Developing personalised education for personal mobile technologies with the pluralisation agenda

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This paper makes a distinctive contribution to the current debates concerning the role of personal mobile technologies (PMTs) in public education. It does this through drawing attention to the imperative to integrate digitally-mediated personalised education with teacher-mediated pluralised education. Premised on the notion that children's learning needs to be both tailored to individuals' aspirations (i.e. personalised), *and* participatory, entailing the consideration of multiple perspectives (i.e. pluralised), the argument is made that for optimal learning outcomes, both personalisation and plurality need to be integrated when deploying PMTs in schools. Vygotsky's theory (1928; 1930/2004; 1967, 1978) is mobilised to provide a theoretical rationale for emphasising the vital role educators play in harnessing PMTs to support the development of traditional as well as new, 21st century skills, and for the argument that personalisation and pluralisation need to be conceptualised as complementary

forces within 21st century education reform. A community project, which deployed PMTs, is used to exemplify how personalised and pluralised educational goals can be integrated and pursued within teaching-learning activities mediated by innovative technologies and educational professionals.

Introduction

In 2007, Campbell, Robinson, Neelands, Hewston and Mazzoli argued that personalised education is best suited to supporting the learning and development of gifted and talented students. Subsequently, the flexibility of web 2.0 technologies has increased the customisation options of tablet and smartphone apps and has catalysed a myriad of opportunities for personalized education, meaning that the notion of personalisation is now prevalent in all areas of mainstream education (Rajasingham, 2011; Gallagher, 2014). Indeed, with the advent of personal mobile technologies (PMTs) personalised education has become the key approach underpinning PMTs' deployment in public education, with heavy financial investments from the technology sector (e.g., $100 million for the AltSchool private school start-up) and charitable organisations (e.g., approximately $45 billion from the Chan Zuckerberg Initiative, a philanthropic limited liability company).

While basic customisation possibilities were available with previous technologies (e.g., desktop PCs), new tablet technologies have made them more detailed and easier to set up for individual learning resources and software programmes (the so-called "apps") . Gardner (2009, un-paginated) writes that: 'apps make it possible to individualize for everyone', referring to the fact that with software programs on iPads and Google Chromebooks, teachers can readily populate individual devices with selected content and specify the learning resource and/or learning levels according to individual students' needs and abilities. Moreover, while previous technologies were often designed for the home (e.g., TV) or school environment (e.g., interactive whiteboards), tablets and iPads are developed for both markets, with several government schemes and pricing options making them more affordable and accessible across the world (Griffey, 2012) and, as indicated by national survey data, across socio-economic groups (e.g., Bergström & Höglund, 2014 in Sweden;

Kucirkova & Littleton, 2015 in the UK and Madden, Lenhart, Cortesi, & Gasser, 2013, in the USA). Arguably, PMTs are ideal for personalised education because they support individualised instruction and one-to-one engagement with content, minimise standardised curriculum and enable the 'decentering' of teachers (Laster, 2013). This, however, gives rise to a sharp paradox: on the one hand, today's UK and US teachers face political pressures to deliver a standardised curriculum with specifically defined learning outcomes, national and international comparative data; and on the other, they are given access to technologies which can individualise instruction and personalise the learning outcomes for each individual child, arguably better than they ever could (see Fleming, 2013).

In this paper, we respond to this tension in two ways. Firstly, we examine the socio-cultural literature, highlighting work which has the potential to inform our understanding of the benefits and limitations of personalised learning - which is currently offered as the key rationale for the deployment of PMTs in schools and public education more generally. Secondly, we present the findings of an on-going project using PMTs in a lower primary school with Year 4 children and members of the local community, where the use of PMTs supported individual as well as collective learning goals and responded to both traditional and new learning expectations, mediated by teachers and new technologies We argue that the deployment of personal mobile technologies must evolve beyond the current one-sided emphasis on the personalized approach and the teacher-versus-technology discourse. Instead, educators, policy-makers and educational researchers need to engage in a more nuanced dialogue about the synergistic role of PMTs in children's development of basic academic, as well as new 21st century, skills within a personalised as well as pluralised curriculum.

