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Trainee Teachers' Cognitive Styles and Notions of Differentiation

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Abstract

Purpose – To compare the cognitive styles of trainee teachers with their notions of differentiation and perceptions of its place/location within their teaching and learning during a PGCE programme of ITE.

Methodology – 80 trainee teachers completed the Cognitive Style Index (CSI) (Allinson & Hayes, 1996) at the beginning and at the end of their course. After completing the CSI measure trainees received instruction on cognitive styles. To assess their initial understanding and prior knowledge of differentiation, all trainees completed a questionnaire at the beginning at the end of their course.

Findings – At the outset rudimentary understandings of differentiation were found to be held by the trainees, as well as stylistic differences between the four style groupings. Gains in understanding of differentiation and the use of cognitive style in school were evident in all trainees. Moderate changes in style were evident, with all trainees becoming more intuitive over the course of the programme.

Research limitations – The sample size may be seen as a limitation in terms of generalisability.

Practical implications –The predominant direction of cognitive style movement was from analytic to intuitive. The suggestion that cognitive style whilst relatively fixed is also something that can be developed, is a feature which should offer encouragement to those developing university courses through interventions such as this.

Originality - Teaching sessions on how cognitive styles can be used in the classroom were used to enhance trainee understandings of individual learning differences and increase awareness of own style to facilitate understanding of differentiation.

Keywords   Differentiation; Cognitive Style; Cognitive Styles Analysis; Teacher training.

Paper type   Research paper

Introduction

In today's increasingly diverse population, 'personalized learning' has become embedded in the educational curriculum and notions of 'learning how to learn' are clearly and firmly part of current and future English educational policy agendas (2020 Vision (DfES 2007a); Making Good Progress (DfES 2007b); QTS standards (TDA, December 2007); DfES (2004, 2006)). However, such terms are considered by some to be ill-defined and vacuous concepts (Bates, 2005).

One means by which to inform and offer greater clarification to elements of this individualising agenda would be to offer the exemplification of effective differentiation in a classroom context, along with an enhanced understanding and awareness of the development of trainee teachers' theoretical insights about the nature of the teaching and learning process. With this in mind, the focus of the enquiry presented here is two fold: firstly to gain insights into trainee teachers' conceptions of differentiation; and secondly to establish the relationship that cognitive style may have with such conceptions of differentiation in order to appropriately scaffold their learning during a programme of initial teacher education (ITE).

Differentiation and the Trainee

It is important to concentrate on the mechanisms by which those involved in teacher education can encourage and support trainee teachers to be able to critically reflect on what they do, be aware of bias in themselves and others, and how they question and cherish the implementation of theory in the teaching and learning process. Just as the intention is for all young people to be provided with an 'understanding of how to learn, think creatively, take risks and handle change' (DfES, 2007b:14), then so shouldn't it be for trainee teachers?

Hutchings et al. (2006:87) asks some poignant questions in relation to this: 'At what point in teacher training and professional development activity are trainees and teachers most receptive to theoretical insights about, for example, the nature of teaching and learning?' An important dimension of this will be recognising and developing the ability of the trainee to understand differentiation 'of' and 'in' learning.

However, when attempting to address Hutchings et al's question certain factors need to be recognised:
- the discrepancy, confusion and ambiguity in terminology employed by policy in schools compared to teacher education;
- exposure to 'good' practice in terms of the extent, nature and timing of it during a one year Post Graduate Certificate in Education.

Differentiation is often highlighted as an area in which trainee teachers have difficulties (Henderson, 2006). This could on the one hand be explained by a lack of experience of sound differentiation practices in their own experiences of learning, and on the other, by poor understandings and lack of clarity by practicing teachers of what differentiation is and how to achieve it (O'Brien & Guiney (2001; Babbage et al., 1999; Pettig, 2000; Scott et al., 1998 as cited in Westwood, 2005).

