Spotlight on Learning

Using the HBDI® to Improve Learning Process, Quality and Outcomes at Yale College, Wales

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better results through better thinking

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Spotlight on Learning Overview

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In July 2004 the Coffield Report was published. This report, commissioned by the Learning and Skills Council in England, investigated the wide range of learning style instruments designed to make learning a more successful process for students. The report evaluates the main theories about learning styles, selects the most important studies from literature, assesses the theoretical robustness of each model and evaluates the implications of these models for pedagogy in post-16 contexts. The report also presents the key problems besetting learning styles, indicates major gaps in the current state of knowledge and comments on prospects for learning styles.

In the conclusion of the report, many of the current learning styles questionnaires in common use are found to be lacking. Coffield concludes that learning style models are not of equal worth and writes that 'it matters fundamentally which instrument is chosen.' The Herrmann Brain Dominance Instrument® (HBDI®), Herrmann International's Whole Brain® Model, was designated as one of the six recommended models and especially for use in Further Education. Coffield writes that the HBDI® 'is intended to throw light on group dynamics as well as to encourage awareness and understanding of self and others. His research led him to the conclusion that Herrmann had 'devised well tried procedures for facilitating personal and organisational change.'

'Herrmann's model,' he goes on to say, 'may prove especially valuable in education and training since its raison d'être is to foster creative thinking and problem solving'. Coffield concluded that the Herrmann 'whole brain' approach to teaching and learning needs further research, development and evaluation within education because 'it is grounded in values which are inclusive, open, optimistic and systematic.' 'It encourages flexibility, adaptation and change, rather than an avoidance of less preferred activities.'

Since the Coffield Report stresses that 'it matters fundamentally which instrument is chosen' and sees the HBDI® as possessing the potential to encourage 'flexibility, adaptation and change' in individuals as well as facilitating 'personal and organisational change,' it seemed that within the HBDI® lay the possibility of transforming the learning culture within Yale College as well as improving the learning process for individuals and groups. However, since Coffield writes too, that the Herrmann 'whole brain' approach needs further research, it seemed sensible to combine educational research with the provision of an innovative and valuable learning experience for students within a Learning to Learn project, which motivated the learners by involving them in a dialogue about learning.

The Challenge and Desired Outcomes

The report seemed an excellent starting point for planning a Learning to Learn project in Yale College, Wrexham, North Wales, designed to improve the learning experience for students and help them become independent, confident learners who would attain better results. The aim of the project was 'To raise the quality of learning and teaching from good to outstanding

throughout Yale College.' Though there are pockets of outstanding practice in the college, as with any large institution, practice is variable. The intention was to put the focus firmly on teaching and learning, raise awareness of the latest research findings and to create both theoretical and practical debate about learning. In essence an excitement about learning would emanate from the project.

The HBDI® provided the key to unlocking the learning potential of students across the college by using it as a motivating catalyst, as a means of identifying high and low learning preferences and as the key to finding appropriate learning strategies to address learning challenges.

In more detail outcomes were identified as:

For students

- Improved learning
- Improved attainment
- Improved motivation
- Improved confidence
- Improved self-awareness

For staff

- Improvement of established practice
- Improvement in knowledge and understanding
- Improvement in relationships with students
- Sharing of good practice; collaboration on learning
- Continuous Professional Development
- Publication of work
- Qualification in Educational Enquiry

In a corporate sense, the project was designed to improve the client (in this case, the learner) experience but also to improve the **Return on Investment** for the organisation - Yale College. The improvement in learning through use of the HBDI® would lead to the following:

A quadrant

Greater customer satisfaction; improvement in performance indicators (retention and attainment); growth in student numbers and therefore increased funding; more efficient use of teacher and learner time – focussed directly on challenges identified by HBDI®; logical rationale for selected teaching and learning strategies; analytical approach to project; marketing of college through publicity from conferences/presentations/press articles, analysis of results.

B quadrant

Secure, controlled environment for learners; high quality of learning sessions; careful planning of Spotlight on Learning Project and of learning sessions; organised, structured project; sequential nature of project; planned outcomes; clear sense of direction; planned prepared resources for learning sessions; staff satisfaction and security; measured, quantifiable results.

C quadrant

Better, effective professional relationships between staff and students, students and students; improvement in relationships in staff teams, professional development of staff; improved satisfaction of learners/clients evidenced in questionnaires; improved communication between teachers and learners with regard to a clear dialogue about learning; improvement in morale and motivation of both staff and students; improved PR in the local community and in Wales; improved results for staff and students; improved personal development for staff and students.

D quadrant

Innovative original project; innovative research; innovative teaching and learning strategies; opportunities to be creative for both staff and students; enjoyment/fun with learning; unexpected findings; strategic decisions about improving learning in the future.

The Intervention

In essence the HBDI® was used as a motivating catalyst, as a means of identifying low and high learning preferences and as the key to finding appropriate learning strategies to address those low preferences, some of which may be essential to success in a particular subject. Staff in the pilot subject areas, both academic and vocational (and including one Welsh medium course), began by identifying topics which students usually found difficult within specifications and syllabuses and then selecting the Herrmann thinking skills that underpinned those topics.

The next step was to profile the students in each group, using the HBDI®, so that staff could then identify the students who had low learning preferences for the thinking skills essential to achieve in that topic area. The staff, too, were profiled so that they were aware of how their own brain profiles were influencing the ways in which they taught and the methods that they chose to use with students. The staff therefore had a personal development tool that they could use to enhance their own professional practice.

The Herrmann model not only identifies preferred thinking skills but also indicates the preferred teaching and learning strategies of each type of thinker. Using their expertise, staff selected appropriate strategies (largely chosen from the methods found to be most effective by the research into effect sizes of Professor John Hattie of Auckland University) that would encourage students to challenge and improve their low thinking preferences and therefore improve achievement and attainment in particular topic areas. After teaching a topic in the usual way, most staff assessed the students, then employed the teaching and learning

innovation and then re-assessed the students, using a test which was identical in format but with different questions. They measured the difference to see how much improvement students had made.

Staff teaching Biology worked with control and experimental groups using the innovation with the experimental group only. The reason for this was that the large numbers of students studying Biology made such a research methodology possible. Both groups sat externally assessed A level examinations and results compared via Alis residuals (see How it Works). The students were involved in the learning process at all stages, knew why they were being taught differently and were involved too in ongoing evaluation and feedback.