We begin this dialogue by revisiting personalised education in light of the pluralisation movement, that has been prevalent from the late 1980s, and the importance of

teachers and technology in mediating children's current, as well as future learning. The central premise of this argument are based on Vygotskian and neo-Vygotskian theories which recognise the importance of the intra-personal (personalised) as well as inter-personal (pluralised) processes for learning and between teacher- and technology-mediated meaning-making. These elements are integrated into a Personalisation-Pluralisation Quadrant (PPQ hereafter) model of learning, which seeks to conceptually integrate and clarify a notion of "pluralised personalisation" which can guide the current and future use of PMTs in schools.

Context: Pluralised and personalised education

Greenbaum (1974) wrote about the rise of a new ideal in America in the 1970s: that of pluralisation, according to which: 'the nation's major institutions are reinforcing difference as a way of increasing similarity' (p.432). Forty-one years later, America and other industrialised Western countries have endorsed a contrasting ideal: that of personalisation, where difference is reinforced as a way of *decreasing* similarity. Since the advent of portable personal technologies in the early 2010s, personalised education has become 'commonplace in learning' (Bienkowski, Feng and Means, 2012, p.5), and is often positioned in direct contrast with the learning models of past decades. While personalised instruction aims to address the needs of individual learners and nurture personal dispositions (Bernstein-Yamashiro, & Noam, 2013) , the objective of pluralised education has been to address the needs of wider social communities and challenge children's thinking through environments which are defined and shaped by wider societal frameworks (OECD, 2006). What, then, are the key benefits and limitations of the two approaches?

Benefits and limitations of personalised and pluralised learning

Personalised education aims to nurture personal fulfilment and self-actualisation, and stresses the importance of engagement with student interests (Sampson, Karagiannidis, & Kinshuk, 2010). Personalised education *par excellence* is characterised by creative learning environments in which the learning subjects are customised to individual learners' skills and capacities (Miliband, 2004). The importance of a learner's active role and self-identification with the learning material is emphasised, together with gradual progression towards achieving personal goals. A strong thread which runs through personalized education is the argument of difference, according to which individual differences should prevail and be celebrated, not diminished for the overall common good.

However, giving each child what they need: 'obscures essential questions about the social and communal purpose of education' (Philip & Garcia 2013, p.306). The limitations of this approach is that it may reduce the ideal of honouring children's voices to hyperbolising or romanticising individual achievements, and fail to place them meaningfully in a wider national and global context. This goes hand-in-hand with the concern that technology providers rarely focus on how PMTs can be integrated within traditional curricula and achieve traditional learning objectives such as supporting students' basic academic skills in, for instance, algebra and decoding (e.g., Philip & Garcia, 2013).

In contrast to personalisation, at the core of the pluralisation agenda is the ideal that students need to be educated in light of collectively established parameters and be aware, from the early years, of the wider societal standards and norms they need to adhere to and comply with. Pluralised education acknowledges difference, supporting minority integration through group-oriented learning, rather than individual-centred, models. At its best, pluralised learning recognises the various ways in which students learn and appropriate knowledge (see Gardner, 2011) and is characterised by socio-culturally sensitive approaches

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to learning which celebrate the different funds of knowledge students bring to the classroom (González, Moll, & Amanti, 2005). In reductionist variants of pluralised education, individual differences are not celebrated but only acknowledged, and are ordered hierarchically with prescribed, incremental conceptions of progress. Within such reductionist variants, emphasis is often placed on collective (rather than individual) achievements (Leadbeater, 2006) which may be demotivating and ineffective. Moreover, an over-emphasis on pluralised education has led to a culture of standardisation or performativity, characterised by high stakes testing systems and an over-reliance on curriculum controls. As Cremin (2015) writes, in the first decade of 21st century education: 'tensions persist at several levels, particularly in accountability cultures, where international comparisons such as PISA and PIRLS frame and shape policy, practice and curricula' (p.353). Furthermore, reduced versions of pluralisation have been criticised for undermining students' attachment to school (Green, 1999) and the limited ways in which students' creativity, proactivity and problem-solving ability can be expressed in environments tailored to satisfy national and international standardisation trends (Moran, 2010).