Importantly O'Brien (2000) highlights the need for differentiation to be seen as an inclusive concept and not as a reactive response to a child experiencing difficulty. In his differentiation model, O'Brien argues for the consideration of four interactive factors that impact on a learner's ability to learn: pedagogical, emotional, cognitive and social, each of which should all be taken into account when planning effectively for differentiation. One way in which teachers and trainees can be more cognisant of their own learning needs, as well as those of their students, is through consideration of learning profiles comprising cognitive styles, learning styles and strategies (Rayner, 2000). Within this context, "Learning styles illustrate how a learner processes information and makes judgements about their own learning capabilities. Learning strategies relate to how the learner reacts to teacher decisions about how the learning environments is structured." (O'Brien & Guiney, (2001:63).

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Figure 1 illustrates the extent of such integration of differentiation in teaching and learning, representing the 'fully integrated' (ideal differentiation) position on the right, shifting to a diluted and fundamentally impoverished 'add on' position for differentiation on the left. To the left the centrality of the differentiation ethos of the teacher has been completely eroded and replaced with it as merely a satellite concern/issue.

The right hand side of Figure 1 identifies a situation where the teacher is fully aware of the individual learner's needs through: accessing various forms of prior knowledge about the individual; fully understanding the theory related to cognitive styles and learning preferences; how knowledge on learning disabilities can be best employed for the benefit of all pupils; the role of cognitive neuroscience; and association with

affective elements that impact on learning. Together these components enable the teacher to create conditions for learning allowing all to thrive.

The more the teacher considers differentiation to be an appendage, something of an 'add on' in their planning and preparation for teaching and learning, the more the awareness, flexibility, malleability, understanding, choice and challenge is reduced. In some instances this is completely removed from the (teaching) learning experience.

Cognitive Style

A cognitive styles approach and the use of instruments such as the cognitive styles analysis (CSI) Allinson and Hayes (1996) were adopted in this study to consider ways of differentiating learning in order to highlight and explore the 'process' of learning and the integration of subject and pedagogical knowledge as advocated by a metacognitive approach.

Cognitive style(s) are commonly described as characteristic modes of thinking, remembering, and problem-solving (Messick, 1984). They are seen as 'stable … unchangeable, individual characteristics which partly control and organise more-fluid cognitive strategies.' (Schmeck, 1988:176). The fixed nature of cognitive style(s) has been challenged in recent years (O'Malley and Charmot, 1990; Skehan, 1998; Adey et al. 1999; Driver, 2000; Sitko-Lutek, Rakowska and Hill, 2000; Armstrong, 2002; Thies, 2003). Amongst those that suggest cognitive style is malleable, questions have been raised over the degree of malleability (Armstrong, 2002) and also whether some individuals are more amenable to style flexibility than others (Evans, 2004). The suggestion that style modification may occur as a result of considered training is something that teacher training programmes should contemplate in regards to developing the potential of their programmes (O'Malley and Charmot, 1990; Skehan, 1998; Evans and Waring, 2006; Rosenfeld and Rosenfeld, 2004).

Aims of the Study

The aim of the study was to compare the cognitive styles of trainee teachers with their notions of differentiation and perceptions of its place/location within their teaching and learning during a PGCE programme of ITE. By exploring and identifying such relationships ITE programmes can be refined not only in relation to the nature,

delivery and assessment of curriculum programming, but in terms of enhancing the most meaningful integration of theory and practice.

Method

80 trainee teachers (males = 33; females = 47) aged between 21 and 55 years (mean 24 yrs) enrolled on a one year Postgraduate Certificate in Education (PGCE) programme completed the Cognitive Style Index (CSI) (Allinson & Hayes, 1996) at the beginning of their course, 89% of whom completed a re-test nine months later at the end of their course. Justification for the selection of the CSI was three fold: it is one of the most reliable and valid measures, possessing good psychometric credentials (Coffield et al. 2004); it is relatively easy and efficient to administer; and there is considered to be no carry-over effect from repeated use of it (Zhang, Allinson & Hayes, 2005).

