesses temporality.

In section 8.3, it is revealed that it is tutorial social interaction and not DMC-FDM satisfaction or discontentedness, which is most influential in the development of identity. In the hypothesised scenarios in which all the DMC-FDM were satisfied with tutorial social interaction the same identities emerged. Indeed, the satisfaction of Basil and Nicola of the Academics supports this outcome, (section 7.4.4). By virtue of its occurrence and possibly its frequency, tutorial social interaction is more influential in the shaping of identities than even the satisfaction or discontentedness of the DMC-FDM.

Finally, in section 8.4, it is shown that the third space is designed to facilitate social interaction between MKO and learners. In the instances, in which tutorial social interaction is unavailable or inconvenient, the DMC-FDM behave like a network to receive equivalent social interaction from other temporary MKO. In this sense, the third space is a type of ZPD (Vygotsky, 1930-1934/1978) however its function is more nuanced than leading towards an end determined by the MKO. Indeed, the in third space there is no end and it is the learner that decides the length of their journey.

Chapter Nine: Conclusion

9.1 The limitations of self-reporting

This thesis used the most common methods of self-reporting (Paulhus and Vazire, 2007) these being: survey and interview; to gather all of the results analysed and discussed in chapters six, seven and eight. Consequently, all the variables explored in the investigation are dependent on the recollections, experiences and perspectives of respondents and interviewees. The limitations of self-reporting raise some questions such as would the use of non-self-reporting methods generate different responses and ultimately a different analysis? For example, a first-hand analysis of learning situations (Lafer and Markert, 1994; Folkstead, 2006), participatory media behaviours (Gee, 2004; Jenkins et al. 2009), or students' digital-maker work, might have produced different results. Using the word 'authentic' as a qualifier, Lafer and Markert (1994) define learning situations as:

Classroom events that allow students to become involved in the learning process for what they understand to be authentic purposes; they learn for reasons other than simply satisfying the requirements of the school...Authentic situation here refers to, classroom activities that compel students to seek skills, find information, and make sense of the information they acquire, for the sake of achieving ends that they understand to be meaningful. Authentic learning situations empower students by giving them ownership of the learning process. Learning takes place for the purpose of answering questions that arise during encounters with personally meaningful, problem-laden events. The questions to which students seek answers are the students' questions. (Lafer and Markert, 1994, pp 80)

I suggest that the descriptions of authentic learning situations are applicable to the accounts of social interactions (Vygotsky, 1930-1934/1978; Turner, 1988) between learners and tutors described in this thesis. Students seeking answers to their own questions; is the same as the Digital-Making Curriculum – Frequent Digital-Makers (DMC-FDM) seeking More Knowledgeable Other(s) (MKO) (Vygotsky, 1930-1934/1978) social interaction to overcome creative problems encountered during progressive problem-solving. Also, students taking ownership of the learning process sounds very similar to the DMC-FDM identities; which are learning trajectories used by learners to exert autonomy in decision-making and the development of identity. In short, authentic learning situations and DMC-FDM identities are both descriptions of learners learning how to learn. Both descriptions mark a shift away 'from teaching to learning, from teacher to learner' (Folkstead, 2006). The shift sounds very similar to the migration of the Digital-Making Curriculum (DMC) away from a teacher-

centred (Nunan, 1988; Elen et al. 2007 Bostock and Wood, 2012) and towards a learner-centred curriculum (Nunan, 1988; Elen et al. 2007 Bostock and Wood, 2012); which is a significant theme throughout this thesis. I suggest that while it is inevitable that alternative methods would have produced different responses; I argue that the similarities between learning situations and the self-reported findings of this thesis strongly suggests that the major findings of both approaches are very similar.

Regarding participatory media behaviours, in Chapter Six, section 6.2, I mentioned that at the lower stages of the discourse of the digital-maker, frequent and infrequent digital-makers are indistinguishable. In the lower stages of the discourse, digital-making does not require formal instruction because the creative goals are short simple and easily achieved. This is because both groups of digital-makers use participatory media as part of their everyday lifestyles (Ramanau et al. 2010). It is not coincidental that YouTube, Facebook, Google, Twitter, Tumblr and Wikipedia were the most visited websites across all the frequent and infrequent, DMC and non-DMC learner groups. Furthermore, in Chapter Six, I did not find much evidence in support of the role of participatory cultures (Jenkins et al. 2009) in any of the DMC-FDM identities. I also found that affinity spaces (Gee, 2004) were only consulted in the absence of social interaction with DMC tutors or other MKO.

The problem with participatory media is that Frequent Digital-maker(s) (FDM) do not greatly improve their digital and media literacies by engaging in the activities found within. The act of uploading digital content to be viewed by others does not require the setting of complex creative goals or progressive problem solving (Bereiter and Scardamalia, 1993). The quality of feedback from fans and followers is often inconsistent or does not offer any constructive advice that can be used for improvement; FDM such as Susie and Vaughan were unconcerned about any form of feedback that was not from an MKO. With social interaction being the most significant factor in the development of DMC-FDM identities; I am not convinced that an analysis of participatory media behaviours (Gee, 2004; Jenkins et al. 2009) would have produced greater insight into the choices and experiences of digital-makers in comparison to self-reporting.

Even so, self-reporting does have limitations the most obvious being “Why should we trust what people say about themselves?” (Paulhus and Vazire, 2007). Baker et al. (2002) highlight accountability and validity issues in self-reported data. Perceptions of reality are subject to distortion

via personal idiosyncrasies. Citing arguments from psychoanalysis and social psychology Baker et al. (2002) add that many feelings are experienced unconsciously due to defence mechanisms such as repression or denial. Furthermore, many people are unaware of the factors that influence their behaviour and may give biased accounts of their own behaviour in comparison to others. I acknowledge that such concerns are valid notwithstanding self-reporting is still of great value (Paulhus and Vazire, 2007); and there are several measures that can reduce or even negate possible distortion.

To counter any distortion, regarding learners' choices and experiences of digital-making within formal and informal settings; informants were employed in the research design where possible. Informants corroborate the accounts given by respondents. For example, learners were asked to provide links to any personal digital public entities they recently produced. It soon became apparent that FDM not only had a greater volume of recent production; but also in many cases a greater volume of historically produced entities. A few FDM were also producing complex digital public entities involving basic forms of programming. In some cases, respondents claimed to possess rich experiences of digital-making but were unable to display any corroborating evidence.

The topology of DMC-FDM identities of section 7.3.1, performs a similar role, by grouping learners with similar experiences of digital-making. These experiences were then further aligned through the situation networks discussed in Chapter Seven. Whenever possible the survey and interview questions were in the form of indirect self-reporting (Paulhus and Vazire, 2007). Here, the purpose of the question was obscured. For example, the third question of the focus-group interview asked the FDM to assign personality traits to the software they used to create digital public entities. The purpose of the question was to ascertain learners' knowledge of the digital tools, processes and skills, to aid in the discovery of their FDM identity. Simply asking learners for their opinions would have generated much less nuanced responses concerning their likes or dislikes of software. The assessment of learners DMC-FDM identities is based on my ability for interpretation, rather than their responses. One must remember that the DMC-FDM are not aware of their identities as viewed from my abstract perspective as a researcher.

Finally, the nature of the information needed to answer the research questions could only be obtained through self-reporting. The answers to the questions required the collection of learners' choices and experiences of digital-making within formal and informal settings, over extended periods.

This type of information could only come from direct experience, generating a richness of information (Barker et al. 2002; Paulhus and Vazire, 2007) that other non-self-reporting methods would have found difficult to match as discussed above.

9.1.1 Critical reflectiveness on the effectiveness of the research process

In hindsight, the small-scale heuristic case study research design was successful, all of the refined research questions of section 5.1 were answered. In section 5.1. based on the Pareto distribution (Rodd, 1996) I predicted that approximately twenty percent of the learners in the sample would be FDM. In section 6.1. the survey identified 19.16% of the learners of North Campus as FDM and 19.88% of the learners of South Campus as FDM. Overall 20.42 percent of the learners of Large college identified as FDM, therefore, the survey achieved its purpose. However, simply meeting the quota is only partial evidence of a successful research design. The vindication of the research design resides in the alignment between the themes from the open questions of the survey and the responses of the focus group interviews. In section 6.3 I mentioned that the themes of the open questions provided a general background concerning FDM uses, perceptions, influences, rationales, choices, and experiences of digital-making within the third space in the settings of the classroom and the home. The themes have also provided evidence in support of the discourse of the digital-maker.

However, the major finding of the chapter was that: FDM attitudes towards digital-making are greatly influenced by the social interaction between tutors and learners. The result of these social interactions is either the maturation of fantasy or pragmatism in learners. Learners with more maturity of fantasy lean towards participation in DMC courses, and those with a greater maturity of pragmatism lean towards non-DMC courses. In section 7.3, I stated that all the digital-maker identities are actually the learning trajectories adopted by FDM in response to social interaction with tutors. I reiterated this statement in section 8.3. The alignment between the themes of chapters six and seven supports my assertion that the questionnaire was successful. The correct learners were identified in the survey and the themes from the open questions directly informed the themes of the focus group interviews. Social interaction between tutors and learners was thoroughly explored in both chapters. Furthermore, many of the perceptions of digital-making within the classroom discussed in Chapter Seven were initially identified in Chapter Six, there is much evidence in support of close alignment between the themes of chapters six and seven.

However, due to the complications of the research context, discussed in section 5.1.1 the research design was inefficient. One must remember that at the start of the investigation there was a lack of previous empirical guidance regarding how to research digital-making and makers. Furthermore, I needed to identify a group of digital-makers that were not aware of their status as FDM. Before the questionnaire, in the first round of research, there were no obvious means of differentiating frequent and infrequent digital-makers. Differentiation was further complicated by, the indistinguishability between infrequent and FDM at the lower stages of the discourse of the digital-maker, mentioned in sections 6.2 and 6.2.4. The research design was also complicated by the fact that infrequent and frequent digital-makers exist on DMC and non-DMC courses. This was a highly influential factor in my research design rationale. In section 5.2.1. I stated that:

All digital-makers possess the potential to become FDM. Learners enrolled in non-DMC courses greatly outnumber those on DMC courses. It is highly unlikely that a random sampling technique (Cohen et al. 2013) would produce an unbiased representative sample without purposely excluding a large percentage of the population of learners enrolled in non-DMC courses

I was concerned that random probability sampling would reduce the likelihood of finding enough frequent digital-makers for the second round of the study. Consequently, the survey was administered with a combination of non-probability quota and theoretical sampling methods. I now recognise that random probability sampling of the questionnaire would have identified a similar number of FDM within the population of learners eligible for inclusion in the study. I now recognise that my concern was misplaced, the aim of the survey was to discover a group of learners identified as FDM within the eligible population of learners in Large college. The identified FDM would then be a representative sample and through statistical generalisation methods, their experiences of digital-making would be applicable to similar learners in other institutions like Large college. Random probability sampling is better suited for this aim than quota and theoretical sampling methods because it allows the use of unbiased statistical generalisation methods which would have strengthened the findings of the study (Doherty, 1994). The use of quota and theoretical sampling prohibited statistical generalisation, therefore, I had to find other means of justifying the reliability and validity of the investigation. Hence, the use of the multiple case study methodology with analytic generalisation (Bengtsson, 1999; Yin, 2009) and fuzzy generalisation (Bassegy, 1999). The multiple case study methodology was designed and applied in a rigorous manner to eliminate as much bias as possible,

nonetheless, selection bias (George and Bennett, 2005) is present in the research design due to the use of quota and theoretical sampling (Eisenhardt and Graebner, 2007).

