The ITB Journal

Volume 11 | Issue 2 Article 7

2010

Using Learning Styles to Optimise Lecturer and Learner Experience and Results in an Institute of Education

Dawn Duffin

Geraldine Gray

Using learning styles to optimise lecturer and learner experience and results in an Institute of Education

Dawn Duffin (a) and Geraldine Gray (b)
(a) National Learning Network Ireland
(b) Institute of Technology Blanchardstown, Dublin

Abstract

The past decade of social policy making and legislative change in Ireland has led to a 'broader range of individuals' accessing higher education (ITB, 2006, HEA 2005, Duffin forthcoming). This means that class groups contain a greater range of diversity of learning behaviours than hitherto. The process of accommodating this range of learning behaviours within curriculum development and assessment poses a challenge for lecturers and students alike. This paper suggests how understanding the relationship of learning styles to cognitive processing can provide sound research support to the use of learning styles profiling to create conditions for optimal achievement in terms of student retention, attendance and achievement.

0. Introduction

In order to demonstrate the relevance of learning styles to psychological profiling of cognitive processing, this paper will summarise what is generally understood by the term learning styles and attempt to determine the synergy between types of learning styles tools and the corpus of cognitive processing research. As a result of this exercise it will then be to possible to indicate where their use has validity as a tool in the classroom before describing the type of learning styles analysis developed and used by two EU funded projects, the Partners Collaborating in Training on Specific Learning Difficulties (PACTS) Inter-reg 3a Project 2004-2006 (PACTS, 2006) and the Education for Employment (E4E) Equal 2 Project 2006-2007 (Lawlor, 2007).

The paper will then describe the use of learning styles identification and analysis in the Learning Styles Theme within the HEA Strategic Innovation Funded (SIF) 2007-2009 (Duffin, D and Gray, G, 2007) collaboration between three Institutes of Technology and a specialist service provider. The body of the paper will focus on describing the first year's activities of the SIF Learning styles theme at the Institute of Technology Blanchard town in terms of student and lecturer perspectives before presenting the findings to date in terms of four key areas of concern to third level educational institutions: student retention, student attendance, student achievement and lecturer continuing professional development before drawing conclusions to date and making recommendations for the continuation of the learning styles theme over the remaining two years of the project.

0.1 What are Learning Styles?

'Learning Styles' has become a popular term over the past decade and it is now used ubiquitously. Despite this fact that it is the author's experience that in delivering CPD training to teachers and lecturers since 2003 it has become clear that knowledge of what learning styles are and understanding of the implication of their application to a teaching and learning environment varies enormously.

It will be useful therefore to contextualise the relationship of learning styles within the research domain of cognitive psychology and to describe some of the main approaches taken

by the range of existing learning styles tools available before examining the use of learning styles for individual profiling in the PACTS and E4E Projects which has now been further reviewed and is identified as the best-practise approach that has now been applied to the SIF Learning Styles Theme.

1. Models of Learning Styles

Overall there are five basic approaches to individual learning behaviours found under the category 'learning styles':

a) Channel or Mode of Learning
b) Cognitive Strengths in Learning
c) Personality Type influence on Learning
d) Manner or Style of Learning
e) Types of Learning Behaviour and Strategy

Adapted from (McAnaney, D. Craddock, G. Gordon, D, Duffin. D. O'Leary, C. and Whelan, G., 2007)

This section of the paper will provide a brief description of each of the above types of learning style with examples of the best known models in the five identified headings.

1.1 Channel or Mode of Learning

The idea that we process information through different modalities is the most well known model of learning styles and operates on the principal that there are a finite number of input channels for information to be accessed through and that different channels are 'preferred' In the case of deafness and visual impairment one channel may be only partly useful or else totally inaccessible. This places greater dependence on the remaining input channels but does not automatically mean that greater abilities in the remaining channels will exist. For example a deaf person will be forced to use visual processing in the absence of auditory access but does not necessarily have greater powers in the channel simply because he or she is deaf; similarly with visually impaired individuals and auditory processing.

Typical models here are the Visual, Auditory and Kinaesthetic (VAK) and Visual , Auditory Reading and Writing and Kinaesthetic (VARK) (McAnaney et al 2007) Learning Styles identification models. In general these models identify channels as being auditory, visual and kinaesthetic (Smith, 1996) and some models include linguistic or reading and writing skills as a separate item (Fleming, N.D, 1995)

1.2 Cognitive Strengths in Learning

Models using identification of cognitive strengths as indicators of learning styles accept the existence of information inputted through the sensory channels as described above and add a cognitive dimension to the processing of the information. A typical model of this category is the TRiM (Clark, 2008)model which identifies three representational modes through which the sensory channel input information must pass before it can be utilised. These three modes are: 'linguistic', 'non-linguistic' and 'affective' (McAnaney et al 2007).