The CSI scores in this study were calculated using a revised scoring method advocated by Hodgkinson and Sadler-Smith (2003) with analysis and intuition identified as coexisting complementary modes of information processing. The original test comprises 38 statements scored in a trichotomous scale (true; uncertain; false). Using the revised scoring method both analytic and intuitive items are scored positively on two separate scales: true = 2; uncertain = 1 and false = 0). Thus 21 statements measure analysis, resulting in a maximum score of 42 and a minimum of 0; 17 statements measure intuition, giving a maximum score of 34 and minimum of 0. Intuition scores were later recalculated out of 42 to enable direct comparison with analysis scores. Using mean scores for analysis and intuition dimensions, it was possible to divide the data into four groupings: (1) High Analysis-Low Intuition; (2) High Analysis-High Intuition; (3) Low Analysis-Low Intuition and (4) Low Analysis-High Intuition.

After completing the initial CSI measure at the beginning of the programme, all trainees received instruction on cognitive styles including key note lectures, follow up group discussions and one to one interviews. To assess their initial understanding and prior knowledge of differentiation, all trainees completed a questionnaire at the beginning and another towards the end of their one year course, so as to assess any development in understanding (71 out of 80 trainees completed both questionnaires).

Using stratified sampling procedures to select trainees with differing style profiles, focus interviews were employed to explore issues raised during the teaching sessions and articulated in the questionnaire responses. Responses were coded using content analysis procedures with two researchers independently verifying key features from the data.

Data analysis

Test-re-test scores for the CSI on both intuition and analytic dimensions demonstrate acceptable reliability (Nunnally, 1978). For intuition: test-re-test value of $r = .67$; $p = .00$; the 95% confidence interval was 0.49 to 0.77. For analysis: $r = .65$, $p = .00$; the 95% confidence interval was 0.52 to 0.78. Analysis scores were significantly higher than intuition scores on both test and re-test. Mean analysis 1 = 29.8; SD = 6.2; N = 80; mean analysis 2 = 28.9; SD = 6.9; N = 69 (86% of original sample).Mean intuition 1 = 21.3; SD = 8.2; N = 80; mean intuition 2 = 22.8; SD = 8.1; N = 69.

Using mixed between-within subjects ANOVA, there was not a statistically significant effect for time, suggesting little change in analysis scores over time (Wilks' Lambda = 0.98, $F = (1, 67) = 1.067$, $p = 0.305$, eta squared = 0.16); and there was no significant interaction effect with gender (Wilks' Lambda = 0.99, $F = (1, 67) = .85$, $p = 0.360$) suggesting that the nature of change for the males and females was similar.

In relation to changes in intuition score over time, using mixed between-within subjects ANOVA, there was no statistically significant effect for time suggesting little change in intuition scores over time (Wilks' Lambda = 0.98, $F = (1, 67) = 1.61$, $p = 0.208$, eta squared = 0.024). There was, however, a statistically significant interaction effect with gender (Wilks' Lambda = 0.931, $F = (1, 67) = 4.94$, $p = 0.030$, eta squared .069 (moderate)) suggesting that the nature of change for males and females was quite different. Using mean scores, the intuition score for males declined slightly over the duration of the intervention whereas the female score which was much lower at the start of the course, increased significantly following the intervention.

Non-significant results using mixed between groups ANOVA need to be interpreted with caution given the small size of study and insufficient power recordings assigned to both analysis and intuition tests .18 and .24 respectively.

At Time 1 - the beginning of the course (see Table 1), analytic style dominance was particularly evident with 45% of trainees exhibiting Style 1 characteristics (high analysis, low intuition) although 25% did fall into Style 4 (low analysis, high intuition). By the end of the study there was evidence of movement towards higher levels of intuition amongst the cohort.

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In relation to style groupings and gender certain patterns were evident. At Time 1, both the majority of males and females (42% and 47% respectively) fell into Style 1, however a greater percentage of males (30% to 21% of females) were Style 4 (low analysis, high intuition).