How it Works/Process

As said before, the HBDI® provided the key to unlocking the learning potential of students by using the profiling as a motivating catalyst, as a means of identifying high and low learning preferences and as the key to finding appropriate learning strategies to address learning challenges. The methodology worked by identifying in a rank order from high to low preferences the thinking styles preferred by each subject area in the study. Course content that students found difficult was identified and the thinking skills required to succeed with such content were compared with the rank order of thinking preferences. This analysis led to a review of the teaching strategies used to deliver difficult content. The attainment results were then analysed. In order to ensure that variables affecting student attainment were addressed then attainment was analysed using Alis residuals.

The Advanced Level Information System (Alis) provides performance indicators for post-16 students across all sectors of education in the UK and in the context of the study at Yale College includes analysis of A level, AS level and BTEC National assessment results. The reason that Alis was used to compare results was that the value-added approach provides fair comparisons between the progress made by students as it takes into account prior attainment based on GCSE performance.

To ascertain student opinion of the use of HBDI®, a questionnaire was completed by respondents involved in the research to establish if they valued the use of the HBDI® instrument as a way of improving attainment and/or enjoyment of their educational experience.

The Results

The project culminated in the Spotlight on Learning Conference in July 2008 where the results of the project were disseminated to an audience from a range of educational sectors across England and Wales. Ann-Herrmann-Nehdi, CEO of Herrmann International, spoke about recent brain research and the impact of the findings on learning while Dr. David Frost from Cambridge University delivered a presentation on teacher-led research. Carolyn May explained the genesis of the project, its rationale, process and method and Paul May provided an analysis of the overall research findings.

Discussions with staff revealed that teachers thought that the project focussed attention on learning, created debate and discussion and provided a systematic method devoted to improving learning. Conversations with learners established that the personal attention and the individual focus of the HBDI® profiles gave students a tangible illustration of their own thinking skills. They found this both interesting and motivational. Students who had previously resisted particular teaching and learning strategies now appreciated the reasons why they were being asked to employ them and were far more willing to do so.

The learning dialogue between staff and students improved relationships and motivation. Many students felt that they firstly had been given clear reasons why they found certain skills difficult and secondly that they were given the means to overcome them. This involved them in the learning and made them feel that they could move from 'I can't' to 'I can.' They also felt that staff were listening to their views, taking account of them and acting upon them, so improving professional relationships. The awareness of how they were thinking and learning instilled a sense of confidence in most learners so they believed that they were able to attain results that previously they had thought to be impossible.

Outcomes

As previously explained, after profiling the students using the HBDI®, staff identified a topic that students found difficult and then using their professional judgement, chose appropriate teaching and learning strategies to encourage students to challenge and improve their low thinking preferences and therefore improve achievement and attainment in these particular topic areas. After teaching a topic in the usual way, students were assessed, then staff introduced the teaching and learning innovation and then re-assessed the students. In order to provide the staff with detailed information about the range of student thinking skills within individual subjects an analysis of the rank order of student cluster preferences within quadrants was produced (Fig. 1).

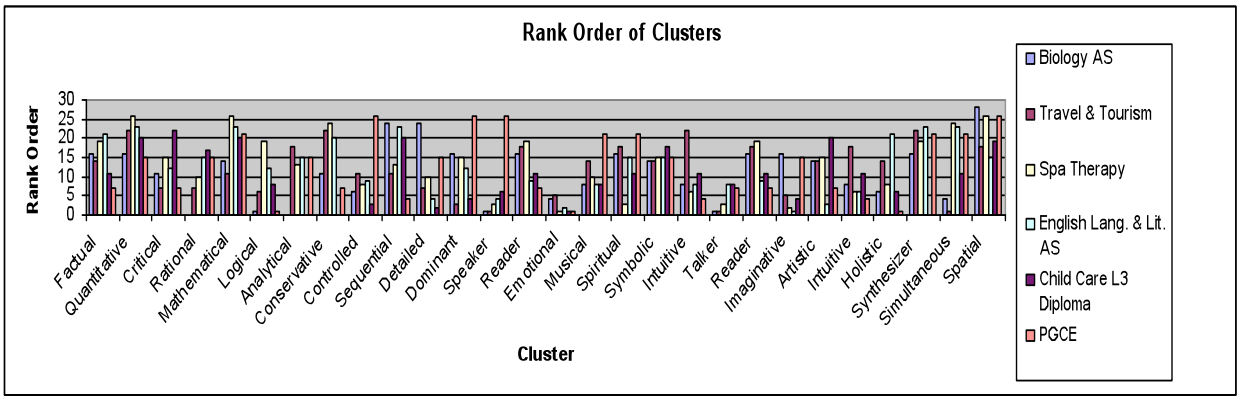
Fig. 1 Numeric Rank Order of Clusters by a Sample of Subjects

Rank Order of Clusters by Subject																								
A							B							C							D						
Cluster	Biology AS	Travel & Tourism	Spa Therapy	English Lang. & Lit. AS	Child Care L3 Diploma	PGCE	Cluster	Biology AS	Travel & Tourism	Spa Therapy	English Lang. & Lit. AS	Child Care L3 Diploma	PGCE	Cluster	Biology AS	Travel & Tourism	Spa Therapy	English Lang. & Lit. AS	Child Care L3 Diploma	PGCE	Cluster	Biology AS	Travel & Tourism	Spa Therapy	English Lang. & Lit. AS	Child Care L3 Diploma	PGCE
Factual	16	14	19	21	11	7	Conservative	11	22	24	20		7	Emotional	4	5	**1**	2	**1**	**1**	Imaginative	16	5	2	**1**	4	15
Quantitative	16	22	26	23	20	15	Controlled	6	11	8	9	3	26	Musical	8	14	10	8	8	21	Artistic	14	14	15	3	20	7
Critical	11	7	15	12	22	7	Sequential	24	11	13	23	20	4	Spiritual	16	18	3	15	11	21	Intuitive	8	18	6	6	11	4
Rational		7	10	15	17	15	Detailed	24	7	10	4	2	15	Symbolic	14	14	15	15	18	15	Holistic	6	14	8	21	6	**1**
Mathematical	14	11	26	23	20	21	Dominant	16	3	15	12	4	26	Intuitive	8	22	6	8	11	4	Synthesizer	16	22	19	23		21
Logical	**1**	6	19	12	8	**1**	Speaker	**1**	**1**	3	4	6	26	Talker	**1**	**1**	3	8	8	7	Simultaneous	4	**1**	24	23	11	21
Analytical		18	13	15		15	Reader	16	18	19	9	11	7	Reader	16	18	19	9	11	7	Spatial	28	18	26	15	19	26

It can be seen that the distribution of rankings varies between subjects. In some subjects such as English the highest preference of 1 is found only in one key descriptor (D – imaginative), while in others the highest preference of 1 is found across several key descriptors, for example Biology (A – logical, B - speaker, C – talker). Where high preferences are found in one key descriptor there will be less difference in preferred thinking styles compared to a situation where the high preferences for key descriptors are distributed more widely. In the latter case to ensure effective learning, differentiated teaching strategies will be required to address the wider range of thinking styles and in such cases the extent of differentiation will need to be greater than in subjects where the range of thinking styles is less.