Reductionist applications of the personalised and pluralised paradigm have led to contrasting pedagogies and views concerning the role of teachers, technology and curriculum content. We discuss the pivotal role of teachers and PMTs elsewhere (Kucirkova & Cremin, forthcoming). In this article, to expand our understanding of PMTs in public education, we focus on the latter two elements, and the extent to which PMTs support new, 21st century skills.

PMTs supporting 21st century skills

The definition of 21st century skills differs from author to author and country to country, but it is generally agreed that 21st century skills are a set of capabilities, which have

been foregrounded in the information age, characterised by new global demands, job requirements and increased use of technologies. Given the prevalence of technology, it is almost universally accepted that children growing up in the 21st century need to develop new digital literacy skills (also referred to as media literacy, especially for higher education students, see Hobbs & Frost, 2003) or information literacy (e.g., Kafai & Bates, 1997). In terms of the global changes happening in the 21st century, and the new skills which need to be mastered in addition to traditional academic subjects, the Partnership for 21st Century Learning lists five key skills: Global awareness; Financial, economic, business and entrepreneurial literacy; Civic literacy; Health literacy; Environmental literacy. New job roles and rapidly shifting employment opportunities and prospects demand a new workforce who are able to: thrive within such a climate of uncertainty and change; collaborate; be flexible; be self-reliant and able to lead (see http://www.21stcenturyskills.org). The importance of creativity (Lucas, Claxton & Spencer, 2014) and what Claxton (2012) refers to as learning dispositions, or sixteen qualities of mind have been emphasised as crucial for the 21st century learner. The marketization strategy and discourse around PMT's use in schools is often defined through the potential of PMTs to support these new, 21st century, skills. Several teacher blogging sites and technology company-sponsored teacher conferences advocate the perspective that: 'by using iPads in collaborative group activities, students are developing the problem-solving, communication, teamwork, and critical thinking skills needed for success in the 21st century workforce' (Kurland, 2012, online). Some educational research also indicates that PMTs have a potentially valuable role to play in fostering the development of 21st century skills. For instance, Yelland (2015) studied how children's learning of such 21st century skills (creativity, critical thinking, collaborations and communications) developed in three Victorian schools in Australia, in three different year levels (*Kindergarten*, 4- 5 year olds; *Year 2,* 7 – 8 year olds; *Years 7/8,* 13-14 years). The teachers and students were

supported by the Education Department and Microsoft, with the provision of *Microsoft's Surface Pro II* tablets. The conclusion from the project was that new technologies 'facilitate the use of 21st skills to enable deep learning that will support them long after students leave school'. Similarly, Huber (2012) researched the use of iPads with 9-year olds and concluded that the PMTs considerably increased creativity in Austrian schools.

Although in these projects the value of PMTs is not only derived from an individual use of PMTs, several national iPad projects foreground the personalisation agenda when justifying the costs for PMTs deployment. In the last few years, there has been a surge of investment in large-scale programmes which aim to provide each individual child with their personal mobile device and in this way, arguably, support children's 21st century skills (see for example, in Turkey The FATIH Project; in USA The LAUSD project in Los Angeles; in the UK iPad Scotland; in Australia the iPads for Learning Trial). The key feature characterising this line of research and practice is that it positions PMTs as an agentic force that supports personalised learning and can disrupt or transform pluralised teacher-mediated pedagogy.

Yet, there is a body of educational technology literature that shows that teachers are rarely open to technology-mediated transformations, and that the deployment of technologies is influenced by a complex interaction among teachers' pedagogical beliefs, school context, professional development and technology use in the classroom (Tondeur, van Braak, Ertmer, & Ottenbreit-Leftwich, 2016). With PMTs, there is: 'a huge opportunity to explore how technology can be used to enhance or extend practices that are already well evidenced' Quinlan (2015, p.1). There are, however, no "silver bullets" or one-size fits all solutions to contemporary educational challenges that can be universally applied across all schools, because schools are 'inherently complex environments that are made even more complex by

significant social, political, economic, pedagogical, legal, cultural, demographic, and historical forces' (Kame'enui, Simmons, & Coyne, 2000, p.34).