Non-probability sampling methods assume that there is an even distribution of characteristics among individuals in a population. In the above quotation from section 5.1. I stated that all learners have the potential to become FDM. I stand by my statement since the prominent difference between frequent and infrequent digital-makers is that the frequent possess greater maturation of fantasy. My choice to use quota and theoretical sampling reflect the assumptions of non-probability sampling methods. I now recognise that my assumption was misplaced. In section 5.1. I used the Pareto distribution to predict that one in five learners on DMC and non-DMC courses would be FDM, which proved to be the case. Random sampling would have identified twenty percent of learners as FDM, I should have retained more confidence in my prediction. Instead, my small-scale heuristic case study research design was needlessly complicated.

9.2 Summary of the refined research questions addressed and explored in this thesis

All the refined research questions have been addressed in chapters six and seven, therefore I will only provide summaries here, for the benefit of the reader.

- Refined research question one, what is the constitution of the Digital-Making Curriculum (DMC)?

The DMC is an unwritten curriculum that encompasses the principles and practices regarding the production, analysis, consumption and distribution of digital public entities. The DMC occurs in courses where digital-making is the dominant or fundamental focus of the curriculum; or is of rapidly growing importance and prevalence, to the point that its absence would be impractical and detrimental for the progression of learners. At its core, the DMC has an unwritten constitution that exists within the social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) between learners and tutors. The purpose of the constitution is the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992) in learners, via the tutorial conveyance of the digital and media literacies; necessary for the

expeditious construction of various digital public entities, and the solution of creative problems encountered during construction. Tutorial social interactions, often take the form of information, instructions and feedback which scaffold (Vygotsky, 1930-1934/1978; Bruner, 1985; Hammond and Gibbons, 2005) and extend the knowledge and experiences of the Digital-Making Curriculum – Frequent Digital-makers (DMC-FDM). The DMC consists of four generations the latest of which is the third space and it is designed to facilitate social interaction between tutors and learners.

- Refined research question two, how are Frequent Digital-maker(s) (FDM)' choices within the DMC influenced by their experiences of digital-making in the home-setting of the third space?

The third space consists of two settings the home and the classroom. The home represents all informal digital-making that occurs outside of educational institutions. The classroom represents all formal digital-making inside of educational institutions. In the home-setting digital-making concerns the pragmatic maintenance of aspects of the identity, environment or present reality of the learner. In the classroom-setting, digital-making is about the maturation of fantasy which is the ability to imagine, realise and materialise aspects of a desired future identity, environment or reality. The DMC-FDM identities of learners are constructed in both settings. In the home-setting, the criteria for decision-making and FDM identity construction are established through experimentation, progressive problem solving (Bereiter and Scardamalia, 1993) and social interaction with MKO. The resultant criteria are then carried into the classroom and used by the DMC-FDM to determine the extent to which they are willing to cede their autonomy in decision-making and FDM identity construction to their tutors, through social interaction. The more the learner engages in digital-making in the home-setting, the lesser the willingness to cede their autonomy to tutors. The home-DMC-FDM are the least willing, the Emulator-DMC-FDM are more willing and the Academic-DMC-FDM are the most willing. The non-DMC-FDM are very similar to the home-DMC-FDM, both are highly skilled, but the non-DMC-FDM are more pragmatic in their attitude towards digital-making and choose not to engage in DMC courses.

- Refined research question three, how are Frequent Digital-maker(s) (FDM) influenced by their prior experiences of digital-making in the classroom-setting of the third space?

In the classroom setting, it is vital that the DMC-FDM perceive the benefit of tutorial social interaction for experimentation and progressive problem-solving. The degree of benefit is perceived in the alignment of tutorial social interaction with the DMC-FDM identity of the learner. If the alignment is narrow the DMC-FDM are more likely to adhere to tutorial social interaction. If the alignment is wide the DMC-FDM are less likely to adhere to tutorial social interaction. Still, the perception of alignment differs across the DMC-FDM identities. The home-DMC-FDM are the most proactive in experimentation and progressive problem solving (Bereiter and Scardamalia, 1993) and are the least likely to view the benefit of tutorial social interaction. The Emulator-DMC-FDM require the perception of resemblance between their career aspirations and the knowledge and experience of their tutors. The Emulators will then adhere to tutorial social interaction to the extent of the resemblance. Yet, if there is little resemblance with DMC tutors, the Emulators will seek to emulate other MKO such as creative professionals. The Academics, only require the perception of tutorial competence before adhering to social interaction. These principles are established in the compulsory education of the DMC-FDM and then carried forward into post-compulsory education. Almost all the DMC-FDM are united in their discontent with the low utility of tutorial social interaction.

In the classroom setting, the reality of digital-making concerns the establishment of basic habits: repetitive series of decisions regarding good practice in the construction of digital public entities. However, many of these basic habits should have been established during the compulsory education of the DMC-FDM. Consequently, DMC tutors in post-compulsory education focus on the establishment of basic habits rather than more complex digital-making. Nonetheless, many of the DMC-FDM perceive the classroom as the setting for advanced digital-making; due to social interaction with tutors. For many DMC-FDM, tutors are the only accessible MKO. Furthermore, the DMC-FDM expect post-compulsory DMC tutors to have greater knowledge than DMC tutors in compulsory education. The need for MKO social interaction is so great that learners also form DMN to supplement their progression. Nevertheless, upon encountering the reality of digital-making in the classroom-setting many DMC-FDM become discontent with tutorial social interaction. Once again, this discontentedness is established in their compulsory education and carried into post-compulsory DMC courses. The non-DMC-FDM was also discontent with tutorial social interaction during compulsory

education. When such discontentedness is combined with the greater pragmatism of the non-DMC-FDM, the likelihood of choosing a DMC course in post-compulsory education becomes remote.

- Refined research question four, what are Frequent Digital-maker(s) (FDM) rationales for and against participation in Digital-Making Curriculum (DMC) courses?

The location of social interaction with MKO is highly significant in the decision of whether to join a DMC course. If the majority of MKO social interaction occurs in the home-setting, the attitude of the FDM becomes pragmatic. Subsequently, the FDM finds it more difficult to perceive the benefit of the learning trajectories offered by DMC courses. This is because the FDM value learning trajectories that will maintain aspects of their current identity, environment or reality. It is then less likely that a DMC course will be chosen, as the learning trajectories of DMC courses are geared towards the maturation of fantasy. If the majority of MKO social interaction occurs in the classroom-setting the DMC-FDM experiences a greater maturation of fantasy and is more likely to choose a DMC course. For the DMC-FDM the need to continue the maturation of fantasy overrides their discontentedness with tutorial social interaction, hence, the DMC-FDM opt to join DMC courses. Due to their greater maturation of fantasy, the DMC-FDM more easily perceive the benefit of the learning trajectories of DMC courses; leading towards the materialisation of a desired future identity, environment or reality.

9.3 Recommendations for the continued development of the Digital-Making Curriculum (DMC)

Social interaction (Vygotsky, 1930-1934/1978; Turner, 1988) between learners and tutors is the core of the DMC. Structurally the third space is well suited for the facilitation of social interaction. One must also remember that for most learners, DMC tutors are the only accessible MKO (Vygotsky, 1930-1934/1978), tutorial social interaction is a highly significant factor in the decision to join a DMC course. For the continued development of the DMC, the issue of learner discontentedness with tutorial social interaction must be addressed. I suggest that discontentedness is perpetuated by learner distrust of tutorial knowledge and experiences of digital-making. A recent report from the Royal Society (2017) expressed alarm concerning the provision and learner uptake of Computing in

compulsory education. A key recommendation called for major investment in the training of primary and secondary Computing teachers, due to a lack of relevant skills. The DMC-FDM use the former and in some cases current creative professional backgrounds of tutors as a validation of their expertise. Tutors without creative professional backgrounds were marginalised by the DMC-FDM. This is most apparent with the Emulator-DMC-FDM, although the home and Academic-DMC-FDM also exhibited the same behaviour.

A solution to this issue is the hiring of more creative professionals as tutors in compulsory education. One must remember that the DMC-FDM perceptions of tutorial social interaction are formed in compulsory education and carried into post-compulsory DMC courses. Recent initiatives designed to increase involvement in digital-making within compulsory education are insufficient. Initiatives such as the 'year of code' have only been mixed successes at best (Naughton, 2014). One of the main problems with the 'year of code' was a lack of digital and media literacies among its leadership (Naughton, 2014). Throughout this thesis, I have argued that to obtain a wide range of digital and media literacies, one needs experience in several environments. One cannot construct a digital public entity that is unrepresentative of the literacies and cultural practices of the environment in which it is situated. In short creative professionals have a wider range of digital and media literacies in comparison to tutors knowledgeable in the use of creative software. Much like the DMC-FDM have wider literacies than the non-DMC-FDM. The scope of any initiative will be extended or curtailed by the literacies of its tutors (Ilomäki, 2008). All the same, when considering a career in education at present many creative professionals are attracted towards post-compulsory education especially HE. Government intervention or support is required to make teaching in compulsory education more attractive to creative professionals. The lack of creative professionals in compulsory education also contributes to the reality of digital-making in the post-compulsory classroom. Many learners enter DMC courses without having established basic digital-making skills in their compulsory education. Consequently, DMC tutors must focus on the establishment of basic habits. The DMC-FDM then become discontent as they hope to learn literacies beyond or outside of the scope and pace of tutorial social interaction.

Another contributor to DMC-FDM discontentment is the procedural approach of the DMC towards progressive problem solving (Bereiter and Scardamalia, 1993). Throughout chapters six and seven I argued that the DMC was still a teacher-centred curriculum (Nunan, 1988; Ende and Davidoff, 1992; Elen et al. 2007; Bostock and Wood, 2012) despite its steady migration towards being more learner-centred (Nunan, 1988; Elen et al. 2007 Bostock and Wood, 2012). Part of the teacher-centeredness concerns the preference for applying conventional step-by-step instructions in the solutions of creative problems, (section 7.4.3). The DMC-FDM do not find this approach useful or engaging, hence the tendency to disregard much tutorial social interaction. Furthermore, the creative problems experienced by the DMC-FDM especially the home-DMC-FDM often cannot be solved through procedural approaches. The DMC-FDM are not seeking social interaction with tutors who can demonstrate procedures but rather social interaction with tutors that can solve creative problems, (section 6.3).

However, the ability to solve creative problems without the use of procedures comes from extended engagement in experimentation and progressive problem-solving. The implication here is that DMC tutors find experimentation and progressive problem solving too time-consuming, and opt for efficient procedural approaches. I am not suggesting that DMC tutors lack the knowledge and experience of digital-making but rather I am highlighting the demanding climate of teaching digital-making in the classroom-setting. In section 7.4.3, Vaughan observed the difficulties of one tutor teaching several learners. In section 7.4.5, Boris observed the constraints placed on tutors by the demands of the curriculum; one must also consider the limitations of time and resources. Asking DMC tutors to bear all of these responsibilities, especially in FE is unfair.

The solution to this problem is the introduction of progressive problem-solving in compulsory education. The instructional teaching of digital software and technologies in compulsory education is inadequate and does not equip learners with the abilities to solve creative problems (Pelgrum, 2001). Consequently, learners become disengaged and view the further study of DMC courses as not worthwhile, such as the experience of the non-DMC-FDM. Alternatively, learners may become overly reliant on their tutors to provide instant solutions; and less inclined to engage in digital-making in the home-setting, such is the experience of the classroom-DMC-FDM and the infrequent digital-makers. The third space is a type of Zone of Proximal Development (ZPD) (Vygotsky, 1930-1934/1978) and facilitates social interaction between learners and MKO. In the ZPD problem-solving drives social

interaction. In the third space, progressive problem solving is a better driver of social interaction than instructional procedures. The introduction of progressive problem solving would improve learner engagement thereby reducing the number of non-DMC-FDM and infrequent digital-makers, by creating more FDM. It is within progressive problems solving that basic digital-making habits can be established in compulsory education.