At Time 1 (the beginning of the course), there was not a statistically significant difference between males and females in relation to analysis scores (see Table 2), whereas there was a statistically significant difference in relation to intuition scores between the two sexes: t = 2.12; df = 78; p = .037; moderate effect size of 0.058. This supports previous findings (Allinson and Hayes, 1996; Sadler-Smith, Spicer & Tsang, 2000; and Murphy et al.,1998). However, following training in cognitive style, by the end of the course (Time 2), there was no statistically significant difference between male and female scores on either analysis or intuition, a finding in common with that of Zhang, Allinson and Hayes (2005).

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Using the two sets of questionnaire data, individual trainee scores on analysis and intuition and written and verbal responses from the trainees, there was greater movement in cognitive style than might be suggested by the ANOVA results. Of the Style 1 trainees (high analysis and low intuition) 19% moved to Style 2 (higher intuition) with 65% remaining the same style; For Style 2 trainees (high analysis and

high intuition) 50% stayed the same and over 33% increased their intuition scores and lowered their analysis scores moving them to Style 4; Only 20% of Style 3 remained in this style (low analysis low intuition) with over 50% moving to Style 4 (increased intuition) and over 33% moving to style 1 (higher analysis); Style 4 trainees(low analysis high intuition) 65% remained the same style with 24% moving to Style 2 and therefore, raising their analysis scores.

By the end of the study, the biggest change was in the distribution of females in Style 4 which increased from 21% to 38%.   In terms of percentage change, males demonstrated bigger increases in relation to Style 2, where by the end of the study 30% of males exhibited high analysis and high intuition scores compared to 21% at the outset.

Trainee initial understandings of their own learning
At the beginning of the one year PGCE course, the majority of trainees had a very limited vocabulary to describe their own learning and had little awareness of approaches used in the classroom to facilitate learning. What understandings there were predominantly focused on VAK (visual, auditory and kinaesthetic along with preferences for active learning). Visual learning as a dominant mode of learning was a common response amongst many trainees (34%) and especially true of Style 2 trainees [high analysis (HA) and high intuition (HI)]. 40% of all trainees placed high emphasis on 'active' learning (trying out ideas/practical work). Consolidation of learning by rehearsing, re-writing information was dominant as a form of learning for both Styles 1 and 3. Very few trainees referred to group work and discussion as ways of encouraging learning.

Trainees also rated their ability / preference for certain learning approaches using a five point likert scale (strongly agree to strongly disagree respectively). Table 3 shows the mean scores for selected statements and summarises the key significant differences using one-way ANOVA.

Interpreting these results with caution, they do provide a form of triangulation and support for the statements obtained in the written questionnaires, in interviews and from the trainees in teaching sessions. In order to interpret the mean scores in Table

3, a score of 1 equates to a trainee who strongly agrees and score of 5 equates to a trainee who strongly disagrees with the statement. Thus from Table 3 significant differences between the four styles in relation to their perceived preferences and approaches in learning are identified.

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There were significant differences between those who were highly analytic (Style 1) and those who were highly intuitive (Style 4) which supports the literature. Style 1 trainees purported to be able to organise their workload more effectively than Style 4 trainees. They also showed a greater preference for a logical and structured approach to work, being more in favour of clear outlines and overviews to sessions. In addition and in alignment with the reported tendency of analytics to process in detail (Evans, 2004), they were more likely to take more time to reach a decision when presented with information.

Style 2 and 4 trainees (both with high intuition) were most likely to favour less structured approaches and favoured practical approaches and more informal learning supporting previous findings (Evans & Waring, 2006). Style 4 (low analysis, high Intuition) were also less likely to request outlines to sessions and purported to be most able to multi-task with Style 3 trainees (low analysis and low intuition) being least in favour of multi-tasking, group work and informal learning and most in favour of a lecture format facilitating a transmitting style of learning.

Trainee initial understandings of differentiation
Approximately 25% of all trainees viewed differentiation as 'learning in different ways' and 'catering for all', however, articulation of what this actually involved was limited.   Styles 1, 2 and 4 emphasised abilities. Varying teaching style was a particular focus for Style 1 (32%) and Style 2 (20%) trainees. 30% of Styles 2 and 4 mentioned using different methods in the classroom, but did so in ambiguous terms.