Without a doubt, there is a wide range of pedagogical ideologies that technologies, including PMTs, are used to support and enact in classrooms. In developing sustainable strategies for PMTs' deployment in public schools, we therefore need a principled framework which allows for this variety and at the same time, provides sufficient guidance for effective pedagogies. The framework also needs to leave enough space for its practical refinement according to individual educational contexts.

Two key questions have motivated our work:

Can the use of PMTs be aligned with the personalised as well as a pluralised education agenda?

Is there an educational model that can effectively blend innovation with tradition and acknowledge the critical role of both teachers and technologies in its delivery?

Such questions have been posed by other scholars before, including those educational researchers working within socio-cultural and neo-Vygotskian traditions (see, for example, Ludvigsen, Lund, Rasmussen & Säljö, 2010). For instance, Claxton and Wells (2008), have considered how social and personal learning might dovetail in terms of the social, economic and political changes at the beginning of the 21st century, whilst Rasmussen, Lund & Smørdal, (2012) have studied the potential of wikis to merge individual and collective thinking and meaning-making and the role teachers play in supporting students' work. In the UK, Littleton & Mercer (2013) have studied the importance of classroom dialogue in developing children's thinking and collective thinking skills ("inter-thinking") with a range of technologies, including laptops and interactive whiteboards. We aimed to complement and

extend significantly this body of prior work by focusing on the deployment of personal mobile technologies, informed by Vygotskian and neo-Vygotskian theory. We were interested in characterising the dynamic interchange of personalisation and pluralisation processes, both of which are mediated by 'mediational tools' (i.e. technology) as well as 'more knowledgeable others' (see Vygotsky, 1967; 1978). Such a theorised perspective, rooted in empirical data, is currently missing within the research literature, so we have developed a new theoretical framework to guide our work. As we shall argue subsequently, it is a framework that has a wider generalisability and applicability – beyond that of our own use-case scenario.

Theoretical framework for pluralised personalisation

Vygotsky's comprehensive theory of development and learning (Vygotsky, 1928; 1930/2004; 1964; 1967; 1978; 1981; 1987) can greatly assist in understanding the personalisation-pluralisation tension, as well as afford new understandings of the technology versus teacher-directed instruction with PMTs dichotomy. The theory serves as the foundation for several contemporary theories, including situated cognition (see Kirshner & Whitson, 1998) or more generally, Activity Theory (see e.g., Kaptelinin & Nardi, 2006). We selectively consider three aspects of Vygotskian and neo-Vygotskian theory, namely those which are of most relevance to our work which has entailed the development of an integrated Personalisation-Pluralisation Quadrant model: this model represents the processes of intra-and inter-psychological development, the interplay of mediational tools and more knowledgeable others in shaping human knowledge, and their integration within the Zone of Proximal and Intermental Development.

Internalisation-externalisation or intra-and inter-psychological development

At the heart of Vygotsky's theory is the recognition that all knowledge is socially constituted and co-constructed and that the process for this construction happens through processes of internalisation and externalisation. Internalisation refers to the subjective process of intra-psychological development, which is in a reciprocal relationship with inter-psychological (or external) knowledge mediation, constituted in dialogue with others. Vygotsky describes the sequential blending of internal and external (or personal and plural) influences on one's learning and understanding as follows: '[...] any function in the child's cultural development appears on stage twice, that is, on two planes. It firstly appears on the social plane and then on a psychological plane. Firstly it appears among people as an inter-psychological category, and then within the child as an intra-psychological category.' (Vygotsky, 1978, p.57). The two processes are not positioned in opposition to each other, but function in an interactive and dialectical relationship of meaning-making (Daniels, 2008). In detailing Vygotsky's theory and its relevance for education, Jaramillo (1996, p.137) specifies the teacher's role in optimising the individual and socio-cultural connection: "to develop curricula, teachers must find middle ground between their decisions towards curricula development and individual student interests'. This "middle-ground" is best mediated by tools and the so-called "more knowledgeable others".