To further improve our understanding of digital-making the DMC needs to become a written curriculum available in a single document containing: the principles of teaching and learning of digital-making across the home and classroom-settings of the third space. The basic and highest aims of the DMC, the maintenance of pragmatism and the maturation of fantasy. The discourse of the digital-maker and the digital-making identities and the historical development of the DMC. This would increase the visibility of the DMC making it more accessible for tutors of DMC subjects. A written document would also improve the deployment of the DMC in conjunction with conventional formal curriculums as described in the previous section. The next stage in the evolution of the DMC involves the need for further empirical and experimental research to prove its effectiveness. It is my assertion that when used in the capacity that I described in the previous section the DMC will prove itself to be a far more effective means of fostering meaningful learning experiences of digital-making inside and outside of formal education. This thesis serves as the evidence for my assertion. Moreover, the academic field of digital-making needs much more empirical and experimental research to truly mature into a concrete body of knowledge.

9.3.1 Contribution to Knowledge

The DMC is the principal contribution to knowledge of this thesis. All other original concepts of this thesis including the notion of the evolved curriculum, the discourse of the digital-maker and the digital-making identities, are all dependent on the existence of the DMC. Methodologically, the small-scale heuristic case study research design used to conduct the study is also an original contribution to knowledge. To create the small-scale heuristic case study, I combined the Multiple Case Study (MCS) (Yin, 2009) and the Heuristic Case Study (Eckstein, 2002) and then made further modifications. I acknowledge that the research design did have some issues however, I stand by it successfully identified the FDM within Large college (see section 9.1.2). One must also remember that there was no prior empirical methodological example of how to research digital-makers in the depth required by

the context of this thesis. I suggest that the with some refinements the small-scale heuristic case study may serve as an example of how to research digital-makers and digital-making in great depth. This thesis has also contributed new contextual meanings to some existing terms such as the notion of the third space as a simultaneously metaphoric space (Bhabha, 1994/2012), physical location (Soja, 1996) and lived experience (Gutierrez, 2008). This triune perception of the third space is unique to this thesis, as are the home and classroom-settings of the third space, which was useful in describing how learners engage in digital-making inside and outside of education. The level of depth provided in this thesis offers new insights into digital-makers and digital-making that did not exist prior to this thesis (please see section 9.2). The term 'digital public entity' (see section 2.2.2) also extends the context of the original term into digital environments to which it did not previously apply. However, it is the DMC that remains the most prominent contribution to knowledge of this thesis.

The DMC is an evolved curriculum it is a model for the experiential teaching and learning of digital-making based on problem-solving through social interaction between tutors and learners. In the DMC the learning experiences are co-constructed by learners and tutors, although ratios of collaboration vary depending on the digital-making identities of the learners. Ultimately the DMC exists for the benefit of learners, as I discussed in section 1.2.1. The DMC is a learner-centred curriculum in which the progression of learning leads learners from general to specialised digital-making knowledge and skills. In comparison to other technology-related curriculums, the DMC contains a deep understanding of learners actual digital-making experiences, knowledge and skills. Furthermore, the DMC contains an understanding of how to develop learners' understandings of digital-making according to their digital-making identities. The progression of learning is inclusive of learners' experiences of digital-making in the home and classroom-settings of the third space. The purpose of the learning progression is not the development of technological competencies regarding the use of digital computers (Passey, 2014), but rather the maturation of fantasy (Vygotsky, 1930/1967; Smolucha, 1992), which learners use to solve the creative problems encountered in complex digital-making.

The development of the maturation of fantasy in learners, is described in the discourse of the digital-maker found in Chapter Four, of this thesis. The discourse of the digital-maker provides tutors with a means of measuring the progression of learners. The discourse functions in a similar capacity to formative assessment. The experiential progression of learning within the DMC is itself a

continuous process in which learners develop their understanding of digital-making by focusing on the solving of creative problems that arise during the processes of construction. Throughout section 2.2.3 I argued that in the DMC the learner becomes a digital public entity and learning becomes the modification and construction of the self. Successful progression of learning in the DMC requires the constant reconstruction of one's digital-making identity.

Within the DMC, the discourse of the digital-maker is used as a guide for social interactions between tutors and learner, for measuring the maturation of fantasy possessed by the learner. Furthermore, tutors may also use the digital-making identities of learners to triangulate the positions of learners in the discourse of the digital-maker to obtain a greater perception of the maturation of fantasy possessed by the learner. The discourse of the digital-maker and the digital-making identities offer tutors a means of understanding the learning experiences in the DMC from the perspectives of learners. Tutors are then in a better position to foster more meaningful learning experiences of digital-making in the classroom-setting of the third space. The insights into learners' experiences of digital-making in the home and classroom-settings of the third space are not present in other types of curriculums.

Finally, the DMC serves as an example of new ways of thinking about the teaching and learning of digital-making inside and outside of education. In sections 1.2.1 and 1.2.2, I provided a working definition of the DMC which I described as an evolved curriculum because it is not the product of a single design and it was not created by a single author or group. Therefore, the DMC does not operate like a conventional curriculum such as the National Curriculum, instead, the DMC should be used to supplement the existing formal curriculums of DMC subjects. The relationship between conventional formal curriculums and the DMC should resemble that of the base and superstructure in Marxist theory (Marx, 1859). By this, I mean that the DMC (the superstructure) rests upon conventional formal curriculums of DMC courses (the base). For example, the DMC does not contain any method of summative assessment, it does not specify the genres and methods of production regarding digital public entities, furthermore, the DMC contains no details about what is to be learned. All of these details are specified by conventional formal curriculums. The DMC specifies how teaching and learning should occur to foster more meaningful and effective learning. The DMC must supersede the aspects of conventional formal curriculums that try to specify the methods of

teaching and learning. In short conventional formal curriculums dictates the content of teaching and learning in DMC courses, while the DMC itself specifies the methods and measurements of teaching and learning. The DMC is an evolved curriculum used to supplement the conventional formal curriculums of DMC courses.

9.4 A call for further research into digital-making and makers

This study is one of the early generation of in-depth investigations of digital-making that addresses and explores the issues raised by Sefton-Green (2013). This thesis has explored, discussed and analysed in depth not only the process of becoming a digital-maker; including how the choices of digital-makers within the DMC are influenced by their prior experiences of digital-making within formal and informal settings in the home and classroom-settings of the third space. Within this thesis are several original constructs that illustrate the process from the early digital-making experiences of learners; through to the learning trajectories used by learners to expedite and manifest future creative professional careers. The major findings of this thesis and its original constructs were all previously unknown: the Digital-Making Curriculum, the discourse of the digital-maker and FDM identities. Therefore, this thesis does offer new insights into digital-making an area of academic study that is still in its infancy, much more is yet to be discovered, defined, and understood.

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Appendix

Chapter five

5.3: The validity and reliability of qualitative methods investigations

Lincoln and Guba (1985) insist that the quality of qualitative research can be assessed by means of qualitatively oriented criteria. The first being credibility, the confidence in the truth of the findings, this is similar to construct validity, which essentially asks How congruent are the research findings with reality, of research participants? (Merriam, 1998; Shenton, 2004). Credibility makes a subtle change in this distinction by asserting that such a judgement can only be made by research participants. Credibility shifts the onus of truth from the construction of research methods onto the reconstruction of research participants' perspectives and experiences within their social contexts. This means that the primary responsibility of the qualitative researcher is now the interpretation of research data as opposed to its construction (Merriam, 1998; Lincoln and Guba, 1985).

Credibility can also be determined by use of several strategies (Lincoln and Guba, 1985 and 1994; Shenton, 2004). Triangulation is an important factor in proving credibility (Denzin, 1978; Patton, 1999). Within this research design, two forms of triangulation establish credibility. Methodological triangulation is provided by use of the survey and focus-groups interviews. Triangulation of sources is provided by multiple uses of each method in the research design at differing times in the heuristic case study. The unit of analysis is projected to include of five hundred learners; all of whom will complete the survey, with an estimated twenty percent identified as Frequent Digital-maker(s) (FDM).

Transferability is the qualitative counterpart of external validity (Lincoln and Guba, 1985 and 1994; Shenton, 2004). Transferability refers to the applicability of research findings to other research contexts (Merriam, 1998; Shenton, 2004). The theoretical framework and hypothesis of *Chapter Four* outlines all the likely eventualities that may be found within this research context. Another consideration is the use of replication logic and analytic generalisation, both provide clear guidance on how research findings may be interpreted and applied in other settings. The methods used in this research design are common to multiple case study enquiry heuristic or otherwise.

The research settings of the heuristic case study have been clearly outlined in this chapter, as has the unit of analysis; and the objectives of the research design. The findings of this thesis can be applied to any FE institution which places a high emphasis on the provision of level 3 DMC courses. In addition, thick descriptions (Ryle, 1949; Geertz, 1973; Lincoln and Guba, 1985 Holloway, 1997) of the situation networks (Gee, 1999) will improve the external validity of the research design. Other researchers should not have difficulty in transferring the research design to similar contexts (Shenton, 2004).

Dependability is the qualitative counterpart of reliability (Lincoln and Guba, 1985 and 1994; Shenton, 2004). Rather than ensuring the replication or repeatability of research findings as in the positivist sense. Dependability aims to give an evolutionary account of the research context. The terms may appear contradictory at first but considering the changing nature of qualitative phenomena (Sale et al. 2002), dependability is essential to ensuring replication or repeatability of qualitative investigation. Dependability places a keen emphasis on the explanation of methods within a research design (Shenton, 2004). Lincoln and Guba (1985) assert there is a strong relationship between credibility and dependability arguing that

a demonstration of credibility is a significant factor in establishing dependability. As both, are concerned with methods such an assertion may appear unsurprising yet credibility and dependability can be differentiated. Credibility is the initial justification of methods prior to deployment in a research context: whereas dependability is the justification of methods during deployment in a research context. Dependability may require qualitative researchers to modify their original approaches based on the conditions of current research contexts.

Regarding this thesis, the question here is how does one account for dependability? A possible solution to this quandary is to conduct a pilot study before launching full-scale data generation (Thabane et al. 2010). This will enable the researcher to forecast the possible ways that the research context may evolve and adjust methods accordingly. For the sake of clarity, I will conduct a small pilot study prior to launching the full heuristic case study. Much like other multiple case studies (Yin, 2009), this thesis includes a theoretical framework but also a hypothesis designed to account for all the possible variations of the research setting. It should be noted that use of a hypothesis is not a common approach in qualitative inquiry, hence the use of heuristic enquiry. Furthermore, in light of the under-theorisation (Tavallaei and Talib, 2010) highlighted by Sefton-Green (2013), I felt it was necessary to define the research context.

Conformability is the degree to which findings are shaped by respondents rather than researcher bias (Lincoln and Guba, 1985 and 1994; Shenton, 2004). This is in contrast to the positivist notion of objectivity, which requires the collection of uncontaminated data via the design of methods that eliminate researcher bias (Carson et al. 2001). Yet, Patton (1990) argues that the intrusion of researcher bias in the design of research methods is inevitable. From the qualitative perspective, objectivity is not viable. Conformability requires reflexivity wherein the qualitative researcher to reduce bias by the admission of any predispositions held by the researcher (Lincoln and Guba, 1985 and 1994; Shenton, 2004). In doing so, the researcher allows the research design to be understood by others that may seek to question any underlying motivations and perceptions (Lincoln and Guba, 1985 and 1994; Miles and Huberman 1994; Shenton, 2004). In light of reflexivity and ethical disclosure, I am declaring that Large college I am employed by Large college as a tutor of BTEC level 3 extended and national diplomas in multimedia. Regarding this thesis reflexivity, is considered a continuous commentary (Lincoln and Guba, 1985 and 1994; Miles and Huberman 1994; Shenton, 2004). Lincoln and Guba (1985) advocate the use of an audit trail:

a transparent description of the research steps taken from the start of a research project to the development and reporting of findings.
(Lincoln and Guba, 1985)

Such a trail may include various forms of raw data, field notes, theoretical notes, reflexive writing and any materials that pertain to the development of methods/analysis or the disclosure of dispositions.