1.3 Personality Type Influence on Learning

This category of model identifies personality type as a primary factor in learning; the best known model is the Myers Briggs Type Indicator (MBTI Basics, 2008) which identifies four sets of scales of personality which contain two poles and measures the individual in terms of a score within each field so that predominant tendencies can be identified and an overall

picture of interaction within the four fields can be presented (Keirsey, 1998). The four personality fields chosen are:

1. Extroversion-Introversion,
2. Sensing- Intuition,
3. Thinking-Feeling
4. Judging-Perspective.

1.4 Manner or Style of Learning

As opposed to learning channels models which identify the manner in which individuals 'prefer' to receive and process information, learning styles models attempt to identify the individual's approach to a learning activity. The most well known format here is Kolb's Learning Style Inventory (Kolb, 2005) which is a two part model identifying categories of learning behaviour linked to a learning style as below:

Reflectors (concrete): Watching (introvert-reflection)
Theorists (abstract): Thinking (mind)
Pragmatists (abstract): Feeling (emotion)
Activists (concrete): Doing (extrovert-muscle)
(McAnaney et al 2007, page 70)

Another model, the Adult Returners Key Skills Resource, (ARKS, 2000) identifies learning styles under the following four headings:

- Enthusiastic
- Practical
- Logical
- Imaginative

(ARKS, 2001, p. 40)

1.5 Types of Learning Behaviour and Strategy

Under learning behaviour models, the range of activities included in learning expands the conventional view of intelligence beyond the accepted range of language and mathematical skills and logic and deductive skills to include other 'types' of intelligence. Howard Gardner's Multiple Intelligence model (Gardner, 2006) identifies eight areas of intelligence under which learning strategies can be created:

- Verbal-Linguistic
- Logical-Mathematical
- Musical
- Spatial
- Bodily-Kinaesthetic
- Interpersonal
- Intrapersonal
- Naturalistic

The tenet that intelligence can only be measured in terms of verbal and linguistic abilities, numeracy and logical deduction which has perseverated over many generations of study and can be seen to underpin all conventional educational curricula, teaching methodologies and assessment practices (Duffin, forthcoming) was challenged by Gardiner's notion that the term intelligence could be applied to and measured in terms of skills such as: musical ability, people skills, bodily coordination and spatial awareness and self knowledge. A classic

example of this in practise would be the entry criteria for the study of medicine where doctors are required to score highly in literacy, numeracy and logic but are not required to prove their manual dexterity or inter-personal competencies despite the fact that these are clearly essential to the profession.

1.6 Summary of Learning Styles Models Currently Available.

This brief summary of the range of approaches that can be taken to identifying the learning behaviours of an individual shows that there is a broad and complex range (Eysenck, M. W and Keane, M. T, 2005) of factors that can be taken into consideration. The obvious question posed by such a conclusion centres on the efficacy of the models and in order to determine this it will be necessary to identify to what extent they are in harmony with the corpus of research pertaining to cognitive psychology.

2. Relationship of Learning Styles to the Discipline of Cognitive Psychology

Having reviewed the range of learning styles models currently available this section of the paper will attempt to identify the underlying hypotheses of the learning styles approaches discussed above and relate them to the discipline of cognitive psychology.

2.1 Channels or Mode of Learning

The three elements included in the VAK model are often assumed to be sensory channels as indeed two of them, 'sound' and 'vision' are. 'Kinaesthetic' is not a sensory channel although kinaesthetic activities require touch as well as movement and touch is one of the five senses. Although there are five senses in terms of physical interaction between our internal and external experiences there is controversy around other potential senses, such as intuition, which are more difficult to measure scientifically but do operate based on accumulated personal knowledge and experience.
Auditory, visual and kinaesthetic learning channels are therefore perhaps most correctly defined in psychological terms as 'modalities' or 'manners of operating' rather than as sensory input channels