Planning for differentiation, trainees, as might be expected at this stage in their development (Bullough et al. 1991) had limited understandings. Notions of differentiation that were explored centred on 'add on models'. For example, where

something different is 'done for those of higher ability.' Although 29% of trainees acknowledged the importance of assessing the prior knowledge of their students in order to plan more effectively, 90% of Style 3 trainees appeared completely unaware of this. Very little mention amongst the trainees was made regarding how groupings of students could be used to differentiate learning. Similarly any awareness of special educational needs (SEN) issues and how good practice in SEN could be used with all learners was lacking for the majority (73%) of trainees.

Accommodating the differing needs of individual students i.e., 'varying the task(s)' within a lesson was mentioned most by Style 3 (44%) and least by Style 1 (31%) trainees. Using different teaching and learning styles was cited most highly by Style 2 trainees (54%), with Style 3 trainees least likely to refer to using different learning styles (11%) and most likely to talk about resource needs (60%). Styles 1 and 4 emphasised the importance of pupils' prior knowledge, with 38% of Style 1 trainees focusing on the importance of the appropriateness of the work set.

At the end of the programme 59% of all trainees considered the cognitive style training highly useful in enabling them to understand differentiation needs amongst pupils. However, there was great variation evident amongst styles e.g. 80% of Style 2 (HA and HI) compared to 40% of Style 3 (LA and LI) found them beneficial; Style 3 found it considerably more difficult to see how a study of cognitive styles was relevant for teaching. This provides a challenge for university tutors.

Styles 3 (LA and LI) and 4 (HI and LA) found the first cognitive style training session, which offered a comprehensive overview of cognitive styles, to be the most useful. 75% of those identified as having high levels of both intuition and analysis (Style 2) found the university-based intervention the most useful. Trainees who scored highly on intuition (styles 2 and 4) favoured more interaction. Trainees with high analytical and low intuitive scores were most likely to feel overloaded with information; application to examples was important for over 39% of all trainees, especially for Style 2 and least important to Style 4.

Impact of the university-based cognitive styles intervention

Whilst the majority (90%) of all trainees had been aware of learning styles at the beginning of the course, after the university-based intervention, ideas about how to implement differentiation practices were predominantly simplified by trainees in-line with their experiences in schools and linked to notions of visual, auditory and kinaesthetic learning (VAK) with little reference to any other concrete ideas. All trainees exhibited greater awareness of the needs of differing groups of children with most comments relating to ability, gender and SEN issues. However, little reference was made to gifted and talented, ethnic minority or to the variable social and emotional needs of pupils.

Pedagogically speaking, the trainees were more aware of the importance of assessing the prior knowledge of pupils in order to plan for effective teaching. The majority of trainees were also aware of the need to vary their own styles of teaching and assessment.

Style group variations were evident. Style 1 trainees were the most likely to mention catering for all styles of teaching; 61% mentioned their own need to better understand learning needs; 43% the importance of varying tasks and variety; 30% mentioned use of VAK; 83 % said they would vary their own teaching style; 74% had a preference for varying whole class, group and individual work; 35% stressed varying questioning; and they were the group most likely to want to marry assessment and learning preferences.

Style 2 trainees were more likely to raise behaviour issues, the need for challenge and provision particularly for the most able students. Style 2 placed great emphasis on catering for all styles of learning; 25% mentioned VAK; 42% need to vary teaching style; less emphasis on using a mix of whole class, individual and group work; 33% variety in assessment; importance of both focused, open and varied questioning in the classroom.

Style 3 trainees were most likely to raise class size as an issue and barrier to effective differentiation. 20% mentioned VAK; use of varied resources were seen as important; over 70% mentioned varying teaching styles, but none had a developed notion of what

this was; 20% talked about fast delivery; 20% felt tasks should be matched to different styles of learner; 40% favoured mixing whole class, group and individual activities with no notion of interaction or types of questioning; 20% felt they needed to reflect more on own teaching to also understand all learning needs; 70% felt assessment should cover all needs.