5.4: Ethics

The intensive nature of the proposed fieldwork raises important ethical issues and the researcher will, therefore, follow the ethical guidelines as set out by the British Educational Research Association (2011). With regard to this research design, there are four issues of import. Voluntary informed consent, so that all participants understand how data arising from their involvement will be used and reported. At every stage, the researcher will ensure that participants are fully informed as to what participation in the project involves.

Before completion of the online survey, participants will be required to read a statement of disclosure regarding all phases of the research design. This will be displayed on the first page of the website. Respondents will be asked to enter their email address into a text box at the bottom of the page. Particular attention will be paid to ensure respondents confidentiality and anonymity during data generation and the publication of findings. In any published works, I will not include any information that will make it possible to identify a respondent. Research records will be stored securely and only the researcher will have access to the records. Participants will be given the option request a copy of the research publications.

Incentives will be offered to participants to encourage data generation. Initially, this will be in the form of a donation to charity upon completion of the survey. It is envisaged that the completion rate of the survey will be quite high due to the altruism of participants. Upon completion of the survey, a further incentive will be offered to encourage participation in the focus-groups. Participants will be paid a small fee of approximately £3 each (this is the cost of a typical lunch in Large-College).

The issue of compensation does raise further ethical concerns regarding the credibility of data. However, learners will only be selected for the focus-groups based on their perceived level of digital-making literacy according to the digital-makers Discourse discussed in *section 3.1*. Learners with low levels of digital-making literacy (including the play, exploration and lower experimentation stages of the digital-making continuum) will not be included in the later rounds of research. This should reduce any discrepancies regarding the credibility of data.

In addition, the use of triangulation (Denzin, 1978; Lincoln and Guba, 1985 and 1994; Patton, 1999; Shenton, 2004) both methodical and of sources should further negate credibility issues.

5.5: Pilot study

The pilot study was conducted for two months and adhered to the methodological procedures defined in sections 5.2.1. and 5.2.2. Thirty-two learners completed the survey of that number three learners also participated in focus-groups. Twenty-three first and second-year learners came from a Btec multimedia course taught by the researcher. Nine learners came from a Btec graphics course. These learners and were not taught by the researcher: however, it should be noted that the graphics course is considered the sister course of multimedia.

The pilot study yielded rich data that infer results which appear to corroborate the theoretical framework of Chapter Four and theoretical hypothesis discussed in section 5.2. The study also revealed several significant insights into the operation and logistics of methodological procedures, to the extent that some procedures must be revised. The use of 'revision' as opposed to 'redesign' implies that the pilot study did not provide any compelling reasons to abandon the small-scale heuristic case study research design.

However, there were compelling reasons to adjust the parameters of the heuristic case-study. By this, I mean the format and timing of data generation. Aside from the anticipated issues regarding gatekeeper access, learner participation: and timetabling conflicts between learner cohorts and myself (Cohen et al. 2013). The main issue was the use of an online questionnaire. The majority of lessons in DMC courses are situated within computer suites. Learners enrolled in DMC courses have frequent access to computers and

were able to complete the questionnaire within a single lesson, without the need for extra arrangements. This was not the case with non-DMC cohorts.

Computer use on many non-DMC courses varies depending on the course. Some courses use computer suites on a weekly basis while others only do so occasionally. This created two problems firstly; non-DMC learners could not complete the questionnaire in college. This meant that I had to rely on learners completing the survey in their own time. Secondly, tutors were happy to use tutorial sessions (typically in rooms with only one computer used by the tutor) for the questionnaire. Tutors, however, were reluctant to give up teaching session time for the completion of the survey, especially if the session was in a computer suite.

To overcome this issue, I tried to book computer suites during the tutorial periods of non-DMC courses. However, I encountered a further problem. The computer suites are heavily used by DMC courses in particular, as well as a minority of non-DMC courses. Consequently, it was very difficult to book the suites without several weeks' prior notice and planning. Despite the strong encouragement and support of non-DMC tutors, not a single non-DMC learner completed the pilot survey. Hence, the results of the pilot survey whilst valid are skewed towards DMC learners and contain no comparative data between DMC and non-DMC courses.

5.6: Refinement of focus-group interviews


After conducting the initial focus-groups of the second round of research, it became clear that; the ratio of learners with high and low digital-making abilities was indeed one in five (Rodd, 1996; Shirky, 2005). As anticipated above this ratio was not evenly distributed (Hargittai and Walejko, 2008). Some cohorts had as many as fourteen FDM while others only had one. I had to split learners from cohorts with large numbers of digital-makers into two or three smaller groups. Due to logistical and gatekeeper issues, it became harder to organise each focus-group. It was also difficult to combine learners from cohorts with low numbers of FDM into one group. This meant that some of the proposed focus-groups became single interviews instead. To minimise the loss of group interaction in the single interviews, respondents were asked the same questions as those put to the focus-groups. I would then triangulate (Denzin, 1978; Lincoln and Guba, 1985 and 1994; Patton, 1999; Shenton, 2004) the single interviews with the focus-groups, thereby, increasing the credibility of the research design (Lincoln and Guba, 1985 and 1994; Shenton, 2004).

Nonetheless, I did not anticipate that the focus-group participants would exhibit such strong emotional responses to questions. Respondents in the large majority of interviews single and focus-group gave lengthy, detailed and complex answers that warranted many follow up questions. In many of the focus-groups, respondents gave their answers in turns; although group interactions were present respondents took it upon themselves to ensure that their individual views were heard. At the end of each interview, a large number of respondents expressed their enjoyment of participation in the interviews and some even volunteered to be included in any future investigation.

Chapter six

6.1: Sample of survey pages - North Campus DMC

Digital Cultures Survey

#28		COMPLETE Collector: Web Link (Web Link) Started: Wednesday, May 07, 2014 4:14:54 AM Last Modified: Wednesday, May 07, 2014 5:28:15 AM Time Spent: 01:13:21 IP Address: 194.82.200.211
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PAGE 1: Welcome to the Digital Cultures survey

Q1: Statement of Consent I have read the above information. I have asked questions and have received answers. By entering my email address in the text box below, I consent to participate in BOTH stages of this study (the questionnaire and focus group interview). Once again, thank you for your input!

[Redacted]

PAGE 2: Section 1: This is about you and your uses of digital media and digital technologies

Q2: Please state the following information:

What is your name (first and last):	[Redacted]
What is your age:	19
What is your gender (Male/Female):	female (but there is more than 2 genders, don't be so closed minded)
What is your ethnicity or nationality:	uk
What is the name of your college campus:	[Redacted]
What is the name of your current course(s) (A-levels, Btec or other level 3 course):	btec art and design level 3
What year are you in (1st year or 2nd year):	2nd
What is your previous level of study (Please state the Number of GCSEs you have at grades A – C, or the grade you got on your Btec Level 2 course)	as level - c and e
Do you have a job (Yes/No):	no
What is your future career ambition [if applicable]:	comic book illustrator
What is your future degree course ambition [if applicable]:	graphic design
What is your Parent(s) occupation:	(dad) costume armeror and (mum) volunteer at people's libry
What is your Parent(s) highest level of education (none/unsure, O-level/GCSE, A-level, Btec, Degree, Masters, PhD)	dad Ba (i think) mum nursing training

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Digital Cultures Survey

Q10: How did you first become interested in the activities for your digital hobbies? (Please give a complete reason for each digital hobby that applies to you. Put N/A in the box if it does not apply to you)

Making/Editing digital files	photoshop and illustrator so a while but more over the last year when i got my graphics tablet
Reading/Writing digital files	when i first saved a ps or ai file
Uploading/Downloading digital files	since the internet but more since i got tumblr
Socialising Online	since 2004 when you tube started
Online Retail	when i got a bank account and an amazon account
Playing digital files	like forever but more since i 2008 or 2009 when i got an ipod and itunes
Using Apps/Programs	since 2000 when my parents bought our first computer
Listening/Watching digital files	since 2000 when my parents bought our first computer

Q11: Please list any knowledge and skills that you have gained from taking part in the activities for your digital hobbies (Please give a complete reason for each activity)

Making/Editing digital files	editing and animating with photoshop. movie editing. drawing with illustrator. sound editing. photography and recording video and sound
Reading/Writing digital files	making jpegs, gifs, pdf, ps and ai files.
Uploading/Downloading digital files	uploading my work to youtube, tumblr etc. downloading games, movies and music mostly
Socialising Online	i know how youtube works. i can use most google things, Facebook, twitter, tumblr etc.
Online Retail	i can use amazon and bank online
Playing digital files	i know what is most suitable to be played on each program
Using Apps/Programs	illustrator. photoshop. most Microsoft programs. games (proper games). paper 53. itunes. etc.
Listening/Watching digital files	i tunes. movie player. google chrome.

PAGE 3: Section 2: This section is about your uses of the Internet

Digital Cultures Survey

<p>Q28: When you visit the 5 websites how do conflicts get resolved? (Please tick all of the boxes that apply)</p>	<p>Other visitors enter and take sides, The conflict does not get resolved, The thread is deleted, Visitors come to agreement or agree to disagree, Visitors are disproved/proved right by other members or other information</p>
<p>Q29: Thinking of the 5 websites, have you or another visitor that you recognise ever been excluded from any of the websites? (Please give a complete reason)</p>	
<p>If no, please go to the next question</p>	<p>no</p>

PAGE 4: Section 3: This section is about technology uses on your current course(s)

<p>Q30: Why did you choose to join your current course(s)? (Please tick all of the boxes that apply to you)</p>	<p>Needed for future degree course, Needed for future career, I find the course interesting/enjoyable, I didn't know what else to do, Childhood ambition</p>
<p>Q31: Before deciding to join your current course(s) did you think it was important to improve your computer knowledge and skills? (Please give a complete reason)</p>	
<p>If no, why not?</p>	<p>i'm pretty good with computers. they did teach some new stuff but it was easy. its also not super important to the course</p>
<p>Q32: Do you think that computer based activities are an important part of your college course(s)? (Please give a complete reason)</p>	
<p>If yes, why?</p>	<p>sort of. more to me because i use it alot</p>
<p>Q33: In your opinion how much of the computer-based activities on your college course(s) involve software that you use for your digital hobbies outside of college (Please tick 1 option only)</p>	
<p>Most activities</p>	
<p>Q34: In your opinion how much of the computer-based activities on your college course(s) involve MS Office and/or a VLE e.g. Moodle. (Please tick 1 option only)</p>	
<p>A few activities</p>	
<p>Q35: In your opinion how interesting are the computer-based activities on your current course(s)? (Please tick 1 option only)</p>	
<p>Mildly interesting</p>	
<p>Q36: In your opinion did you find the computer-based activities on your course(s) restrictive? (Please give a complete reason)</p>	
<p>If yes, why?</p>	<p>yeah. i'm a fast learner with this stuff so i move on quickly</p>

Digital Cultures Survey

Q37: In the past academic year have you used computers in your classroom for recreation instead of coursework during lessons? (Please give a complete reason) If no, why not?	not during lesson. after... yeah a bit
Q38: In your opinion do your tutors/teachers provide much support with computer-based activities? (Please tick 1 option only)	Support with a few activities
Q39: Please describe any help or support that you received with your computer knowledge and skills on your current course(s)? (Please give at least 1 complete description) i just ask what program they think is the best then learn it by myself. again i'm a fast learner and i'm good at figuring this sort of stuff out	
Q40: In your opinion does your college/school encourage you to develop your computer knowledge and skills? (Please tick 1 option only)	Unsure
Q41: Before you joined your current course(s) did you expect the course(s) to improve your computer knowledge and skills? (Please give a complete reason) If no, why not?	not really no. its not super it based.
Q42: In your opinion has your current course(s) improved your computer knowledge and skills? (Please give a complete reason) If yes why?	yeah but only because I pursued it
Q43: In your opinion who is responsible for the development of your computer knowledge and skills? (Please give a complete reason) If you, why?	me. i like learning tech and what kind of nerd would i be if i didn't know the basics

PAGE 5: Section 4: This section is about technology uses in your home

Q44: In your opinion how strong are your family's computer skills? (Please tick only 1 option per row)	
Mother	Weak
Father	Neither strong or weak
Brothers/Sisters	Neither strong or weak
Other relatives/friends	Weak
Q45: When at home how frequently do other people in your house teach computer skills to you? (Please tick 1 option only)	Hardly ever
Q46: When at home how frequently do you teach computer skills to other people in your house? (Please tick 1 option only)	At least once a week
Q47: In your opinion do your parents encourage you to develop your computer skills (Please tick 1 option only)	Neither strong or weak encouragement

6.1.2: Sample of thematic analysis of the written survey responses - North Campus DMC

Q10: How did you first become interested in the activities for your digital hobbies? (Please give a complete reason for each digital hobby that applies to you. Put N/A in the box if it does not apply to you)

Themes: Schools seem to have played a large part in fostering the students' initial interest in computers and digital technologies

Making/Editing digital files: a combination of different reasons but school and image editing/photography feature quite heavily. The students do seem to enjoy making things

Reading/Writing digital files: Once again a mixture of reasons but school features heavily here, based on their answers the student's digital cultures do not require much reading or writing this is driven mainly by their courses.