When we consider the additional element of the VARK model it is clear that 'reading and writing' is a quite different element altogether as it is neither a sensory channel nor a mode of operation. The acts of reading and writing cover a range of literacy skills based on the ability to abstract spoken language performance into an orthographic form and vice versa (Duffin, D, 2004). An extremely simplified description of these skills shows that the orthographic form of a language is an abstraction of the spoken form of language, which itself is an abstraction of a spoken language performance as speech uses groups of sounds to represent concepts in terms of words and sentences (Eysenck and Keene 2005). By including language into the elements of a model we significantly enlarge the factors to be taken into consideration as the language development of individuals varies enormously from native and bilingual acquisition, to second language acquisition and in the case of deafness, acquisition in a different modality where a sign language is available and impaired spoken language acquisition where it is not (Duffin, D., 1999)

Additionally, acquiring the skills of reading and writing actually requires the use of a combination of all the other three channels in performance as well as a range of other cognitive processing skills on language production and perception (Harley 2008).

The term 'linguistic skills' includes verbal, written and reading comprehension abilities all of which also must draw on the previous experiences and knowledge of the individual as well as

relevant motor and interpretative skills. Cognitive science has attempted to model some of these behaviours in isolation but the complexity of processing mechanisms and their interconnected nature makes it impossible to map them overall (Eysenck and Keane 2005) (Harley, 2008).

2.2 Cognitive Strengths in Learning

We have discussed the lack of homogeneity with the VAK and VARK models and the points raised above continue to be relevant in the models that also include cognitive strengths in their operation. In this example the terms 'linguistic' and 'non-linguistic' are ambiguous to say the least, especially now in the light of the past thirty years of sign language psycholinguistic research which has confirmed the presence of visual and spatial modes of language perception and production (Duffin 2004), (Emmorey, 2002), (Brentari 1998). Defining 'language' is fraught with assumptions and misconceptions as the majority of people assume that language means 'spoken language' and that the terms 'language' and 'speech' are synonymous (Duffin, D, 2004).

Additionally, the category 'affective' is also ambiguous in terms of psychological analysis and is said to include 'feelings, emotions and moods' and where the candidate will opt for a pleasant outcome rather than a painful one and that state of mind will influence the learners approach to a task (McAnaney et Al 2007 p 70) is a difficult category to define in terms of cognitive psychology beyond stating that emotional responses are highly subjective and vary enormously from one individual to another.

This means that in models of this nature that although a number of criteria are being considered within the learning performance of an individual, they are not necessarily underpinned by psychological mainstream theories or easy to apply to the individual's task of identifying a quantifiable and consistent method to support his or her learning.

2.3 Personality Type influence on Learning

Whist there is no doubt that the personality traits of any individual will impact on and influence his or her learning behaviours and dispositions, the usefulness of identifying personality, assuming it can be done accurately, also remains highly subjective. The concept of personality itself is one that is not easily measurable especially in younger students and young adults as its emergence is not only part of the process of adult maturation that will potentially continue to change over the entire lifespan but also a product of all the previous experiences of the individual. This means that the lack of common fixed points for measurement and the enormous range of variables make the task of personality identification itself extremely complex under an attempt at cognitive analysis.

This means that personality identification can only provide a guide for trends at a given time and is more useful as a contextualising exercise rather than a set of pragmatic tools to enhance learning performance (Henderson, H. and Wachs, T., 2007) (Nowak, A. And Vallacher, R, 1997).

2.4 Manner or Style of Learning

Manner and style of learning are closely linked to personality and there is much overlap between these two categories as can be seen by the terms chosen to describe personality types and learning approaches. In terms of cognitive processing there is a range of cognitive processes used in the learning process that is common to all learners and these include: perception, attention, memory and language processing. Attempts to identify the learning

behaviour of any given individual without including some assessment of skills in these areas will only give a partial analysis of the individual's learning abilities. Cognitive processing tests such as the Wechsler Intelligence Scale for Children known as the WISC-R (Wechsler 1974) and the Wechsler Adult Intelligence Scale known as the WAIS-IV (MSN Encarta, 2008) provide the most accurate data for individual processing skills but, even so, all Educational Psychologists will always add that this measure is of a performance on a given day and will go to great lengths to demonstrate a sufficient range of information gathering and one to one consultation to confirm the findings of the assessment (McCarthy S. , 2004).

2.5 Types of Learning Behaviour and Strategy

The conventional idea of intelligence includes skills and performance in language, mathematics and logic. Historically, only those possessing these skills at high levels were considered to be 'intelligent'. Assessment of such learning has arisen based on this premise, and written and verbal examinations require both a good memory and good language skills. This means that we are often examining performance in specific modes rather than subject knowledge or understanding.