Travel and Tourism is an interesting example as the results of this particular research indicate that the 'spatial' key descriptor ranks at 18, while 'simultaneous,' 'talker' and 'speaker' rank at 1. This would suggest that prospective employees for the travel industry from this particular group of students are more interested in the customer care aspect of the travel industry rather than the spatial (geographical / travel) aspect. This feature also requires particular learning activities to address what may well be a 'spatial' low preference and future research could be productive in this area The range of the differences can be more clearly seen if displayed graphically (Fig. 2). These results once again highlight the fact that individually targeted differentiation is crucial for effective learning to take place.

Fig. 2 Graphical Rank Order of Clusters by a Sample of Subjects



In some subjects the research involved an assessment before and after an intervention in teaching (Fig. 3).

Fig. 3 Assessment Scores; Before and After an Intervention in Teaching (based on HBDI®)

Subject	Assessment Score (%)		% Change
	Before Intervention	After Intervention	
Administration	73	90	17
Child Care	39.3	70	30.7
Civil Engineering HNC	65	70.9	5.9
Fabrication & Welding	62.8	71.2	8.4
Media A2	57	61	4
Spa Therapy	70	70.8	0.8
Spanish A	74	86	12
Theatre Studies A	61	66	5
Travel and Tourism	37.8	89	51.2

In this sample of subjects there was an increase in assessment score following the intervention in teaching in all cases. The intervention used was decided upon after an analysis of the HBDI® profiles of students in each class which indicated the high and low preferences. Once the content and skill of the session to be addressed via the intervention was determined, then a suitable teaching strategy was decided upon, based on the preferences to be supported.

While the evidence from this small sample does not constitute a causal relationship, as there were other variables that could have produced an increase in performance, not least the 'Hawthorn Effect', qualitative case study evidence suggest that the use of an intervention in teaching based on the use of HBDI® profiling may well have produced an improvement in learning outcomes. This is a rich area of interest for future research using larger samples.

Travel and Tourism is one of the areas that produced exceptionally good assessment results after introducing an intervention after HBDI® analysis. The subject demands that students be proficient in quantitative skills in order to be capable of working out accurate costings for holidays. The HBDI® analysis indicated that the group of 21 BTEC National Diploma Travel & Tourism students in their 2nd year (of a 2-year course) had low preferences for 'mathematical,' 'quantitative' and 'reader' key descriptors but strong preferences for 'talker,' 'speaker' and imaginative.' This cohort had demonstrated difficulty in completing tour operating calculations in the Autumn term.

In order to improve the mathematical skills of the students the teacher devised a game called the "Battle of the Borderlands. This was designed to appeal to their preferred ways of thinking (talking, speaking and imaginative) and was also underpinned by Hattie's high effect size for co-operative learning. The game encouraged the students to improve their skills by introducing calculations in a competitive, fun, but non-threatening manner and combining a range of learning outcomes and subjects (linked to two BTEC units: Tourism in the Countryside and Tour Operations).

The usual manner of teaching the students calculating skills was through worksheets, so the teacher taught in the traditional way and then assessed the students who achieved an average of 38% in the test. After HBDI® analysis and the consequent innovation of the 'Battle of the Borderlands' game, the students achieved 90% in a similar mathematical test. While it is not possible to establish a definite causal link, it is nevertheless likely that this dramatic improvement was a result of the teaching innovation that was introduced as a result of the HBDI® analysis.

Media students traditionally found the genre module difficult. An intervention was carried out to support students in using a Whole Brain® approach to their thinking. Such an approach had a particular emphasis on synthesising material using a holistic approach to ensure that an evaluation of how a film contributed to the development of its genre was produced. The standard of the evaluation was expected to improve after the intervention. Media students had right brain preferences (see Fig. 4 and 5).