Up/Down digital files: Mainly driven by downloading music but a lot of mentions regarding school

Socialising Online: Mainly through friends but some mention of school and gaming as well

Online Retail: The usual reason of convenience but also some mentions of mobile phones and gaming

Playing digital files: Mainly though general computer use but there were a number of there are reasons mention as well.

Using Apps/Programs: Mobile phone use

Listen/Watch digital files: Mainly listening to music especially for the person who was able to learn English through music and cartoons

Making/Editing digital files	Reading/Writing digital files	Up/Down digital files	Socialising Online	Online Retail	Playing digital files	Using Apps/Programs	Listen/Watch digital files	Themes
Introduction to Photoshop in secondary school	Introduction to Final Cut Pro in College, experimenting with Windows Movie Maker	Free downloads and bought Downloadable Content and add on's for Video games on the PlayStation Network	Following latest social medias Facebook, and others through my friends		Always been a hardcore gamer from the start ever since i was bought a PS2, and have followed games series, console upgrades from the start and discuss them with my friends with the same interest. Also following anime that my friends are interested in as well often doing both activities together	Current movements and upgrades heard of from friends or PC suggestions	Always been an avid music listener and follow different genres, some that I listen to I have got from my parents as well as my friends	Art and Design
i started using photoshop to edit image but then i learnt that you could creat really interesting images so became more interested	i mostly used Microsoft in school to write my essay's	i really like music so i started downloading music a lot and uploading some on social websites to share	i beacme interested when Facebook came out nice way to keep in touch with people who don't live in the same country		i use iTunes and and my iPod to play digital files	i started using apps and programs when i got a iPhone	i listen and watch digital files on youtube or my mp3	Art and Design
in school	in school	in school	in school			when I got my ipad	in school	Art and Design
college-	secondary school-	3 years ago when	about 7/8 years	3 years ago,	about 7/8 years ago	3 years ago win i	7/8 years ago	Art and Design

photography and photoshop	microsoft word	in first got an iPhone	ago, when i joined MSN	when i first got my iPhone	when i first discovered youtube	got my iPhone	(youtube)	
College- editing work on photoshop	Secondary school- essay writing	Downloading music about 3/4 years ago and images on to Facebook/twitter	6 years ago when Facebook and twitter first became popular	3/4 years ago to shop/sell online	when i first got my mac-5 years ago	When I got my first iPod touch - 4 years ago	Online when I discovered youtube and other sites	Art and Design
Secondary school, Photoshop, so I could edit friend's photos.	Learnt from a young age; writing essays.	Secondary school, transferring photos and media from site to site.	Primary school, MSN	College, when I got a phone that could use internet.	Primary school, watching youtube, music	College, when I got a phone that could download apps	Primary school, watching youtube, music.	Art and Design
I use photoshop and illustrator quite a lot in my work because i enjoy it.	Research and for important essays.	I upload/download my work a lot because of my online portfolio.	through friends.	clothes and art products.		i work with illustrator, photoshop, word and google chrome.	I'm into music so i go on Soundcloud at least everyday and i also love Youtube.	Art and Design
Interest in Photoshop	No choice had to use it	Watch Films [Torrents]	Got bored		I enjoyed watching media	Mainly used for gaming	Get bored on journey so mainly used while travelling	Art and Design
photoshop	using word	research		shopping		phone	phone	Art and Design
college, friends	college	college, friends, family	friends	friends, family	friends, family	friends, family	friends, family	Art and Design
Watching YouTube videos	YouTube	YouTube	Gaming	Shops	Music	Gaming	Music	CAGWD
Getting a Graphics Tablet	Homework and trying to write small stories	Uploading to art websites, downloading music/videos, uploading pictures to my computer	To talk with friends when at home and not with them	To buy the things I need, such as art materials, or things that I want	DVD's?	To get the full experience and try new programs to find out which one is suitable for what I need	Videos and DVD's	CAGWD
Creating Youtube videos	work/personal interest	personal interest	personal interest	Work	personal interest	work/personal interest	personal interest	CAGWD
My Band/Gaming	My Band	My Band/Gaming	Friends using social networking sites	I like to shop	My Band/Gaming/Everything else	They are there to use and they seemed interesting	They were accessible	CAGWD
Procrastination	Procrastination	Procrastination	Procrastination	Procrastination	Procrastination	Procrastination	Procrastination	CAGWD
Largely for creative purposes such as filming	Largely through a necessity to use publication	One of my first uses of downloading files	A need to message a friend on	To access online exclusive	I was introduced to gaming at an early age from my older brother.	From seeing the Apps /Programs being used	With the growth of digital music and video files, this was	CAGWD

and animating.	programs such as Microsoft Word.	would be to download those necessary to emulate console games on a computer.	sites/programs such as Windows Live Messenger, MySpace or Facebook.	items such as independent products and tickets to concerts.		by peers.	slightly pushed upon me by modern society.	
			through family	through family	gradually using a computer			ICT Group P
Youtube	playing games	music	friends	Needing to buy stuff	Finding out games	friends	Music	ICT Group P
Personal Research and Interests	Personal Research and Interests	Personal Research and Interests	When talking with my friends	Saw Many people use it	Personal Research and Interests	Personal Research and Interests	Personal Research and Interests	ICT Group P
when starting this course	when i bought a smartphone	when i bought a smartphone	when i come to the UK	seeing everyone else doing	my friend asked that i should relax by playing games	once i bought my phone	my phone	ICT Group P
			Friends	On interest		friends		ICT Group Q
		I became interested by downloading music	twitter	clothing retail				
			Skype/Teamspeak all sorts of ways, just talking to people i know	Buying computer Parts and building computer is one of my interests i got into it from my brother		I do a lot of things in computers so i get to use variety of apps and programs	I just like listening to music	ICT Group Q
Youtube interesting me in editing videos.	Reading Novels got me into writing my own.	Music, video and video gaming keep me interested.	Gaming has brung me into the online world.	Through gaming, I have been brought towards a online retail world and I can purchase my necessary needs for gaming and such	Came naturally when I was introduced into computing	Came naturally when I was introduced into computing	I enjoy listening and watching videos so It was no surprise that I took an interest	ICT Group Q
School Work	School Work	School Work	Socializing		To entertain	Work, Learning new things and to have fun	To entertain myself	ICT Group R

Because of images i used to edit.	I am a novelist so reading or writing is just a part of me.	You can find or download anything on internet.	I didn't know about any social networks till 2011, when one of my friend told me about facebook. So after that i started using all of the social network sites, through which you can stay connected to each other.			depends what app you are using or which program. My favourite app is Google play, that came into my life list recently when i bought a droid phone but these things change with Media and technology. You cant stick to one favourite app or program for the rest of your life.	Music is everything to me from the beginning. It gives me ideas when i need it most. Without it i am nothing and Movies are my Godfather. I learned English from watching cartoons and movies. I started listening and watching digital files in my school age when i was 12 or 11.	Media
I first started by making a video on videomaker for a friend as a birthday present from then, i enjoyed it and continued to make different things on it and upload to youtube			just regularly use it to keep in contact with friends from primary school and secondary	It became quicker and easier to do instead of going out and shopping	just became a thing to do whilst chilling out on the laptop		usually at night when i cant sleep i watch films or if i want to catch up on something i have missed i watch it online	Media
when i started to have a keen interest in making my own files	college	when i want to download a new song or to watch tv online	when everyone started to use facebook i was around 14 so then	when i got my self a job and got paid i realised i could buy stuff online	on my iPhone/iPod	on my iPhone/iPod	when i got my first laptop i started watching youtube videos	Media
Interest in photography and video	Films	Images	Family and friends	Shopping	Music and video	College and family work	Music and video	Media
Studying photography GCSE	Schoolwork		Facebook	Amazon			Films	Media
Youtube	Reading digital novels/stories		Video games/Social Network sites	other hobbies		other hobbies	Playing the keyboard/musical interests	Media
Media course	school	school						Media

YouTube	I write blogs to get rid of stress	It's easier than other options	Facebook	T-shirts and comics	iTunes and YouTube	My iPod	YouTube and BBC iPlayer for radio	Media
My friend edits video game shots and puts them into a montage		Needing music/movies to watch	Everyone in my school was doing it and I felt left out	It's quicker and easier than going to the shop	Entertainment	Making the most out of my iPhone	To fill time	Media
friends	college	friends	friends	personal interest	personal interest	friends	friends	Media
Friends	Personal Interest	Share Daily Activities	Personal Interest	Personal Interest	Personal Interest	Friends	Personal Interest	Media
School and college	School using USB's	School using USB's	When I was introduced to wifi	When I got a card	At home and at college, playing videos from my phone or a camera etc.	When I got a smartphone	School & College	Media
Making videos at home	school and college	at home	at home talking to friends	when I realised I could shop at home	at home	at home	at home	Media
television and games	college/ i love writing too	secondary school ICT	when i discovered Hotmail.com		when i wanted to see videos or games etc- secondary school	last year	early secondary school	Media
Brothers' music career			Popularity					Media
I make music and logos	I have a blog	I upload my songs onto youtube and SoundCloud	Facebook	Amazon	YouTube	Multimedia Software	Youtube/Soundcloud/RapUp	Media
college	college	college	friends	family	college	college	college	Media
self	friends	self	brother	mum	self	self	self	Media
			Socialising on daily bases with my friends	Range of products online rather than normal retail	The Entertainment value		The variety of media genres	Media
this is used when i DJ		this is used when i DJ	this is used for my photographs		this is used when i DJ	this is used when i DJ	this is used for photographs	Photography

Q31: Before deciding to join your current course(s) did you think it was important to improve your computer knowledge and skills? (Please give a complete reason)

Themes: “Not really it just happens automatically” This is the attitude of the student-tutor as I mentioned in Q41 & 42 students believe that by a certain age they automatically know enough about technology. To the point that the students feel better equipped to teach them-selves rather than be taught by their tutors. They choose their courses to get exposure to areas of knowledge that are too difficult, expensive and/or inconvenient to gain access to outside of education. However the slight majority did feel the need to improve their skills for a number of reasons. Some are mindful of future employment, others simply want to achieve well on their courses while others just want to upgrade their knowledge.