There is no doubt that 'multiple intelligences' exist and that they occur in a range across society. The task of measuring this range within one assessment tool in an effective manner in any given individual is gargantuan and extends beyond the current frame of our understanding of the supporting cognitive processing profiles to be mapped.

2.6 Summary

The main components of cognitive processing are perception, attention and memory, language production and language perception, all of which operate in at least visual, auditory and kinaesthetic modes. These processes all draw on, and are influenced by, the individual's world experience and knowledge to date. The task of accurately capturing and recording learning behaviours for one individual or for a group of individuals is enormous and cannot be achieved by the application of a single learning styles model.

> What is cognitive psychology? It is concerned with the internal processes of making sense of the environment, and deciding what action might be appropriate. These processes include attention, perception, learning, memory, language, problem solving, reasoning and thinking.
> (Eysenck, M. W and Keane, M. T, 2005, p. 1)

This quote (above) from Eysenck and Keane provides a very useful encapsulation of what needs to be taken into consideration when examine learning behaviours but, although their extremely comprehensive text on progress to date summarises past thinking and current hypotheses, it cannot yet offer us an overview of the inter-connections that must occur between the given areas. This is because the current corpus of research on cognitive psychology has not yet arrived at a position from which a comprehensive overview can be modelled. Trevor Harley has reviewed the psychology of language for over a decade and has reached a similar conclusion in respect of language processing (Harley 2008). As time progresses the corpus increases and the model extends as is shown by the recent changes in the way the literature now presents memory processes (Eysenck, M. W and Keane, M. T, 2005)

The diagram below attempts to show the overlapping nature of the processes identified as being essential to learning:

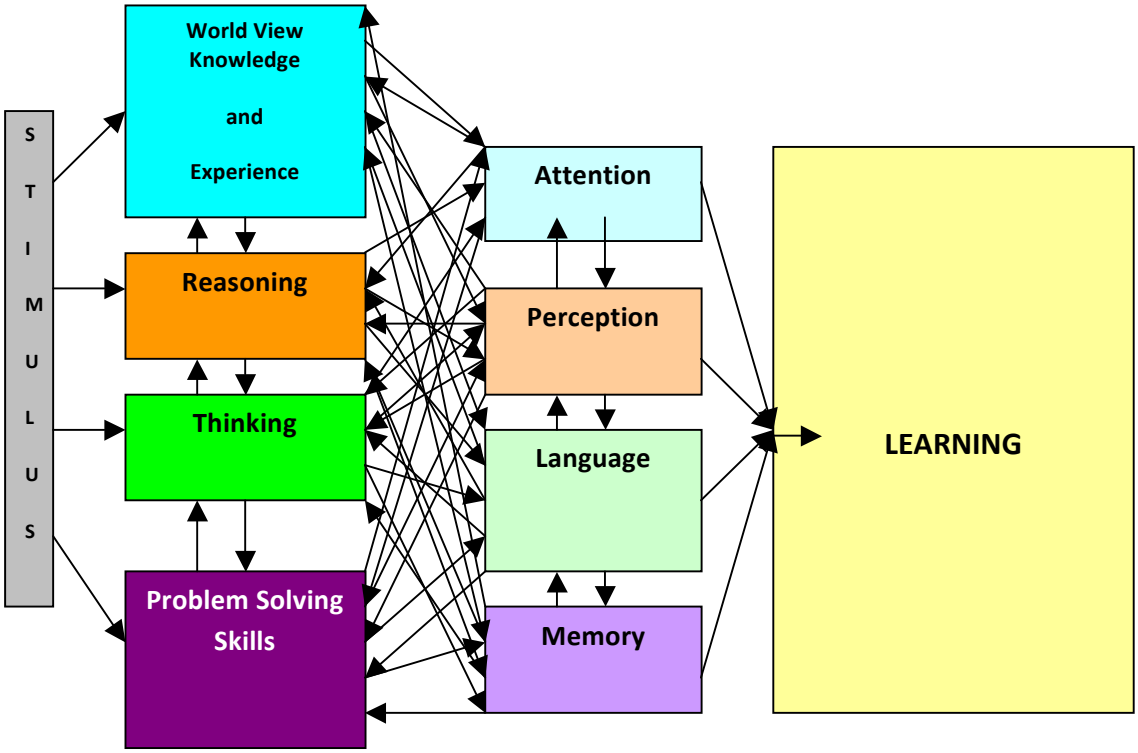

Diagram 1: Representation of the complexity of the inter-connected relationship of processes involved in learning. (Duffin, forthcoming)