Fig. 4 Media Students – Team Profile Clusters

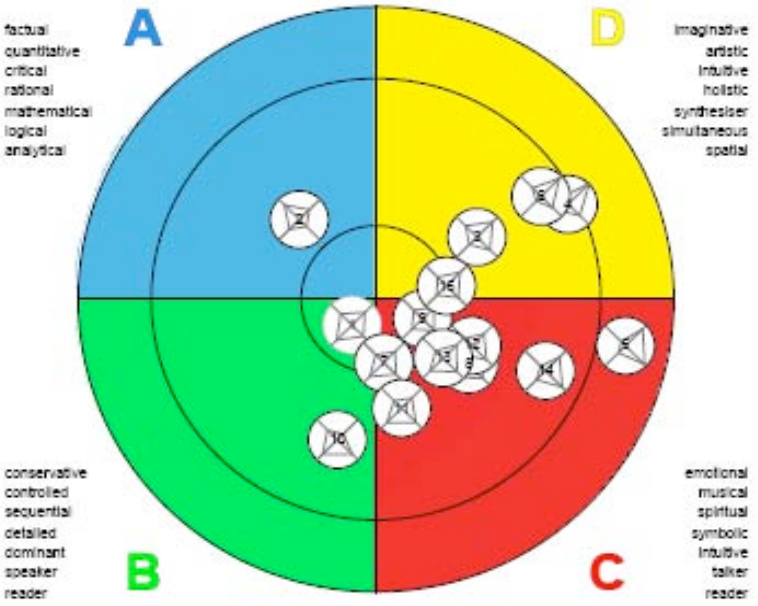
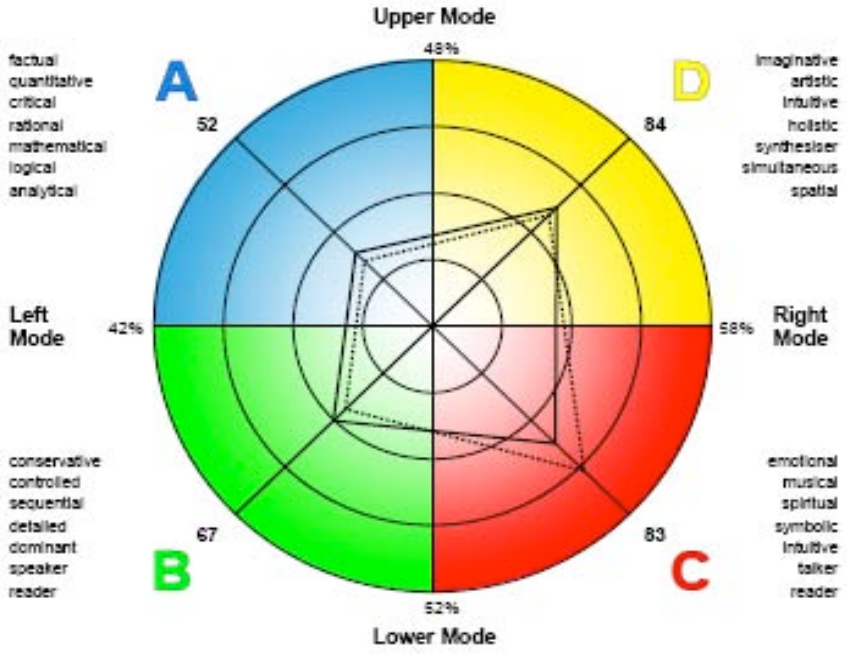


Fig. 5 Team Profile HBDI® Scores



The high preferences for right brain clusters where identified when the clusters were placed in rank order (Fig. 6)

Fig. 6 Rank Order of Clusters for Media Students

Cluster	Rank
Logical	1
Emotional	2
Artistic	2
Imaginative	4
Simultaneous	4
Detailed	6
Dominant	7
Reader	7
Musical	7
Reader	7
Critical	11
Sequential	11
Spiritual	11
Intuitive	11
Intuitive (Solutions)	11
Factual	16
Rational	16
Analytical	16
Controlled	16
Speaker	16
Symbolic	16
Talker	16
Mathematical	23
Conservative	23
Synthesizer	23
Spatial	23
Holistic	27

As a result of the intervention Overall class assessment result increased by an average of 15.79%, thirteen students improved their mark, one student remained the same and only one student had a lower mark (of 1.72%). The student whose mark remained the same had a Whole Brain® profile and so was receptive to any teaching method. The student who attained a lower grade had a profile which indicated strong preferences in the green quadrant nut very low preferences in the yellow quadrant (score of 35) so really disliked the lesson that was

directed at the group profile of strong yellow preferences. A student with low preferences in the A quadrant (HBDI® score of 42) and the B quadrant (quadrant score of 44) actually improved his mark by over 17%, suggesting that the use of a Whole Brain® approach did improve thinking skills for this particular student.

One particular student achieved a D grade at A2 in June 2007. He therefore re-sat the examination in June 2008. He had very strong preferences in the Blue and Green quadrants (1122) and therefore did not fit the overall profile of the Media group who had strong red and yellow preferences. The Media tutor worked with this student during 2007-2008 using his Green and Blue preferences to try to improve his essay writing which had always been a problem for him. The support offered by the tutor was structured, sequential and logical. For every essay he was given a grid with questions which he had to fill in with the relevant answers. He would then write the grid as an essay with each block written up as a paragraph. In 2008 his grade in the final examination improved from a D to a B. He is now studying Mathematics at university.

Outcomes revealed that gender played an important role in differences in thinking styles with more females having right brain (56% right and 44% left) and limbic preferences (54% limbic and 46% cerebral) compared to more males having left brain (52% left and 48% right) and cerebral (53% cerebral and 47% limbic) preferences. These differences in thinking styles were statistically significant between males and females left and right brain scores (n=414, F=37, sig.=0.0001) as well as limbic and cerebral scores (n=414, F=102, sig.=0001).

Significant differences were also found between the sexes and the four quadrants, which has would be expected to correlate with the differences already identified between left and right brain and limbic and cerebral. (Fig. 7 and 8). There was a significant difference at the 0.0001 level (F=67.2) between quadrant scores and males and females. This reveals the importance of differentiation when teaching mixed gender groups subject and matter and associated skills that require high preferences in A and C thinking styles.

Fig. 7 Boxplot and One-Way Analysis; Quadrant Score by Gender

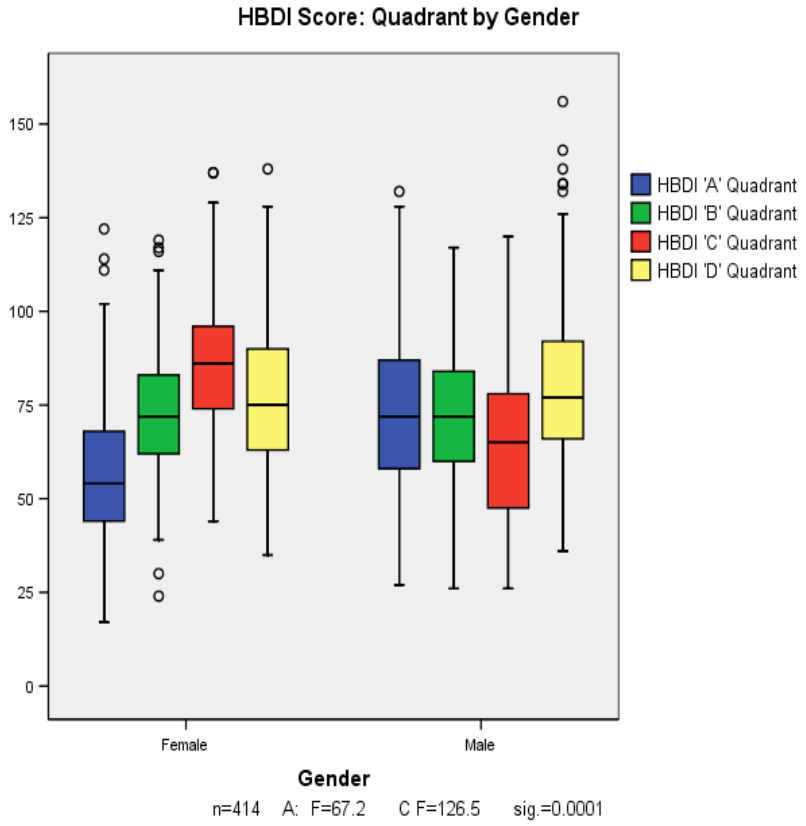


Fig. 8 HBDI® Quadrant Score by Gender

Gender	Quadrant	Score
Female	C	85
Male	D	80
Female	D	77
Male	A	73
Female	B	73
Male	B	72
Male	C	64
Female	A	56