Style 4 trainees were most aware of SEN; importance of challenge; varying methods. 41% of them emphasised that planning needed to cater for all learning types and use of a variety of tasks; 24% mentioned VAK; 53% acknowledged the importance of vary teaching style; 24% favoured group work (also favoured by Style 1); 41% favoured a mix of whole class, group and individual work; 53% wanted variety in assessment and open questioning in the classroom.

Individual learning points

22% of all trainees following the university based intervention highlighted an increased personal understanding of their own learning and the impact it might have on their pupils:

> "I like all the information at the start of a lesson…as a result, my
> teaching has meant that I sometimes give pupils too much information at
> the start." (Style 4 – LA-HI)

> "I have an understanding that I have a specific way of learning that
> reflects upon my pupils." (Style 3 – LA-LI)

> "Knowing how I learn has helped me to understand how others learn and
> appreciate that this may differ." (Style 4 – LA-HI)

> "It [the training] enabled the trainees to put themselves in the position of
> the pupils and identify how each individual has their own preferred
> learning profile." (Style 2 – HA-HI)

> "It makes you realise why certain things happen on placement and it
> gives you more tools to add to your box." (Style 1 – HA-LI)

"It helped me to understand my learning but also how other people learn.
I know to vary my delivery and presentation of information in school."
(Style 1 – HA-LI)

While 28% of Style 1 trainees said they felt they could apply the ideas to their teaching easily, 31% of Style 1 trainees felt overloaded with information, preferring more incremental delivery of the ideas in the university-based sessions. Across all style groups 35% of trainees welcomed greater application to specific examples. Style 2 and 4 (both high on intuition) favoured more interaction in university-based learning sessions. 14% of trainees were negative about the training, these were predominantly trainees who exhibited low analysis and intuition scores before and after the university-based intervention (i.e. Style 3). These trainees were less able to understand how they themselves learnt, however, they favoured repetition as a method of learning. This style also struggled more in relation to applying the ideas about cognitive style to their teaching.

The written statements of the trainees were analysed using Marton et al., (1993) and Säljö's (1979) conceptions of learning to identify more developed levels of understanding amongst the trainees. 42% of Style 2 and 35% of Style 4 trainees exhibited greater levels of personal understanding of their own learning in their responses compared to 16% of Style 1 and 8% of Style 3 trainees. Style 1 trainees, whilst not exhibiting as great an understanding of their own learning paradoxically were able to discuss at length how they would implement ideas in practice.

Discussion

Results suggest that the majority of trainees found the intervention helpful and a useful starting point to enable them to engage with the process of learning. In assessing trainees initial understandings of differentiation, it was apparent that trainees' understanding was limited, raising questions as to how best develop awareness and a philosophical commitment to enabling all learners to learn (O'Brien and Guiney, 2001).

The nature of the curriculum and methods of instruction that trainee teachers have been exposed to throughout the different phases of their own educational history at school and university may be instrumental in creating highly analytical teachers. In this study, trainees did initially demonstrate higher analysis than intuition scores, however, there was evidence of cognitive style movement, albeit greater for some than others.

The predominant direction of cognitive style movement was from analytic to intuitive which replicates previous research findings (Evans and Waring, 2006) and supports Gregory (2000) who argues that awareness of intuition can be raised through training interventions. There is considerable debate surrounding the view that teachers need to develop both intuitive and analytical skills if they are to fully cater for the needs of all learners (Atkinson and Claxton, 2000). O'Brien and Guiney (2001:56) take this further and argue that intuitive and reflective skills are essential if a teacher is to be able to 'see beyond the superficial and consider what can be done to enable a learner to learn.' The suggestion that cognitive style whilst relatively fixed is also something that can be developed, is a feature which should offer encouragement to those developing university courses through interventions such as this.

Initial gender differences were highlighted with males demonstrating higher intuition scores as demonstrated in the literature (This supports previous findings (Allinson and Hayes, 1996; Sadler-Smith, Spicer & Tsang, 2000; and Murphy et al.,1998). It is interesting to note that following the intervention, there were no statistically significant differences between male and female intuition scores suggesting that the training did enable the female trainees to develop their intuitive thinking.