2.7 Conclusions on Review of Learning Styles Models under Cognitive Processing Research.

This paper acknowledges that the complexity and interconnected nature of information reception, comprehension and production operations continues to challenge cognitive psychologists in capturing the manner and nature of these processes. Nevertheless, it is still possible to draw some general conclusion on the usefulness of a learning styles approach in maximising the identification of learning trends of individuals and groups in an educational setting.

a) The decision to use a 'Learning Styles' approach must be contextualised within the corpus of psychological research on cognitive processing for its application in educational environments to be effective.
b) Research on cognition primarily concerns the way an individual processes attention, perception, memory and the relationship of these to his or her linguistic functions. This is an important starting point as when we are asking individuals to identify their preferences in learning styles, these elements can be further investigated in normed and standardised psychological tests for confirmation.
c) The chosen approach must provide information that is useful to the individual in creating an understanding of his or her 'learning profile' that is relevant to the learning environment and that can be followed up by an educational psychologist should any specific difficulties requiring individual support be identified.

A clear outcome from the review of learning styles models and the discussion of cognitive processing is that the type of model chosen must contain elements that can be quantified in some manner and that these must be capable of measurement if necessary. Therefore this paper concludes that the choice of learning styles identification must involve the input and output operations in auditory, visual and kinaesthetic channels and must also be mindful of linguistic ability.

Whilst we have stressed the importance of testing of individuals where necessary, in a pragmatic application of the information provided on individuals and groups on learning behaviours through learning styles identification by teacher and student support staff it is more important to understand the diversity that naturally occurs in the presentation of these processes across society than it is to identify individual instances of atypicality. This means that methodologies employed in teaching and learning must reflect awareness and understanding of the range and scope of these differences rather than placing a focus on individuals with 'learning problems'.

3 Developing and Identifying an Appropriate Tool

Having provided a context and rationale for the type of learning styles tool required, Section 3 of this paper will now describe the development and use of the chosen tool in two projects, Partners Collaborating in Training for Individuals with Specific Learning Difficulties (PACTS, 2006) and , (E4E, 2007) before describing its use and progress to date in the current project Strategic Innovation Funding; Learning Styles Theme (Duffin, D and Gray, G, 2007) which is the subject of this paper.

3.1 Application of Learning Styles in the PACTS and E4E Projects

The previous section identified the fact the there is not one definitive accepted view on how learning styles tests and models might be underpinned by cognitive psychological research. It also highlighted the complexity of the task of cognitive scientists in modelling cognition in all its interconnectivity. These two facts combine to raise questions on the validity of adopting a learning styles approach to education without understanding its place within the larger frame of cognitive psychology.

This section of the paper will show how two projects, PACTS and E4E, have informed a SIF theme on the use of a largely modality based learning styles approach for student and lecturer support to optimise achievement across a diverse student body in the Institute of Technology, Blanchardstown.

The main objective of the two projects was to support specifically identified individuals experiencing difficulty and marginalisation and, interestingly, the outcomes of both projects have demonstrated that there is a need for inclusive institutional approaches to learning and teaching in general.

Both projects specifically considered the atypical learning behaviours of their participants, the PACTS project particularly considered the four areas of difficulty most commonly associated with the term Specific Learning Difficulties; dyslexia, dyspraxia, ADHD and Asperger's Syndrome and the E4E project considered access largely in terms of physical mobility and performance, many of the functional difficulties experienced by the individuals presented as being identical whatever its underlying cause.

> Individuals who have a Specific Learning Difficulty (SPLD) have a specific difficulty in the way they process information which impacts on their ability to achieve their true potential. (McCarthy S. , 2004, p. 1)

What is particularly significant about the four discrete areas of SPLD is that there is considerable overlap between them and it is more likely that an individual profile will consist of two or more overlapping difficulties than of one in isolation only (Kirby, A. and Smythe, I, 2008) (Kirby, A. and Kaplan, B, J , 2003) (McCarthy S. , 2004) consequently interventions will only be effective if all areas of overlap have been identified and this means that a holistic approach must be taken with the individual that focuses both weaknesses and strengths and, particular, on the functional difficulties themselves rather than on any diagnostic label.

This paper will now briefly describe the relevant findings of the two projects before providing information on the two partnering institutions and a rationale for the chosen methodology that is now being tested in the SIF Learning Styles Theme.