Mediational tools and more knowledgeable others

From Vygotsky's (1978) perspective, a child's learning can be extended with the help of meditational tools and technologies and through the support of "more knowledgeable others" (Vygotsky, 1978, p.86) such as teachers, educators, parents, older peers. Given that he was writing in the early part of the 20th Century, Vygotsky defined the mediational tools as: 'various systems for counting, mnemonic techniques, algebraic symbol systems, works of art, writing, schemes, diagrams, maps and mechanical drawings, all sorts of conventional

signs and so on' (1981, p.137). Today, the 'various systems' would include the many

technologies which expand and reflect the individual and social knowledge of our times,

including those which offer powerful personalisation and customisation options such as tablet

and smartphone apps and other web2 tools (see Kucirkova, 2013). Vygotsky's proposition

that tools are important knowledge-mediators recognises that some technologies can extend

learning and understandings in fundamental ways. However, Vygotsky's theory is primarily

about socio-cultural interactions and the notion that learning process is facilitated by a more-

skilled or more-knowledgeable peer or adult. Tools, together with more knowledgeable

others, help the child progress from current to future knowledge and this occurs within the so-

called zone of proximal development.

ZPD and IDZ

Vygotsky defines the ZPD to be: '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, 1978, p. 86). The ZPD was originally conceptualised as the

potential or added capacity each child has, when the appropriate support (or scaffolding, see

Wood, Bruner & Ross, 1976) is provided. Mercer and Littleton (2007) built upon this initial

characterisation to argue that the most effective learning happens in the so-called intermental

development zone (IDZ) which is about the ways in which: 'a teacher and a learner can stay

attuned to each other's changing states of knowledge and understanding over the course of an

educational activity' (Mercer & Littleton, 2007, p.19). The two zones thus extend and

complement each other.

In our previous work (Kucirkova, Sheehy & Messer, 2015), in which we examined in

detail how two mother-daughter dyads 'think together' when co-creating digital books on

iPads, Vygotsky's theory provided a valuable lens through which to explore the on-going teaching-learning processes between the mothers and their children, whilst the notion of the IDZ afforded a theorised characterisation of the dynamic processes within and through which the co-construction of authentic and multimedia stories were negotiated and accomplished. In developing the theoretical model for our work concerning the deployment of personal mobile technologies in a local school, we mobilised the constructs of the ZPD and IDZ and built on the mediation and internalisation-externalisation elements of Vygotsky's theory. Through a conceptual synthesis, we integrated them into the PPQ model, outlined next.

The PPQ Model

We agree that: 'all learning theories are based on premises about persons and the world' (p.307, Coenders, 2008). The theoretical argument that emerges from our conceptual synthesis foregrounds this personal – collective connection in Vygotsky's theory, together with the notions of the ZPD and IDZ. The synthesis can be graphically represented as a quadrant model in which the personalisation and pluralisation processes (or internalisation and externalisation forces in knowledge development) are not represented on one axis in opposition to each other, but are plotted at right angles. Similarly, the technology- and teacher-mediated learning are in a perpendicular relation to each other which means that a high score is achieved with an increase on both sides, i.e. the most effective learning happens when teachers and technology work together. The expansion of a child's zone of proximal development does not happen only with the help of more knowledgeable others, but also with the meditational tools (in our case PMTs) which can support the internal-external exchange in knowledge building (cf Kaptelinin, 1996).

Atherton (2013) provides a schematic representation of ZPD using two ovals, which we adapted and integrated with the IDZ's third oval and the personalisation-pluralisation aspects of the model. The zone of most effective learning is represented with three ovals which diminish in size as the effectiveness decreases. The matrix is broken down to four quadrants; the fourth quadrant represents the most effective learning, it is the space of merging ZPD with IDZ, and of the highest presence of technology and teacher influence and personalisation and pluralisation integration. Quadrant 1 represents those things that the child can accomplish unassisted, they are minimally participatory and not fully informed by the child's own aspirations. Quadrant 2 shifts the balance in favour of personalisation, i.e. the child's learning is extended in accordance with her own thinking, needs and preferences, but it is little aligned with community interests and priorities. Conversely, Quadrant 3 represents those contexts where children's learning is increased through collective approaches, defined by codified and homogenized norms. The optimal learning conditions are high pluralisation and high personalisation, and a dynamic exchange between ZPD and IDZ, as represented by Quadrant4. Figure1 provides a graphical representation of the model.