Yes	No	Unsure	Themes
Yes, as i do not know how to use every programme to edit media			Art and Design
		was not sure because before that i did not think i needed computer skills to do art but it turns out that i do because we use programs such as photoshop and illustrator	Art and Design
	no as the course isn't very computer based		Art and Design
yes because i knew that it would be a lot more work than gcse			Art and Design
	no- because i'd learn everything here		Art and Design
	I'm quite computer savvy as it is.		Art and Design
yes, because everyone uses a computer and its a useful thing to learn about			Art and Design
because i know i would be using programs to push concept ideas together			Art and Design
to help me produce good work			Art and Design
for networking, and for creative media work in my projects			Art and Design
Yes, because the course requires them			CAGWD
		Wasn't too sure w hat I had to improve on	CAGWD
The course w ill be teaching me new skills that I'll have to keep practicing and using in my ow n time.			CAGWD
Because I want to learn more.			CAGWD
To improve			CAGWD
	I felt competent at the skills I needed when starting the course and had assumed correctly that we would be taught what we need to know.		CAGWD
	no		ICT Group P
yes because this course requires the use of computers			ICT Group P
	no because i know enough already		ICT Group P
Yes, it's needed for future career and degree course.			ICT Group P
yes because the w orld has become computer w orld			ICT Group P

to get more knowledge			ICT Group Q
Because i will be functioning with computers			ICT Group Q
Because IT is my Hobby.			ICT Group Q
Yes as I believe I'd learn a bit more and improve on my current abilities.			ICT Group Q
	no		ICT Group R
Yes			ICT Group R
	No.. i have already got the skills not like a Geeky one but i know how to use stuff and i didnt think of improving it.		Media
because even though i am quite know ledgable w hen it comes to computers theres loads of different sections to computer skills and its a forever learning skills as you go along each day.			Media
yes because i w ill be using them a lot			Media
	I felt that I had quite a good skill set		Media
	Because I expected to be taught the more advanced skills I w ould need on the course		Media
yes, as i w ant to get into a job in videogaming industry or media.			Media
so i have an idea how things w ork			Media
	Not really it just happens automatically		Media
	I've alw ays been confident on technology		Media
	no		Media
Yes because i did not w ant to be left behind w ith the least know ledge			Media
	Not really as I'd already had some previous skills that I think w ould be up to standards for this course		Media
	didn't think I needed to		Media
because applications are alw ays upgrading so my skills should do as w ell.			Media
	No, because you learn as you go along		Media
you need them TO BE INVOLVED w ithin the media			Media
	no your gonna learn on the course		Media
becomes i can alw ay lern			Media
	because my computer skills w as good enough already		Media
		dont know	Photography

Q41: Before you joined your current course(s) did you expect the course(s) to improve your computer know ledge and skills? (Please give a complete reason)

Themes: The majority of students felt obligated to improve their skills because they were aware that their course would introduce them to software that they did not know before. This is very interesting. How could they have done this if they didn't know what software they would be using? How could they have learned new skills independently? It is almost as if the students don't see any difficulty in acquiring new skills rather what they dislike is the uncertainty of not having the correct knowledge. Therefore these students are choosing their subjects based on a need or desire to expand their knowledge beyond its usual spheres. Only a few students mentioned that their subjects expected them

to have improved knowledge; and only two students mentioned relying on their tutor for improved knowledge. Thus the student-tutor dislikes uncertainty and will seek to join a course to remove their uncertainty.

Yes	No	Unsure	Themes
		i joined my current course although my job interest veers to the more game design course, with myself wanting to be a concept artist but was unsure what it would be like. As my way of drawing is illustrative	Art and Design
	no i didn't think it was really computer based		Art and Design
because it was a web design course and you need computers			Art and Design
	no because i didn't think i would be using these type of programmes		Art and Design
	no as its art based		Art and Design
Art and design involves graphics			Art and Design
yes, because I'm being taught by sustain teachers who use CAD everyday.			Art and Design
I knew there were some CAD teutor present who could help me if I need it.			Art and Design
because I was told I would have a CAD teacher			Art and Design
part of the course program			Art and Design
Yes, because it is a computer animation course			CAGWD
Use of loads of different computer programs			CAGWD
That's the w hole point of this course.			CAGWD
It w ill helps me w iths computerings.			CAGWD
I knew that there would be programs involved with the course that I did not know how to use and would be expected to learn.			CAGWD
because its a computing course and there are a range of subjects, boy w as i w rong!			ICT Group P
Beucase it is an IT course, so more know ledge is need in this topic/course			ICT Group P
	no		ICT Group P
Yes, they teach a lot of advanced computer skills and this is something i need to consider for my future career.			ICT Group P
yes because this course is w working w with computer			ICT Group P
		not sure	ICT Group Q
Because i have gained much more knowledge before staring my course			ICT Group Q
		Kinda in the middle, Just Unsure about it.	ICT Group Q
Well taking a look at the couse I found out			ICT Group Q

there are some units which I haven't studied before so i took it as a chance to learn something new			
	no		ICT Group R
Yes			ICT Group R
	No because it is a level 3 course even if they had to do it, they could do it in level 1		Media
because media is half mainly about using the computers and expanding your know ledge			Media
yes because it is a lot of computer w work			Media
The course involves learning media production skills w which are largely computer based			Media
Because a media course requires heavy use of computers and different programs, hence my skills would need to be improved			Media
yes, as the course uses much computer technology			Media
because you are doing media			Media
In specialised software yes			Media
All of the work is mac based			Media
yes because it is computer based			Media
Yes, because the course is mac based			Media
Yes, Media is a subject w here you'll need to learn and know a lot of computer skills			Media
using new software			Media
because it epects us to use applications that i did not know existed			Media
	No you asked this already i swear		Media
because its a media course			Media
yes its media you use computers			Media
final cut pro			Media
yes because the Course is IT based			Media
		don't know	Photography

6.1.3: Tables of results from the survey of Large college

Table 1: Large-College Overall Survey

	Number of Learners Surveyed	Number of Completed Learner surveys	Number of Uncompleted Learner surveys	Number of Frequent Digital-makers	Number of Infrequent Digital-makers	Percentage of Completed Learner surveys %	Percentage of Uncompleted Learner surveys %	Percentage of Frequent Digital-makers %	Percentage of Infrequent Digital-makers %
Total	494	470	24	96	374	95.14	4.86	20.42	79.58

Table 2: Large-College Survey: Breakdown by campus

Name of Campus	Number of Learners Surveyed	Number of Completed Learner surveys	Number of Uncompleted Learner surveys	Number of Frequent Digital-makers	Number of Infrequent Digital-makers	Percentage of Completed Learner surveys %	Percentage of Uncompleted Learner surveys %	Percentage of Frequent Digital-makers %	Percentage of Infrequent Digital-makers %
North	313	301	12	60	241	96.16	3.83	19.16	80.06
South	181	169	12	36	133	93.37	6.62	19.88	78.69

Table 3: Large-College – North-Campus: Survey Breakdown by campus and course

Name of course	Name of qualification	Year of course (1 st /2 nd)	DMC or non-DMC	Number of Learners surveyed	Number of completed Learner surveys	Number of Uncompleted Learner surveys	Number of Infrequent Digital-makers	Number of Frequent Digital-makers
Art & Design	BTEC Level 3, 90 credit diploma	1 st	DMC	18	18	0	11	7
Art & Design	BTEC Level 3, Extended diploma	2 nd	DMC	11	11	0	5	6
Computer Animation, Games and Web Design (Multimedia)	BTEC Level 3, 90 credit diploma	1 st	DMC	16*	16	0	10	6
Computer Animation, Games and Web Design (Multimedia) (Pilot Study) ^	BTEC Level 3, Extended diploma	2 nd	DMC	(16) ^	(16) ^	(0) ^	(13) ^	(3)^
Creative Media Production	BTEC Level 3, 90 credit diploma	1 st	DMC	18	17	1	11	6
Creative Media Production	BTEC Level 3, Extended diploma	2 nd	DMC	35	34	1	21	13
Graphic Design	BTEC Level 3, 90 credit diploma	1 st	DMC	9	9	0	9	0
Graphic Design (Pilot Study) ^	BTEC Level 3, Extended diploma	2 nd	DMC	(9) ^	(3) ^	(6) ^	(2) ^	(1) ^
IT Users	BTEC Level 3, 90 credit diploma	1 st	DMC	0	0	0	0	0
IT Users	BTEC Level 3, Extended diploma	2 nd	DMC	60	57	3	46	11
Photography	Combined A-	1 st	non-	16	16	0	15	1

	Level & BTEC Level 3, 90 credit diploma		DMC & DMC					
Photography	Combined A-Level & BTEC Level 3 Extended diploma	2 nd	non-DMC & DMC	0	0	0	0	0
Business (Finance, travel & tourism)	BTEC Level 3, 90 credit diploma	1 st	non-DMC	0	0	0	0	0
Business (Finance, travel & tourism)	BTEC Level 3, Extended diploma	2 nd	non-DMC	46	44	2	43	1
Health and Social care	BTEC Level 3, 90 credit diploma	1 st	non-DMC	0	0	0	0	0
Health and Social care	BTEC Level 3, Extended diploma	2 nd	non-DMC	18*	15	3	13	2
Sociology, Mathematics, Chemistry & Various courses	A-Level	1 st	non-DMC	49*	48	1	44	4
Sociology, Mathematics, Chemistry & Various courses	A-Level	2 nd	non-DMC	17	16	1	13	3
Totals				313	301	12	241	60

* = 1 incomplete duplicate survey not included in the number of learners surveyed

^ Used in pilot study not included in the number of learners surveyed

Table 4: Large-College – South-Campus: Breakdown by campus and course

Name of course	Name of qualification	Year of course (1 st /2 nd)	DMC or non-DMC	Number of Learners surveyed	Number of completed Learners surveys	Number of Uncompleted Learners surveys	Number of Infrequent Digital-makers	Number of Frequent Digital-makers
Art & Design	BTEC Level 3, 90 credit diploma	1 st	DMC	22	22	0	17	5
Art & Design	BTEC Level 3, Extended diploma	2 nd	DMC	15	14	1	9	5
IT Users	BTEC Level 3, 90 credit diploma	1 st	DMC	14*	13	1	13	0
IT Users	BTEC Level 3, Extended diploma	2 nd	DMC	23	23	0	18	5
Music	BTEC Level 3, 90 credit diploma	1 st	DMC	11**	11	0	5	6
Music	BTEC Level 3, Extended diploma	2 nd	DMC	12	12	0	4	8
Mathematics & Engineering	Combined A-Level & BTEC Level 3, 90 credit diploma	1 st	non-DMC & DMC	11	10	1	10	0
Mathematics & Engineering	Combined A-Level & BTEC Level 3 Extended diploma	2 nd	non-DMC & DMC	11*	9	2	7	2
Applied Sciences	BTEC Level 3, 90 credit	1 st	non-DMC	17	17	0	15	2

(Medicine)	diploma							
Applied Sciences (Medicine)	BTEC Level 3, Extended diploma	2 nd	non-DMC	9*	8	1	8	0
Sports	BTEC Level 3, 90 credit diploma	1 st	non-DMC	36	30	6	27	3
Sports	BTEC Level 3, Extended diploma	2 nd	non-DMC	0	0	0	0	0
Totals				181	169	12	133	36

* = 1 incomplete duplicate survey not included in the number of learners surveyed

** = 2 incomplete duplicate surveys not included in the number of learners surveyed

Chapter seven

7.1.1: Sample of focus-group interviews: Btec Art & Design - North Campus DMC

Moderator questions in **Bold**, Respondents in Regular text.

Transcriber Comments: Generally good audio.

KEY: Unable to decipher = (inaudible + timecode).