This study highlights the value of a metacognitive approach to differentiation whereby learners who gain greater understanding of their own learning are then more predisposed to being able to consider differing learning perspectives. This approach requires teachers to gain an in-depth understanding of child development, learning outcomes, assessment strategies of and for learning, as well as being flexible and effectively using time and resources (Tomlinson, 2004). Such thinking however, needs to be grounded by exposure to good practice on an on-going incremental, cumulative and measured basis. In addition to enabling sufficient time for refection

and analysis, trainees need as much exposure to good practice in a school context as is possible during their placements, whether this is through: the use of 'leading lights' (expert teachers / expert schools); changes in Initial Teacher Education to encourage a more problem-solving/ demonstration approach; peer support programmes; online problem-solving exercises; or vicarious learning – demonstration of others thinking and doing). In addition, on going continuing professional development throughout a teacher's career must be increasingly attuned to providing higher levels of support if good differentiation within schools is to become a reality.

This study also demonstrated, through the use of a complex rather than unitary conceptualisation of style (the CSI), that it may be possible for an individual to be both analytic and intuitive and to be able to develop strategies to address any inherent bias towards one style or another (Evans & Sadler-Smith, 2006). In addition, whilst differing style priorities were evident in this study, caution is needed in interpreting these as other contextual factors may be relevant depending on subject and course, call for further studies to ascertain whether such findings are generalisable.

Conclusion

The intervention in this study enabled trainees to think more carefully about their own and others' learning and thus provided a useful tool/mechanism that would fit with Claxton's (1999; 2006) concept of 'expanding the capacity to learn.' The importance of assessing variable needs of trainees in order to allow them to access theory is also brought to the fore by this study. The integration of theory and practice in a manner that is meaningful for a trainee is a key issue requiring flexibility in the teaching and learning process. Cognitive style and differentiation provide a convenient marriage as both enable autonomy in allowing the learner and teacher to gain self-awareness, provide challenge and promote awareness of choice, resulting in more enriched understandings.

By encouraging trainees to consider their own learning processes and biases in planning, delivery and assessment they (albeit at an early stage in their career development) are more receptive and able to consider different approaches. Similarly a critically informed use of a cognitive styles approach can enable trainers / tutors to

consider the initial starting points of their trainees and to plan accordingly for these through the use of specific strategies to develop both analytic and intuitive capacity.

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Figure 1: Conceptions of Differentiation in Teaching
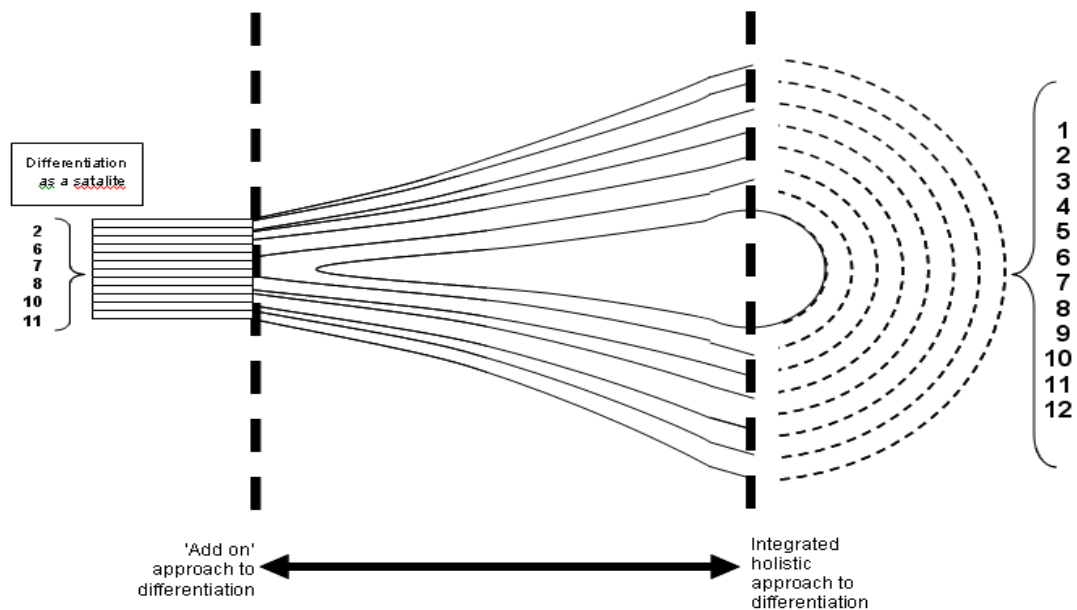
Key:
1 = Awareness of individual needs through accessing prior knowledge of individual.
2= Awareness of individual needs by creating conditions for learning allowing all to thrive.
3= Awareness of individual needs through an understanding of theory related to cognitive style and learning preferences.
4 = an understanding of theory related to role of cognitive neuroscience.
5= an understanding of theory related to links to effective elements.
6= Understanding of specific learning needs e.g. dyslexia.
7 = secure subject knowledge in order to manipulate content.
8= flexibility in organisation/delivery/planning.
9 = Attuned to sensitivities.
10 = choice offered to students and challenge.
11 = tapping into concrete/abstract/analysis/intuitive.
12 = reflective/active learning and teaching processes.