3.2 PACTS

The PACTS project set out to raise awareness and provide appropriate training and materials to support individuals diagnosed with specific learning difficulties such as Dyslexia, Dyspraxia, AD(H)D and Asperger's Syndrome (PACTS 2006).

One of the most significant findings from this cross border project funded by the EU which drew on expertise from the Ireland and Wales, was that although it is generally accepted that up to ten percent of the population may experience sufficient difficulties in the above areas to warrant a diagnosis (Kirby, A. and Kaplan, B, J , 2003), (McCarthy S. , 2005), it is far less generally known that because individuals affected are average or above average intelligence they often create excellent coping strategies and can remain undiagnosed far into adult life. Usually a diagnosis is only sought when a 'tipping point' is reached which overstretches their coping resources. This could equally be in an education or employment context.

Without identification and support at such a time the individual will not be able to demonstrate potential in the new area of challenge which could be a job promotion or a further level of education (Kirby A, Davies R, and Bryant A , 2005). Equally important to this fact is the fact that although the individual may have progressed through work or education by the development of good 'coping skills' due to his or her intelligence, it is still unlikely that he or she will have been able to demonstrate ability commensurate with his or her intelligence to the optimum (McCarthy, S. and Duffin, D, 2006) (McCarthy, S. and Duffin, D., 2007).

The PACTS Project also identified the fact that even if an individual does not qualify for an actual diagnosis because the cut off point for diagnosis is historically the bottom 10^{th} percentile, if a person demonstrates a number of trends within the four SPLD areas in the bottom 20%, he or she will still need intervention and support to demonstrate an optimal achievement performance.

This group of individuals is considered to include a further 10 percent of society. Overall these findings indicate that up to 20 percent of individuals within society will need support to demonstrate their potential in a given performance context (McCarthy, S. and Duffin, D, 2006).

As identified in its key objectives the PACTS project led to the National Learning Network Assessment Service (www.nln.ie) being set up to provide multi-disciplinary collaborative

assessment, identification and support based on the model in use in the Discovery Centre, University of Wales Newport (http://dyscovery.newport.ac.uk) and this service continues to work closely with Professor Kirby in the provision of its assessment services in Ireland.

Both the National Learning Network Assessment Service and the Dyscovery Centre have continued to research how individuals learn optimally and now proceed from a more generic perspective on learning diversity than one of a medical model of individual diagnosis. It has been conclusively demonstrated that a model of identification of individual learning profiles and behaviours applies to all learners precisely because there is no normal way to learn. The model set up to identify undiagnosed SPLD in Wales and Ireland serves equally as a best practice model to optimise learner performance in general.

> 'No intervention provided to support an individual experiencing SPLD will harm any other learner.'
> (Kirby, 2007).

A major conclusion of the project, therefore, was the fact that the research produced highlighted the need to examine learning in general and within that context in education that both learner and teacher behaviour must be considered.

3.3 Summary of PACTS Project Findings.

The PACTS project identified a number of key facts in the provision of support relevant to education that have been taken up in the SIF Learning Styles Theme:

- Individuals learn differently
- All learners will benefit from identifying how they learn
- Up to 20 percent of learners need support to succeed optimally with learning
- The manner in which a lecturer learns influences his or her teaching
- Screening individual and group learning styles informs both learners and teachers
- Differentiated teaching methodologies reduce the numbers of students requiring individual supports

  Adapted from PACTS 2006

3.4 The Education 4 Employment Project (E4E)

The Education for Employment Project (E4E) 2006-8 had two main objectives;

1. To create pathways through different levels of education through cognitive tools and inclusive methodologies for adults experiencing marginalisation such as those with disabilities or ex-offenders
2. To support students on those pathways and with transition to further education or employment
   (Lawlor, 2007, p. 7)

In achieving its objectives E4E used the development partnership of 6 specialist and mainstream further education and higher education service providers to share research, expertise and resources in the needs identification, assessment, training and support of students and lecturers (Kelly, 2008).

The National Learning Network continued to collaborate with its PACTS partners to refine the profiling and learning styles techniques used in the PACTS project through the continuing development of two tools, the Adult Profiling Tool (APT) (Kirby, A. and Smythe, I, 2008)

and a learning styles questionnaire (Kirby 2004) for the benefit of students and lectures and these two tools provide the foundations for the learning profiling necessary to SIF.