The differences in thinking style had an effect on subject choice, self-belief, motivation and performance. Differences in thinking styles were identified between subject areas as well as between group profiles of students in those subject areas. In general it was found that students' thinking styles matched those required for a specific programme of study. However it was discovered that when students found a particular subject difficult, it was often due to them having a low preference for the thinking skills needed to achieve. Significantly, the performance of individual students who were finding the subject difficult, improved dramatically in some subjects, after the innovation had taken place. The research suggests that there tends to be a wider differentiation in some subject areas (for example, Biology) which further suggests that pedagogical practice needs to be considered by course teams in those areas.

In addition it was found that students studying Biology, Civil Engineering and IT had a higher A (logical) score than the other quadrants, while those studying PGCE (Teacher Training), Theatre Studies, Health and Social Care, Child Care, Media, Travel and Tourism, English, Human Biology and Spa Therapy had a lower A score than other quadrants. A practical application of this finding was that students in Health and Social Care had a high preference in the C quadrant but had to produce a project-based research methodology which contained the necessity for quantitative thinking in which they had low preferences. A delivery strategy was adopted which employed a teaching method appealing to the thinking preferences in the C and D quadrants (group discussion work/kinaesthetic materials), to address the thinking challenges in the A quadrant. This resulted in improved performance on the project work.

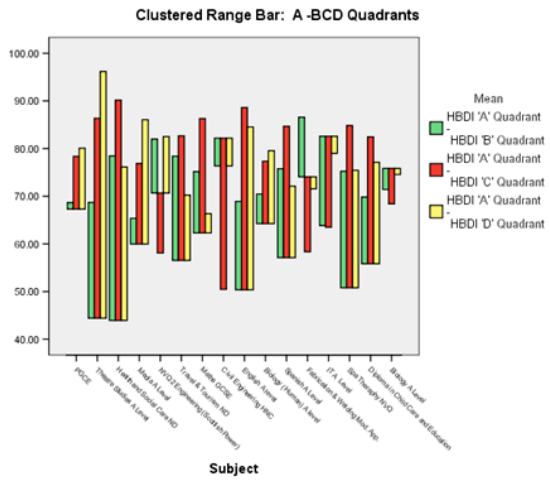
Further analysis took place to identify differences between subjects in the relationship between an individual quadrant and the three other quadrants. (Figs. 6-9) The aim of this investigation was to find out if within a particular subject one thinking style identified by quadrant had a greater impact that the other three.

The research took one quadrant at a time and investigated if the other three quadrants had a higher or lower HBDI® score. The results were then used consider the most effective teaching strategies and in particular how differentiated methods should be applied. Overall it was found that;

- **A Quadrant;** only technical / science subjects had a higher A score than BCD scores (Fig. 9)
- **B Quadrant;** there was considerable differentiation in this quadrant between subjects (Fig. 10).
- **C Quadrant;** technical and science subjects had a lower C score than A, B and D scores. Humanities, Languages and Child Care had higher C scores than A, B and D scores (Fig. 11)
- **D Quadrant;** in the majority of cases the highest score was found in the D (Fig. 12)

Fig. 9

Relationship of A to BCD Quadrants by Subject

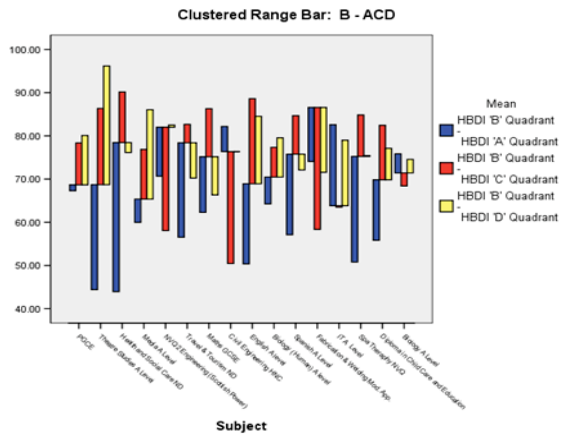


BCD Score > A
PGCE, Theatre St. Health & Soc. Care, Child Care, Media, Travel & Tourism, English, Human Biology, Spa Therapy
BCD Score < A
Biology, Civil Engineering, IT,
BCD Score <> A
Fabrication & Welding Engineering

In most subjects the B,C,D score is lower than A, except for Biology, Civil Engineering and IT, while in Fabrication and Welding and Engineering it is similar. Human Biology (science based subject) contains student preferences that match the Arts / Care subject sectors rather than sciences and this suggests that there will be a considerable variation in the thinking styles required to succeed in Human Biology compared to a traditional Biology course. Differentiated teaching strategies used on a Human Biology course need to employ strong preferences in A to address the lower preferences in B.

Fig. 10

Relationship of B to ACD Quadrant

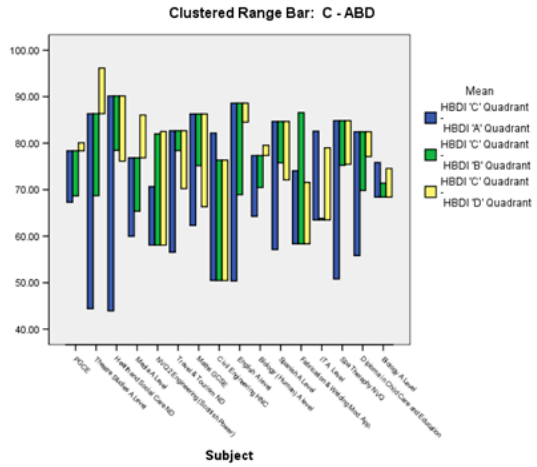


ACD Score > B
IT
ACD Score < B
Fabrication & Welding Engineering
ACD Score <> B
PGCE, Theatre Studies, Health & Social Care, Media, Travel & Tourism, Maths, Civil Engineering, Human Biology, Spanish, Spa Therapy,Child Care, Biology

The majority of subjects have both higher and lower scores in A, C and D quadrants compared to the B quadrant. This means that when teaching a topic that requires a B thinking style there will be considerable variation in the preferences within a group of students. Effective teaching should therefore take into account individuals' preferences and differentiation should be planned accordingly. This will involve strategies that use A, C and D approaches to succeed in delivering material that requires B thinking styles.