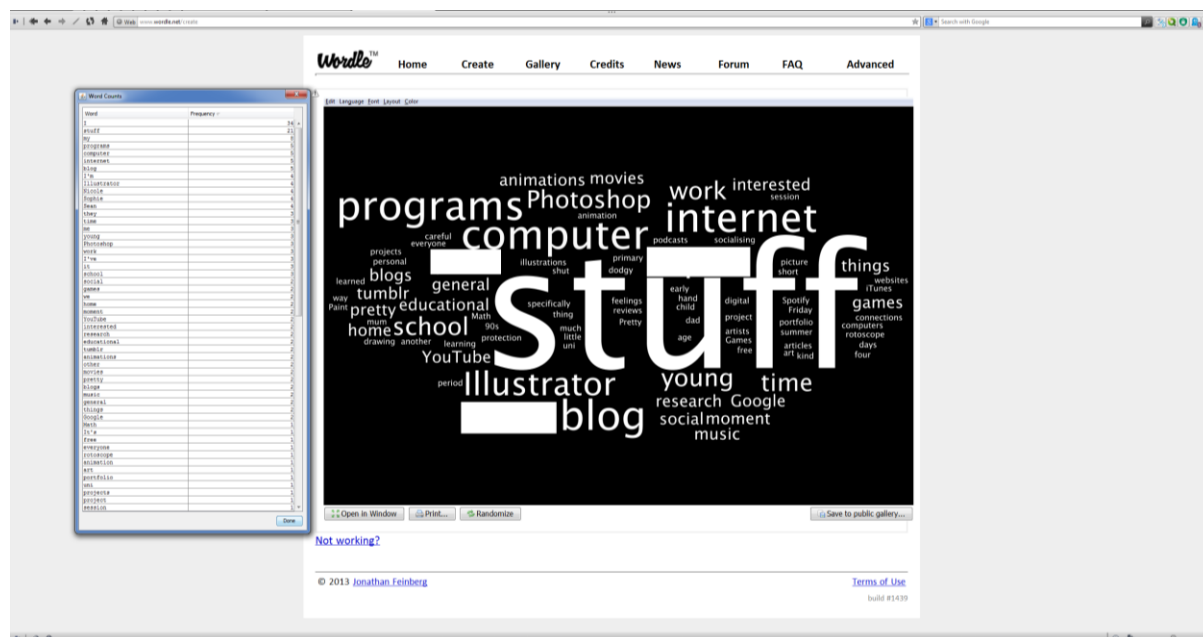
Italics = my additions

Situated Meaning (adjective, noun)

Cultural Model (Espoused Model, Evaluative Model, Model-in-(interaction))

Reflexivity (Activity, Material, Political, Semiotic, Socio-Cultural) the reality of the situation

Q1) That's fantastic. So, let's begin. I'd like you to think back to when you were a child. Think back to your early experiences of computers and digital technologies. What did you think their purpose was?



The real names of the three participants have been redacted to protect their anonymity. The sizes of the white boxes indicates the frequency of participant responses to the question.

Situated meaning to question 1 and follow up questions: The tag cloud and word count (Wordle) indicates that all three were initially unclear as to the purpose of computers and digital technologies. Word 'Stuff' is the largest word and appears 20 times in their responses to Q1. However, one can see that as they aged their

understanding of the purpose of computers and digital technologies, begins to emerge. Susie and Vaughn dominate this question. Nicola has the least input this is significant as one can literally see the development of Susie and Vaughn's understandings. The next largest words in the cloud are programs, computer, internet, Illustrator, young, time Blog: photoshop, work, school. One can argue that as the Susie and Vaughn grew they came to understand computers and digital technologies as a platform for artistic expression most likely influenced by the activities they undertook in school (and the home). In their early experiences, they used artistic programs (Paint, Illustrator and Photoshop) they also used the internet. It suggests that their understanding of its purpose became clearer over time evolving from broad terms like programs, computers, internet and stuff: To more specific terms like blog, Illustrator and Photoshop; via the conduit of work done in school. The specific terms occur at the latter stages of their early development. They were given time at a young age to develop their digital-making skills.

The frequent appearance of the word stuff may still be a reluctance to define the art work which they produce. Or 'stuff' is a lazy term used whenever the student cannot or does not want to clarify a statement or term any further. This may be an indication of an attempt to hide their unfamiliarity or lack of knowledge.

Nicola: Games.

MODEL-IN-(INTER)ACTION: Association with play this supports the initial stage of the digital-makers discourse. This was also found in the pilot study.

ACTIVITY: Computer games

SEMIOTIC: This is a sign that her digital literacy began at a very low level. Because she is not involved in digital-making she does not require high levels of digital literacy to participate in this activity.

Games.

Vaughn: I think it was for creating stuff, digital stuff, programs you can make animations and stuff. *I'd learn about animation* At my primary school, every Friday we used to do a little *rotoscope session thing* (inaudible - 00:01:05).

MODEL-IN-(INTER)ACTION: His first experiences with tech were at school therefore his digital activities always had an external goal. This supports the notion that if one's first encounters with digital tech occur in a formal setting; the individual skips the play stage and goes directly to the experimentation phase. This was also

found in the pilot study. The external goal is usually set by an authoritative figure such as a teacher or parent, with learning the operation of a computer or the performance of a task at the core of the goal. Computer sessions took place every Friday. This is significant because it provided a structure and support system that Vaughn may not have otherwise received. The sessions were focused on animation as situated activity so computers were embedded into the pursuit of a fun activity (the ideological model). This is the basis of Vaughn's tech world view, had the autonomous model been used would he have the same attitude.

MODEL-IN-(INTER)ACTION: His early experiences with digital tech were guided. This supports the Situated meaning which initially observes that their early experiences were shaped by others (parents & teachers) as the students grew they began to shape their own experiences.

during their initial experiences with digital-making students need routines. Ad hoc delivery of digital-making skills is not beneficial for development of skills. THEME: ROUTINE

ACTIVITY: Digital arts and animation software packages for the creation of digital art and animation

SEMIOTIC: Digital arts and animation are digital-making activities; digital-making is necessary for the development of high levels of digital literacy. Vaughn began his digital literacy development at a higher level than Nicola.

MATERIAL: Primary school, regular lessons every Friday students and teachers present

SOCIO-CULTURAL: the teacher student relationship and knowledge distribution is established.

POLITICAL: From this point onwards Vaughn will look to his tutors for the advancement of his digital-making abilities. This means that digital culture was a significant factor in his decision to join a DMC course.

That's where you first got your experience with computers and everything.

Vaughn: Yes, yes.

That's really interesting, yes, you are lucky. *That sound's really good.*

Susie: For me it was just, I learned to use Google at a really young age and stuff like that, I started learning the internet when I was quite young. Really, at home it was mostly just games and educational stuff and Paint. (group laughter)

MODEL-IN-(INTER)ACTION: Susie learned to use Google and the net at a young age. This would imply that she was looking for specific information. However, I think that Susie did these activities in school because she then says at home it was just games and educational stuff. Her early experiences with digital tech were guided by Google and her Parents. This fits with the situated meaning.

EVALUATIVE MODEL: From her speech one can see that Google and the Internet (I think she is using both interchangeably) is of particular importance to her it is the one thing that she is specific about in her answer and it is mentioned twice. The makes a second judgement stating that in her home it was just games, educational stuff and paint.

Perhaps the continuum phases of play and experimentation should be merged into a single phase consisting of two tiers. She also mentioned paint which has come up a lot in the interviews. I will class digital art as a ludic activity as the student was not commissioned to produce the artwork. There may be something important about visual or aesthetic creative activities or perhaps the student is trying to replicate the learning activities that take place in junior school.

The educational software used in the home replicates or reinforces the learning activates that take place in the school. Hence the student is immersed in digital-making in both the discourse of the school and the home. THEME: IMMERSION

ACTIVITY: Susie was involved in more than one type of activity. She learned to search and navigate the web, she created digital artwork, she played games and used educational software all form a very young age.

SEMIOTIC: Susie's greater range of activities demanded much higher levels of digital literacy. When combined with her intrinsic motivation one can see that she began her digital literacy development at a much higher level than Vaughn and Nicola

MATERIAL: The Internet, home, school, digital art software, computer and educational games.

SOCIO-CULTURAL: The key thread that links all her activities together is independence. She was not guided by teachers as in Vaughn's experience; rather her experiences were self-driven. She began to build relationships with the software directly.

So for Susie and Nicola it was games, digital art, that sort of thing.

Nicola: And what do you call it? Math websites.

So there was some educational *edutainment* stuff as well.

Susie: I think because I started using the computer really young, I wasn't really allowed to use the internet so much, because it was still kind of in the early days of the internet, I was about four when we got our first computer, so it would have been still in the '90s, stuff was still dodgy and they didn't have all the child protection stuff, so my mum and dad were really careful for me not to use the internet, so I only used the internet at school, but they got me loads and loads of educational games and programs and stuff.

EVALUATIVE MODEL: The internet is dangerous this is a perception that was prevalent amongst parents and other concerned parties. The ease of accessibility meant that it was easy for young children to stumble upon inappropriate content. Susie's parents censored her use of the internet.

MODEL-IN-(INTER)ACTION: She didn't use the net at home but rather in school. However her parents were not technology-averse they gave Susie educational games and programs. HADMs require structured environments in their initial encounters with digital technologies; preferably environments that either mimic or replicate learning in schools. This would imply that play may be adverse for the development of digital-making. Do HADMs begin with the logical instruction phase?

Unstructured or loosely structured environments are dangerous for the inexperienced; such individuals need structures imposed by concerned authoritative figures. In this instance schools and parents. THEME: STRUCTURE

Learning through games at a young age, making stuff (animations), internet use at a young age, learning at school and in the home.

SEMIOTIC: Susie's future reliance on Google is foreshadowed here. From an early age her interactions with software were guided by the software itself. Hence Susie develops a reliance on software to solve problems beyond her capabilities.

POLITICAL: Parents and teachers acted as guardians rather than as guides. In this instance Susie was wittingly or unwittingly immersed in a constructivist/constructionist learning environment from a very early age.

SOCIO-CULTURAL: the internet is a vast expanse far too complex and dangerous for young children therefore parents and teachers must set boundaries and cordon off any dangerous areas. However, many parents and teachers often focus on the danger and encourage or leave the child to cope with the complexity. Thus, if given enough time the child will learn to overcome the complexity and appear to be naturally adept with technology.

MATERIAL: The Internet, home, school, digital art software, computer, and educational games.

ACTIVITY: Susie was involved in more than one type of activity. She learned to search and navigate the web, she created digital artwork, she played games and used educational software all from a very young age.

That is brilliant, that's brilliant! So is this how you see computers now?

ALL: No.

So what's changed?

Vaughn: The way I use computers now, I socialise more, but I also have a lot of programs like Spotify, I listen to a lot of music. On the other hand, I use a lot of programs like Illustrator, Photoshop to edit stuff and create my illustrations, create my work, my art. That's what I mostly use the work for. I also go to YouTube and stuff like that, and social networking a lot, as well, more.

EVALUATIVE MODEL: Initially Vaughn used computers to make things now he is also using computers to communicate with others. Yet he sees making and communication as two separate things, as indicated by 'On the other hand'. Vaughn is primarily a digital-maker at his core 'That's what I mostly use the work for'. Vaughn does not appear to be communicating his making work with others. Could it be that HADMs are able to view this distinction between making and communication? As Vaughn matured he began to see distinctions in his uses of digital tech.

MODEL-IN-(INTER)ACTION: His use of social software and creative software is compartmentalised he is guided by the vendors of each software. To a large extent he has little recourse in his uses of software.

making, communication (socialising) and research are distinct activities. THEME: DISTINCTION

ACTIVITY: Socialising online, listening to music online, using digital arts software (creating & editing) and watching videos online.

MATERIAL: The Internet, Photoshop, Illustrator, Spotify, and YouTube

POLITICAL & SOCIO-CULTURAL: online recreation activities are now part of how Vaughn views computers and digital tech. This type of behaviour is the accepted norm of the times. Digital technologies are commonplace in the maintenance of friendships and relationships.

SEMIOTIC: However, there is a clear distinction between recreation and art.

Vaughn's clear division between recreation and work-related activities is a sign that his digital-making skills have improved. He can recognise different types of digital literacy and prioritise one above the other.

So, it's become more like a social and creative platform for you.

Vaughn: Yes.

Okay, that's excellent.

Vaughn: And also, I use it for research, as well. So research, creating and socialising.

MODEL-IN-(INTER)ACTION: By research Vaughn means college coursework. This implies that he views creating (making) as his thing.

SEMIOTIC: Vaughn is reinforcing the distinction between his recreational and work related uses of computers. This is a sign of high digital literacy due to his digital-making activities.