The techniques and tools offered to teachers and lecturers through training and mentoring in E4E included De Bono's Cognitive Research Tools (CORT) and his 6 HATS model (Duffin 2004, McAnaney et al 2007) which had been extensively employed by the Central Remedial Clinic in previous learning projects in its Special School housed on its Clontarf site (Gordon, D, Craddock, G and Lynch, B., 2004)

Another partner, the Dublin Institute of Technology contributed research and established practice on learning styles and differentiated instruction (Gordon, Craddock and Lynch 2004) in use in the Computer Science Department.

The past research of these three partners in particular concentrated on teaching and learning within the project and led to an inclusive approach (Duffin, D. Gordan, D. and Nolan B., 2008) (Duffin D. , 2006) that demonstrated tangible results for both students and lecturers (CRC, 2007).The finding from PACTS that up to 20% of individuals need support to demonstrate optimal potential in the learning environment (McCarthy 2004) is now joined by a complementary finding that strategically planned developments in teaching and lecturing delivery lower the numbers of students requiring individual supports (Duffin 2004).

3.5 Summary of E4E Project Findings

The E4E project identified a number of key findings in the provision of education from both learning and teaching perspectives that have been taken up for further development and implementation in the SIF Learning Styles Theme:

- Group profiling identifies individuals who may have undiagnosed SPLD and those who may not qualify for diagnosis but will need support in this area.
- Raising awareness around 'learning styles' encourages reflection and application of new knowledge in both teaching and learning situations.
- The presentation of learning in individuals is underpinned by that individual's genetic cognitive information processing profile.
- Production and perception of the knowledge required through the access and delivery of educational courses is highly dependent on the way an individual responds through sensory perception, especially visual, auditory and touch, and, by his or her abilities with motor coordination.
- The knowledge gained from profiling the above is capable of being pragmatically applied to selected individuals, class groups and courses.
- Successful application of inclusive methodologies reduces the numbers of individual students requiring supports, and facilitates transfer and progression.
  Adapted from (CRC, 2007)

3.6 Strategic Innovation Funding Learning Styles

Having summarised the findings of two innovative projects, it is the task of this section of this paper to provide the context from which the joint partners of the learning styles theme chose to collaborate under a 2006 Strategic Innovation Funding Application to the Higher Education Authority. The paper will then describe progress made in year one of the project.

3.7 Theme Partners: The Institute of Technology, Blanchardstown

The Institute of Technology, Blanchardstown (ITB) was opened in 1999, and is the Republic of Ireland's newest Institute of Technology with a brief to accommodate student diversity.

As a high profile partner in both of the above described projects ITB acknowledged the natural progression of learning styles based approaches in pursuit of three out of five organisational priorities identified in its Strategic Plan for 2006-11:

- Achieve an economically viable and diverse student population
- Attain teaching excellence and learning flexibility
- Supporting and valuing each other so that we can work together with energy, commitment and creativity
  (ITB, 2006, pp. 14-20)

The SIF funding stream was chosen as the ideal vehicle to progress this line of research and ethos and was granted funds to address learning styles identification across the organization for a three year project from 2008-2010.

As joint lead partner in the learning styles theme in the 2006 round of this strategic innovation funding, the Institute of Technology, Blanchardstown saw itself as being ideally placed as the location for developing and implementing pragmatic outcomes from the research and development on the manner and nature of learning described by the final reports of the PACTS Project (PACTS, 2006) and the E4E Project (E4E, 2007).

3.8 Theme Partners: The National Learning Network

The National Learning Network is the Republic of Ireland's largest specialist provider of training for people with disabilities and for those experiencing marginalisation and has over 50 centers delivering more than 75 FETAC accredited programs nationally. In addition it provides assessment and support services locally and nationally and has an active Continuous Professional Development Training Service.

The mission, vision and values of the National Learning Network reflect 60 years of specialist service provision:

> **Mission**
> A world of equal opportunities through learning
>
> **Vision**
> To promote equality by providing world class training, education and employment access services and by actively influencing the creation of a more inclusive society
>
> **Values**
> Integrity
> Empowerment
> Partnership
> Mutual Respect
> Innovation
> Honesty
> Courage

The inclusive model of individual needs identification and learning supports used in program delivery by the National Learning Network have been conclusively shown to support a diverse learner population through learner outcomes. In 2007 88% of all learners progressed to further training and education or employment (REHAB GROUP, 2007).