Figure 1 to be inserted about here

Applying the PPQ model

There are several innovative educational approaches which could be regarded as instantiations of synergistic pluralised personalisation. The particular exemplar approach included here is not intended as an 'endorsement' of the wider efficacy (or otherwise) of that approach, but rather to provide a concrete exemplification of Quadrant 4 of the theoretical framework in a context which we know well and which has proven to be effective with PMTs.

Kucirkova, Messer, Sheehy & Flewitt (2013) outlined how the use of an iPad app for story-making supported a positive home atmosphere and bonding between a mother and her 33-month-old daughter. In another study with 41 four-and-five-year-olds, Kucirkova, Messer, Sheehy & Fernandez-Panadero (2014) experimentally demonstrated how the use of the app in a pre-school context supported children's exploratory talk, problem-solving skills and collaboration. In scaling up the project, we were interested in how the app could facilitate children's story sharing at a community level. Over the course of six months, two classes of Year 4 children collected personal reminiscences and stories concerning the war from elder members of the community and documented their experiences in texts, pictures and audio recordings, using iPads and additional web-based resources from a local archive. These intergenerational stories were later shared online with the wider community from the parish network and at a local event in the school. In a comprehensive evaluation of the project, we found that the possibility to personalise curriculum content at macro software level empowered teachers to effectively adopt and adapt new educational models. Thus, customisation features available to teachers supported their empowerment and motivation to use the tools in the classroom. Interviews with the participating teachers and our observations in the classroom indicated that the opportunity to share and collaborate on the creation of digital stories have increased children's awareness of citizenship issues and their capacity to recognise personal stories from the wider narratives of the past (Kucirkova, 2016). In other words, the activity of digital story-making and story-sharing supported some of the 21st century skills. The project also facilitated tangible action and change in the community, with regular digital literacy courses run in a local café, bringing together elder members of the community and children from the local school. The inter-generational collaboration orchestrated by the teachers has influenced children's understanding of citizenship issues and narratives of the past. In this instance, it was the pedagogy that enabled

an intergenerational transfer of knowledge. Overall, by participating in this project, the children learnt about traditional content contained in the History lessons and also acquired new digital skills from manipulating the iPads and creating digital stories, thus combining traditional and new learning outcomes. The project thereby constituted an instantiation of how personalised pluralisation can be orchestrated in the classroom, through the synergistic mediational role played by the teachers *and* the technologies.

Conclusion

In this paper, we discussed the concerns and opportunities of using PMTs within the paradigm of personalised education. The argument was made that embracing personalized education at the expense of the pluralized education model would be a reactionary rather than visionary solution to the outstanding problems of public education. Instead of trying to accommodate the individual interests of every child, educators and policy-makers need to be thinking of ways in which the educational space and the learner can challenge, accommodate and mutually shape one another. In the Remembrance project, teachers were crucial mediators of the activity, contextualising the iPad app's use and scaffolding the children's learning. It was the pedagogy contextualising the technology use, not the iPads *per se*, which positively impacted the children's learning.

While the current use of PMTs is motivated by the belief that they can be effective in realising children's learning outcomes as part of the personalised learning agenda (see e.g., The Creative Classroom Lab, http://creative.eun.org/news/-/blogs/5361030), the PPQ model posits that teachers, in conjunction with technologies, can extend children's learning in two ways: to provide support and resources for increasing similarity (the pluralisation principle) as well as difference (the personalisation principle). That way, they can nurture in children

what Pring (2012) calls: 'dispositions that enable one to live the distinctively human life, ensuring a proper balance between destructive extremes' (p.323). Such balanced dispositions build on traditional school content and correspond to the virtues of democratic citizens (see Covaleskie, 2003) and 21st century global learners (Ornstein & Eng, 2015). In other words, they support traditional as well as new 21st century skills.

The PPQ model integrates key aspects of Vygotskian and neo-Vygotskian theories to provide a new holistic framework to guide the deployment of personal mobile technologies in public education more broadly. We have exemplified the use of the framework in conceptualising and executing a successful community story creation project which used iPads and encouraged colleagues to refine the framework in their own educational contexts. Vygotsky's theory (1981) reminds us that pluralised personalisation can be supported by specific tools and technologies but ultimately, it is educators who have the responsibility for enacting a holistic education system in which personalisation and pluralisation dovetail in synergistic interaction.

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