Fig. 11

Relationship of C to ABD Quadrant

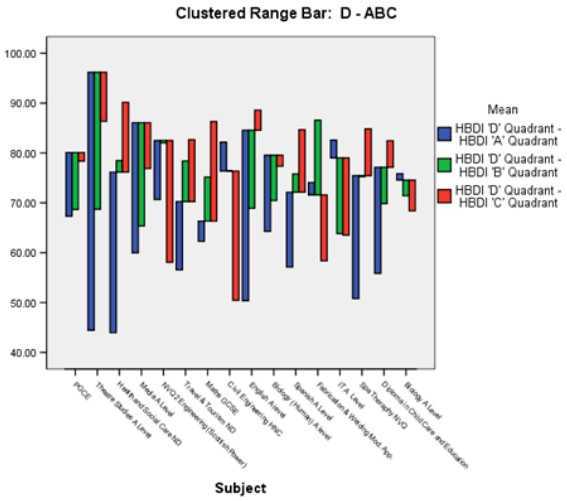


ABD Score > C
Engineering, Civil Engineering, Fabrication & Welding, IT, Biology
ABD Score < C
Health & Social Care, Travel & Tourism, Maths, English, Spanish, Spa Therapy, Child Care
ABD Score <> C
PGCE, Theatre Studies, Media, Human Biology,

As would be expected Arts and Care subjects have a higher C score than A, B and D which suggests that when teaching material requiring a preference in C, less differentiation is required as the group of students are likely to have high preferences in this area. Note the difference once again between Biology and Human Biology. Biology students have a lower score in C than A, B or D while those taking Human Biology have both higher and lower scores. Greater attention to differentiation is required to successfully teach Human Biology students.

Fig. 12

Relationship of D to ABC Quadrant



ABC Score > D
ABC Score < D
PGCE, Theatre Studies, Media, Engineering, Human Biology,
ABC Score <> D
Health & Social Care, Travel & Tourism, Maths, Civil Engineering, English, Spanish, Fabrication & Welding, IT, Spa Therapy, Child Care, Biology

No subject had all three A, B or C scores higher than D. Five subjects had one quadrant with a higher D score and three with two quadrants higher. Five subjects had all other quadrants lower than D. This suggests that overall there are high preferences in the D quadrant across all subjects in the sample, while in PGCE, Theatre Studies, Media, Engineering and Human Biology the D score is the highest compared to the other quadrants. This suggests that the preferences in the D quadrant can be used to plan differentiated lessons to address lower preferences in the other quadrants and that this strategy could be successful across all subjects.

A questionnaire survey of the students was carried out to ascertain their opinion of the impact of the use of HBDI® on learning. According to the results from the questionnaires, overall, across all subject areas, 58% of students felt that they had learned more as a result of the teaching strategy used based on the HBDI® findings. Students with low A scores did not like new methods, while students with high C scores did like new methods. High preferences in the B and D quadrants did not influence a student's enjoyment of new learning methods.

Right brain students (predominance of female) were more open to new teaching and learning methods. The main reason for students enjoying the new teaching strategies was that they felt that the material was easier to understand. This may have been a reason for improvement in Alis residuals and is a relationship that could be tested in future research.

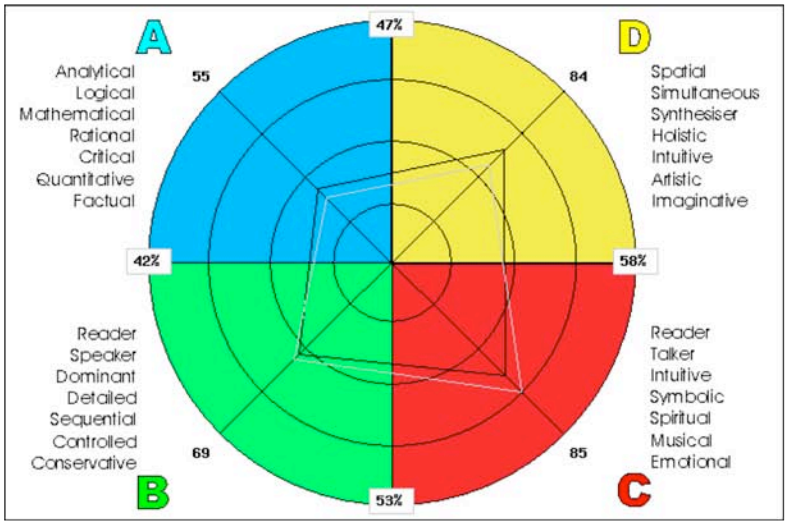
Examination results from the five A Level subjects in the research project were analysed to see if there were improvements in Alis residuals. A residual of 0.0 equates to the national benchmark while a figure above this indicates added value. An improvement in the figure year on year suggests an improved outcome over time.

It must be noted that all subject groups (except Media) contained less than 50 students, a figure below which Alis suggests that the results can be questionable. With this note of caution, it was still found that overall there was an average increase in the residual of 0.54 and large increases of 0.9 in Human Biology and 0.5 in Media. Such an increase in the residual in one year is usually attributable to improvements in teaching and learning strategies used to deliver a curriculum to a group of students. Further research is required to establish meaningful relationships between the use of the HBDI® and changes in teaching strategies and improvements in achievement but these initial results are both exciting and encouraging.

Results were also analysed within subject groups. Students studying A Level English Language and Literature used an online resource bank on the Yale College VLE (Moodle). This included a threaded discussion board where the tutor instigated focused critical questions for the students, study notes to supplement class teaching plus worksheets on characters, themes and stylistics in the text (**Wuthering Heights** by Emily Brontë). There were video clips of a film of the text available and hyperlinked pages where students could research the historical context of the period in which the text was set.