Table 1: Style groups and changes in style over time

Style	Style type	Time 1 N	Males N = 33	Females N = 47	Time 2 N	Males N =27	Females N = 42
1	High Analysis Low Intuition	36 (45%)	42%	47%	25 (36.2%)	33%	38%
2	High Analysis High Intuition	14 (17.5%)	21%	15%	15 (21.7%)	30%	17%
3	Low Analysis Low Intuition	10 (12.5%)	6%	17%	6 (8.7%)	11%	7%
4	Low Analysis High Intuition	20 (25%)	30%	21%	23 (33.3%)	26%	38%

Table 2: Gender variations - mean analysis and intuition scores

Gender	N	Analysis 1	SD	Analysis 2	SD	Intuition 1	SD	Intuition 2	SD
Males	27	29.3	6.9	29.2	6.98	23.7	7.4	22.9	7.5
Females	42	30.07	5.7	28.8	7.07	19.8	8.4	22.7	8.5
Total	69	29.8	6.2	28.9	6.98	21.3	8.2	22.8	8.1

Table 3: Significant learning preferences of the four styles as demonstrated by means

Perceived learning	Style 1 High Analysis Low Intuition	Style 2 High Analysis High Intuition	Style 3 Low Analysis Low Intuition	Style 4 Low Analysis High Intuition	One way Anova	Significance	Effect size	HSD Tukey significant differences Between groups
					F	p	Eta square	
N	36	14	10	20				
Organisational skills	1.89 (.74)	2.36 (.84)	2.3 (.94)	2.85 (1.63)	2.6	.056	0.09 moderate	1 and 4
Ability to multi-task	3.52 (.9)	3.57 (1.22)	4.10 (.87)	2.9 (1.07)	3.5	.019	0.12 mod- large	3 and 4
Require logical, highly structured sequence	1.77 (.79)	2.57 (.85)	2 (.67)	2.6 (.99)	5.5	.007	0.18 large	1 and 2, 4
Reflect and consider all options before arriving at decision	2.2 (.81)	2.28 (.82)	2.8 (.92)	3.05 (.95)	4.1	.009	.14 large	1 and 4
Require a clear outline and overview of learning	1.36 (.49)	1.5 (.65)	1.8 (.92)	2.05 (.83)	4.9	.004	.16 large	1 and 4
Favour practical based learning	1.86 (.87)	1.42 (.51)	2 (.82)	1.35 (.59)	3.2	.03	.11 moderate	
Prefer group work	2.67 (.96)	1.86 (.77)	2.9 (1.09)	2.2 (.69)	4.04	.010	.14 large	1 and 2 2 and 3
Prefer informal learning	2 (.79)	2.07 (.99)	2.4 (.84)	1.56 (.60)	2.9	.04	.10 moderate	3 and 4