ACTIVITY: Research, Creating artwork and socialising online.

making, communication (socialising) and research are distinct activities. THEME: DISTINCTIONS

Brilliant.

Nicola: I'm similar, except I don't use Photoshop or Illustrator, because they require me to pay. I watch movies and I run a blog on Tumblr, and for socialising and Skype-ing.

ESPOUSED MODEL & EVALUATIVE MODEL: Nicola also sees distinctions; surprisingly she states that she does not make things due to prohibitive costs. By this she is stating that she does not create artistic NMO she does create other types of NMO. Nicola is a different type of digital-maker; she uses NMO to communicate with others. Her non-use of digital-making software is a choice based on her belief that such programs have prohibitive costs; or she simply refuses to pay. There are alternatives but I don't think that she is aware of them.

the social web enables the construction of NMO for communication rather than making. There are at least two types of digital literacy one that enables digital-making and another that enables digital communication. THEME: TWO LITERACIES (Vaughn is a maker, Nicola is a communicator)

SEMIOTIC & ACTIVITY: Her activities do not include digital-making this means that her digital literacy skills have not developed as extensively Vaughn and Susie. She watches movies, skypes, runs a blog and socialises online. These activities are recreational; her only reason for using a computer is that they help her to further her interests.

POLITICAL: Her excuse for not using creative software is weak and indicates that this is her preference rather than an enforced choice.

Can I ask about your blog, is it just like a general blog?

Nicola: It is like a picture blog and then I do my own stuff, like writing my feelings or reviews or all that.

EVALUATIVE MODEL: Nicola comments a lot on the NMO of others. There are two types of NMO primary (original content made by the individual) and secondary (evaluations of content made by others) For Nicola computers became an emotional platform. **THEME: DISTINCTIONS**

SOCIO-CULTURAL: Nicola may see her online activities as a means of connecting to people outside of her normal social circles. It is almost as if she has a compulsion for emotional gratification or catharsis which she gets from her blog and reviews. Or could it be that she is an artist just like the other two and feels a need to be recognised by others. Nicola lacks the digital-making skills and so uses her digital communication skills to project herself into the online sphere.

ACTIVITY: blogging and writing reviews

Vaughn: I also have a blog, as well. I have two blogs. One for my personal stuff, what I'm interested in, and another blog that I set up for uni, for a short period, for summer school, and they helped me make a blog for my work, getting my portfolio up on the computer so everyone can see it, connections and networking with other artists and stuff.

EVALUATIVE MODEL & MODEL-IN-(INTER)ACTION: Vaughn continues to display his distinctions even further, by having separate blogs one for his personal life (communication) and one for his making (career). I think that by 'everyone' Vaughn means other digital-makers like him as indicated by 'connections and networking with other artists and stuff'. Here the social web is enabling the communication of

Vaughn's artwork but not the making. The making was developed by the university summer school. Digital-making requires structure.

The social web enables the construction of NMO for communication rather than making. THEME: DISTINCTIONS

ACTIVITY: blogging provides a space where Vaughn can display his work

POLITICAL & SOCIO-CULTURAL: The blog that contains his artwork was set up by a university. Once again Vaughn has turned to education for the development of his digital-making skills. However, he has also discovered a new means of developing his skills, by seeking to connect with other artists. Vaughn's relationship with digital-making will always be rooted in education but the future development of his skills may come from networking with other artists especially professionals. This may be Vaughn attempt to develop his skills beyond that of education perhaps he recognises this. Or Vaughn is simply moving on to the next stage of his own professional development.

Susie: Pretty much all of that. I listen to a lot of music on my computer, I've got iTunes. I've got Google running 24/7, it doesn't get shut down. I watch a lot of movies and YouTube and stuff like that and I watch a lot of things like animations and stuff like that *things that I'm interested in*. And I run two blogs on Tumblr, one is stuff that I do, just a general one. Between projects, it will just be general stuff, but during a project it will be specifically focused on that, so right now it's what I'm doing at the moment. And then, I have my other one, which is just stuff that I do at home, in my own time. So I haven't really been doing much on that one recently. And yes, I use Illustrator and Photoshop a lot, and pretty much any drawing programs that I can find for free as well, but mostly Illustrator at the moment, I've been using that. And yes, social networks and stuff like that. Oh, and I read articles and listen to podcasts all the time.

EVALUATIVE MODEL: Susie is showing similarities to Vaughn in that she can also see distinctions between making and communication. Although Susie has two blogs as well she does not use them in the same way as Vaughn. Both of Susie's blogs are used for making: a general blog that she uses for her coursework and personal interests and a second one that she uses for her personal making projects. Susie only posts personal stuff when not engaged in making. Susie's distinctions are arguably more nuanced than in that her making work is divided between her college coursework and her personal stuff.

ESPOUSED MODEL & MODEL-IN-(INTER)ACTION: Susie is a maker. Susie does not use both blogs at the same time this implies that she uses her home blog as a means of replicating or extending the digital-making activities that she performs in college. This is the second time Susie has mentioned Google she has a strong reliance on it. Susie has come to believe that Google is beneficial for the expansion

of her knowledge. Vaughn and Susie immerse themselves in digital-making via different approaches. Vaughn reaches out to educational institutions, while Susie replicates the learning environment at home. Both are still operating in the same way as their initial experiences. Susie's parents gave her games and programs. Vaughn had his Friday animation classes.

As High Ability Digital-makers get older they take on the responsibility of immersion in digital-making for themselves. This perpetuation of immersive digital-making environments replicates fashion in which students initially encountered digital tech.
THEME: DISTINCTIONS, SELF-IMMERSION

SEMIOTIC & ACTIVITY: listen to music & podcasts, iTunes, Google searches, watching movies and animations, YouTube and blogging with Tumblr. Illustrator, Photoshop and drawing programs and social networking, reading articles; multiple activities including digital-making; this is a sign of high digital literacy. It is interesting that Google is the only thing that does not get shut down. As predicated Susie has a major reliance on Google for the development of her digital-making skills. This is a learned behaviour based on her early experiences with digital technologies. It is interesting that she can find free creative software but Nicola couldn't or rather chose not to.

POLITICAL & SOCIO-CULTURAL: Just like Vaughn she has two blogs Susie is also able to make a distinction between different types of digital literacy. However unlike Vaughn both of Susie's blogs are about digital-making. One projects her identity into the online sphere the other is for her coursework. Her relationship with both blogs is interesting the home blog represents her personal evolution as an artist, the college blog as a student. She is not reliant on education for her development as an artist.

That's a lot of things.

Susie: I'm pretty much on my computer all the time.

MODEL-IN-(INTER)ACTION: Key part of her creative process

SEMIOTIC & ACTIVITY: This is an indication that she has a greater level of digital literacy than Vaughn and Nicola.

Published Article

Whitton, N. (2010). *Learning with digital games: A practical guide to engaging students in Higher Education*. London: Routledge. ISBN 9780415997751, 232 pages, \$46.95 US.

Are there any benefits that can be gained from the use of digital games in higher education? Imagine the following scene; a group of students are playing a digital game mid-morning in a university dormitory. The students are playing a mission in the World of Warcraft (WoW): an online role-playing game. The mission presents the students with a series of problems that must be solved. Every student controls an avatar that possesses a unique combination of competencies. Successful completion of the mission requires collaboration between avatars. In the real world this entails development of higher order cognitive skills. The students will need to use analysis, synthesis, and evaluation to solve problems. In recognition of their efforts, WoW rewards the students by increasing the proficiencies of their avatars. Now imagine the same scene but this time in a classroom.

Is it not possible for higher education to give the students a much greater reward for their efforts? Are students missing the chance to develop higher order cognitive skills through digital games? Can digital games be used to enhance collaborative learning activities? These are the types of question posed by Nicola Whitton, who seeks to challenge negative perceptions of digital games use in higher education. Whitton argues that collaborative learning via digital games is vital in the acquisition of higher order cognitive skills.

Whitton argues her case from an “unashamedly constructivist learning perspective” (pp. 3) and uses the introductory chapter to outline her position and explain the structure of the book and its relevance to higher education. The book is accompanied by a website <http://digitalgames.playthinklearn.net/> that contains supporting materials, resources, additional readings, case studies and links to games. The main body of the book consists of twelve chapters split into three sections theory, practice, and technology. Each section is comprised of three to five chapters. The book is intended to serve as a practical guide for student engagement in higher education. The book is written in a clear fashion. Whitton takes great care in outlining the purpose of every chapter at its beginning; and supports many of her points with vivid explanations drawn from personal experiences. Every chapter is summarised at its end. The book also contains activities that encourage readers to gain a visceral understanding of digital games.

Chapters 1 – 4 (Theory) cover the polemical issues that surround digital games in higher education. Whitton presents a number of balanced yet compelling arguments in favour of increased use digital games. These lines of reasoning include the characteristics and types of digital games and their related pedagogies. However, Whitton’s reluctance to use strict categorical definitions of characteristics and types; does present readers with some ambiguities. Namely, what is a digital game and what are its educational benefits? Whitton herself refers to digital games as constructivist learning environments then collaborative learning environments in another chapter and active learning environments in the next. One may ask what the distinction is. Upon reading the theory section one cannot escape the notion that digital games are merely a conduit between students and higher order cognitive skills. Which raises the question of whether or not such skills can be acquired using other methods?

Chapters 5 – 7 (Practice) encompass the practical issues digital games. Whitton presents comprehensive range of issues that such the constraints of integrating digital games and curricula, differences between face-to face and online learning with games, model of integration, pedagogic design considerations and the importance of aligning learning objectives with collaborative game

activities. In chapter seven Whitton discusses many methods of assessing learning with digital games. For many the crux of Whitton's arguments resides on this issue. It is disappointing that the innovative approaches favoured by Whitton are accompanied by unoriginal and forms of assessment. This makes it harder to deduce the impact of digital games on learning. Subsequently, Whitton struggles to provide a means of assessment that supports her claims. Whitton rightly calls for more research in this area.

Chapters 8 – 12 (Technology) Whitton explores the technical issues of digital games use in higher education. This includes comparisons between the merits of commercial and bespoke educational games, design methodologies and a discussion about the accessibility and usability of digital games within educational settings. Chapter eleven is crucial it includes six case studies which give the reader a clear insight into how digital games are used in higher education. In many cases a blended learning approach was used, activities within games were supported by or combined with real world activities such as group meetings and tutorials. In some cases, student participation had to be incentivised and games that involved competition between groups of students' poor performers were de-motivated. However, many of the games did produce positive results students were engaged and obtained many high order cognitive skills and subject specific concepts; which may have been too difficult to learn from other methods. Nonetheless these positive results came at great financial and time-consuming costs. One game took an entire year of planning before it was given to students. Two other games required grants from funding bodies and some games needed input from programming and animation experts outside of education. In chapter twelve Whitton recaps the issues discussed throughout the book and makes links between digital games and constructivist learning theories. The book ends with a call for more research into *Learning with digital games*.

Whether or not *Learning with digital games* serves a practical guide to student engagement is debateable. The book is not a technical manual, lecturers should not expect a definitive guide as to how to design a build a game let alone incorporate such a creation into curriculum. There are many technical and practical problems that Whitton either avoids or concedes. Even her definition of the benefits of digital games subtly changes from chapter to chapter. Consequently, it is difficult to refute her claims and the case studies in chapter eleven tend to support her arguments. Even with a lack of insight into the digital cultures of students and how this may impact on their ability to learn with digital games. On the first page of the introduction Whitton states that the book is based around the work for her doctoral thesis 'An investigation into the potential of collaborative computer game-based learning in higher education' (Whitton, 2007). Accordingly, the book does read like a thesis. However, this does not mean that *Learning with digital games* is without merit. Whitton makes many salient points in frank discussions and Whitton succeeds in educating readers about many pedagogic issues. The book is a welcome and much needed discussion about the benefits of digital games in higher education. Any practitioner at all levels of education should read this book before embarking on the rewarding yet arduous process of *Learning with digital games*.