The tutor monitored the usage and the accessing of pages by each student and related this usage to the HBDI® profile for each student. This usage was then compared to the external examination results obtained by each student. Initial findings from this tutor suggest that there is a correlation between the use of the VLE and examination performance. The group profile can be seen in Fig. 13.

Fig. 13 Group Profile: A Level English Students



A correlation was found between what the group accessed on the VLE and the students' individual HBDI® profiles. The quadrant C activities of empathy questions and discussion boards were the most popular choices for students within the group, followed by quadrant B activities. Therefore the most preferred teaching methods correspond to the strongest HBDI® preferences in quadrant C. However, the next most preferred quadrant was D but the students then opted for quadrant B activities. This may be because Moodle lends itself more readily to these types of tasks but further research is needed.

To improve the use of a VLE, it is clear that activities should be designed to appeal to a learner's HBDI® profile. In reality this means that each task must be able to be accessed via methods that appeal to each of the four quadrants. Without this facility then VLE use may not be effective in terms of improving learning. It was found that students who used the VLE a lot achieved higher grades but further research is needed to establish a relationship between attainment, VLE use and HBDI® profile.

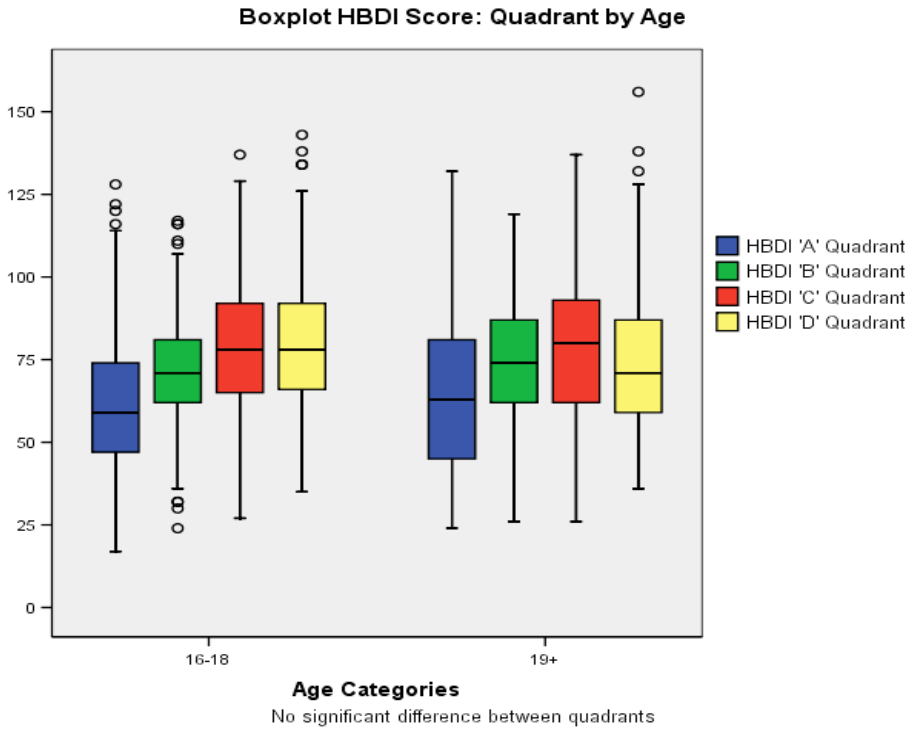
Students on a Fabrication and Welding course achieved an overall improvement in performance of 4% by addressing low preferences in writing, expressing, reading and speaking through using teaching methods designed to appeal to the high preferences of planning, problem solving and attention to detail to improve communication. It is interesting to note that three students in this group did not improve and actually obtained significantly lower attainment scores. However if the individual profiles are analysed then it is clear that these three students did not conform to the overall group pattern. This means that though using a group profile to plan effective learning designed to improve attainment is important, it is just as important to address individual needs through differentiation. Some students will need different activities from the rest of the group.

In Media Studies A Level there was an overall half a grade improvement between AS (year one) and A2 (year 2) which resulted in 35% of students (n=14) improving by one grade, 7% by 2 grades and 50% remaining the same. All the students who improved by one or more grades had a strong preference (1) in quadrant C and D i.e. the thinking skills that equate to Media Studies. Of the students who did not improve a grade, 28% had a strong preference in the C quadrant (1) and a medium preference (2) in the D quadrant.

The traditional age split in further education in the UK is 16-18 and post 19 and so these age profiles were used to investigate age differences. While significant differences in thinking style were found in relation to gender and curriculum type, no statistically significant differences were found between thinking preferences and age (Fig. 14).

This is an important finding as there is a view in further education that adults need to be taught in a different way from younger students. This research suggests that from the age of 16 upwards then no differences in thinking style are found and so similar teaching strategies can be used with 16-18 year old students and those over 19. However, the research did not address the social-economic differences of 16-18 year old students and those over 19, which often results in very real tutorial and pastoral provision for these two age groups.

Fig. 14 HBDI® Score and Age



The Future

The research allowed teachers to precisely identify areas of thinking in which students may have difficulty, discuss these difficulties with the students and implement specific teaching strategies to address such difficulties. As a result students suggested that they enjoyed the lesson more as they felt that they had been included in the learning process and had learned more effectively. The application of the HBDI® was therefore successful in terms of student motivation and achievement.

In order to use the HBDI® effectively to improve student attainment in more institutions and learning situations, then further research is needed, of both a qualitative and quantitative nature. This would provide more evidence of improved attainment and would therefore lead to a long-term investment in using the HBDI® instrument. Therefore, it is important to promote further research into relationships between changes in teaching strategies as a result of HBDI® analysis of student thinking skills and the impact this has on attainment. Further research using control and experimental groups is also necessary to establish the impact of HBDI® on improved attainment.

Other key results from the research need further exploration; in particular gender differences in thinking skill profiles and significant differences in subject group profiles. The relationship between these thinking skills and teaching and learning methods need to be investigated. The greater differentiation between students in some subject areas and the subsequent need to consider pedagogy, would be a rich source for research as would the relationship of thinking skills and subject choice.

The learner voice is increasingly important in any analysis of learner satisfaction and in England will be one of the criteria used to provide a score for the Framework for Excellence Self-Assessment regime, introduced from 2008. In Wales, too, the increased emphasis on Self-Assessment processes will necessitate evaluation of learner satisfaction. It would therefore be of interest to carry out further research to establish any relationships between the use of HBDI® and overall learner satisfaction with either a course and/or an educational institution.

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Additional Case Study Summary

Spotlight on Learning

better results through better thinking

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Additional Case Study Summary: Spotlight on Learning Project

Introduction

In addition to the aims and outcomes identified in the main report, one of the additional advantages of research based on thinking preferences is to explode the myths surrounding learning styles which are so embedded in learning culture, particularly in schools and even in the new diploma programme. For example, many schools still rely heavily on VAK, which is not only simplistic in the extreme, but damaging in the way it stereotypes children. It is not grounded in science though many teachers believe firmly that it is. The only way in which VAK can be used without damage is to create labels for resources, not for learners. Many schools and indeed the diploma programme use other learning style questionnaires too, such as Honey and Mumford, to stereotype their learners and focus on their learning 'strengths'.

In contrast, the thinking skills research encourages teachers to address the complexity of the learning process, the uniqueness of each learner and emphasises that learners can and should address their challenges and find ways of overcoming difficulties. Researchers such as Art Costa at Sacramento University and Carol Mcguiness at Belfast are also pursuing seminal work on thinking skills (Habits of Mind) using different models from the Herrmann model but basing their research on similar values.

The Spotlight Project

Methodology

Quantitative methods were used in that:

- Attainment was analysed using ALIS residuals and % assessment scores
- HBDI® group profiles were analysed numerically producing a rank order of thinking preferences within the teaching group
- Pre and post innovation assessment comparisons were made based on in-class assessments
- HBDI® thinking preferences in relation to gender were analysed
- HBDI® thinking preferences in relation to student choice were analysed

However, it is conceded that research based on purely quantitative methods is very difficult to achieve in education. In particular it is difficult to isolate variables that are involved in causal relationships. Nevertheless, there is value too in qualitative research and in this case many potential relationships were identified that would benefit from further large-scale quantitative research.

Qualitative research was also used to provide reasons to explain the results of the quantitative research. These included a questionnaire survey, individual interviews with lecturing staff and students. Student and staff motivation, opinions and perceptions play a major part in a successful learning process and these were discussed in the individual interviews. During these interviews the HBDI® profiles of individuals were discussed in relation to students' preferred learning methods and teaching methods used.

Limitations of the Research Methodology

1. Learning to Learn projects have a Hawthorne effect which may result in the points 1,2,3 in Findings. This is not a problem in that it still improves the learning process but it is a problem in terms of valid and reliable proof that the use of the HBDI® actually did improve learning.

2. Proving cause and effect in educational research is very difficult because of the number of variables involved. Control and research groups were used to attempt to isolate variables but a more rigorous experimental design is required to pursue this research.

3. The sample size in some individual subject areas was small and so significantly significant relationships could not be reliably proven.

4. There were more younger learners than older learners in the sample.

5. The use of ALIS to measure attainment was an effective measure of attainment and added value for A level but a more statistically reliable method is needed to measure attainment on NVQ provision, since NVQ is an assessment not an achievement.

Key Findings

1. The use of HBDI® profiles provides a tangible focus which motivates the learner.

2. Using HBDI® profiles and employing discussions on learning encourages the learner to face learning challenges.

3. Focussing on learning methods rather than solely subject content/skills improves teacher/learner relationships.

4. It is essential to drill down to the 28 thinking skills and emphasise the unique individuality of each learner to avoid the stereotyping so evident in the learning style mythology.

5. Profile patterns can be identified in most, but not all, subject areas. Teachers do have to teach a whole group for much of the time so profile patterns are of practical use as long as they are used with a health warning (see point 7 below).

6. In subject areas where profile patterns are not easily identified (e.g., Biology), there are greater teaching challenges in terms of differentiation.

7. It is essential to consider individual profiles which do not fit the overall subject pattern. These learners may well need individual help and support through different teaching and learning methods to avoid learner drop out.

8. There is some evidence that addressing learning challenges through the introduction of carefully targeted teaching innovations based on analysis of HBDI® profiles seems to improve attainment. Further research is needed on this.

9. There are statistically significant differences in the thinking preferences of males and females. This has a direct impact on both subject choice and preferred teaching methods. Differences in thinking preference have an effect on subject choice, self-belief, motivation and performance. This is likely, correspondingly, to have an effect on attainment.

10. There are no statistically significant differences in the thinking preferences of older learners in comparison with younger learners.

11. The thinking profile had an effect on learner willingness to try new teaching methods.

Future Research

It is likely that further research into the following would prove worthwhile:

1. The impact of gender differences in thinking skills on subject choice. Such research could have a major effect on finding ways to encourage girls to study science, technology and engineering or boys to study Arts subjects or follow care courses.

2. The impact of gender differences in thinking skills on teaching methodology. Such research could also have a major effect on finding ways to encourage girls to study science, technology and engineering or boys to study Arts subjects or follow care courses.

3. The relationship between thinking skills and subject choice.

4. The relationships between changes in teaching strategies as a result of HBDI® analysis of student thinking skills and the impact this has on attainment.

5. The greater variance in thinking skills between students in some subject areas and the subsequent need to consider pedagogy. This results in the need to relate differentiated teaching strategies to HBDI® group profiles.

6. The relationships between changes in teaching strategies as a result of HBDI® analysis of student thinking skills and the impact this has on attainment.

Recommendations

In future research projects:

1. The use of control and experimental groups would be necessary to establish the impact of HBDI® on improved attainment.

2. Control and experimental groups would result in greater validity of findings but there is higher expense.

3. In order to obtain statistically valid data a greater number of learners need to be involved in the project.

4. Teachers need to have protected allocated time to focus on considering profiles, selecting teaching methods, planning learning sessions, working with individual students and deciding on the method of assessment.

5. A project management team with varied expertise, devoted to planning, supporting teachers and learners and analysing results would be essential to the success of the project

6. An objective critical friend, such as a university faculty or research expert should be attached to the project.

7. Research projects, in accordance with the work of Prof. John Macbeath and Dr. David Frost, work most successfully when the ethos is 'teacher leadership' with the professional teacher best placed to carry out the research in a non-judgmental atmosphere, separated from inspection and appraisal processes.

Carolyn May