Both the Institute of Technology Blanchardstown and the National Learning Network have demonstrated commitment to inclusion by their ethos, strategic objectives and research. As

past partners representing both specialist and mainstream service provision they are ideally suited to combine resources and expertise in bringing some of the research findings of the PACTS and E4E projects into a more pragmatic and sustainable application under the SIF Learning Styles Theme.

3.9 Conclusion

Section 3 of this paper has examined the recent research of the two partner institutions in two EU funded projects and demonstrates that their organisational profiles and ethos' are harmoniously and strategically aligned and that their past collaborative work provides the necessary appropriate research foundation.

This combination of specialist and mainstream education and training expertise places these two Learning Styles theme partners in a unique, and therefore, ideal position from which to move forward. SIF will provide the opportunity for pragmatic implementation of methodologies and the collection and collation of quantitative data to demonstrate if a learning styles approach will meet identified education service provider needs in respect of student recruitment, student retention, student engagement, student achievement and lecturer continuous professional development.

The ultimate aim of this third strand of partnership work is to have created a mechanism by which such practices can be incorporated in the day to day running of the organization and thereby be sustained.

Sections 1 and 2 of this paper examined a range of approaches to learning styles and aligned them with mainstream cognitive psychology research and came to the conclusion that learning styles are a the most useful indicator of learning preferences and that the VAK, VARK type of approach identifying learning channels or modalities is the best model to consider the range and complexity of information processing, planning and coordination skills required in the learning process.

Section 4 of this paper will present an examination of and a rationale for the specific learning styles profiling tools chosen for use in the Learning Styles Theme.

4 The Adoption of Generic Approach to Learning Styles Identification

As stated the SIF learning styles theme gives the opportunity to apply the research outcomes of the PACTS Project and the E4E Project within an overall inclusion methodology in an Institute of Technology. These two projects provided the tools to identify both student and lecturer information processing profiles and this section of the paper examines how and why the methodology is used in the learning styles theme. Before proceeding with this task Section 4 will first address two important elements required in an institution wide approach to successful teaching and learning. These elements are:

1. Identification of specific students likely to need additional supports.
2. Identification of teaching and learning styles from both individual and group perspectives.

4.1 The Identification of Students Likely to Need Additional Supports

Whilst the best model of student needs identification is undoubtedly based on Individual Education Planning (IEP) (NCSE, 2006), the high numbers of students, the short timeframe available at the commencement of courses, the reluctance of students to identify support

needs on application forms, the fact that up to 10% of students may unknowingly have SPLDs and the exceptionally high levels of resourcing required to collect and collate IEP data all conspire to prevent this being a viable option.

The current structure of third level education requires a process that can be completed at the start of the academic year within a short time constraint. Ideally, as an inclusive process, it must be applied to all students so that those who do and do not know where their support needs lie will be included and should also be of benefit to any student participating regardless of support needs. Such a process might be best managed within an induction context where it will need to be capable of self-administration for expediency. It will also need to be capable of being analysed speedily so that findings can be disseminated to both students and lecturers at the start of the semester.

4.2 The Adult Profiling Tool

In the PACTS project a self-administered screening tool designed by Amanda Kirby at The Dyscovery Centre was shown to accurately predict which individuals may be experiencing specific learning difficulties (McCarthy S. , 2004), (Kirby A, Davies R, and Bryant A , 2005), (McCarthy, S. and Duffin, D., 2007).

This screening tool, the Adult Profiling Tool (APT) has subsequently been converted to an online format easily accessible through the college website (Kirby, A. and Smythe, I, 2008)

The tool consists of 60 questions about functional difficulties. The individual's responses, whilst perceptual, provide sufficient valid information to determine whether that individual should be invited to undergo further investigation in the context of psychological testing. The questions cover the four main areas understood within the term specific learning difficulty; dyslexia, dyspraxia, ADHD and Asperger's syndrome. None of these terms is mentioned either in the process of filling out the questions or in the feedback sheet that is immediately available online offering study advice in response to the answers given. This advice which is tailored to each individual's answers, provides ideas on how best to study and raises individual awareness on his or her learning profile and on learning diversity in general.

The table below describes the four areas of functional difficulty:

Table 1:Functional Difficulties Associated with SPLD.

Identified Area of Functional Difficulty:	**Commonly known as:**
Difficulty with reading and writing	Dyslexia
Difficulty with motor planning and organisation	Dyspraxia
Difficulty with social interaction and communication	Asperger's Syndrome
Difficulty with attention and concentration Lack of Impulse control	ADD ADHD

(McCarthy, S. and Duffin, D, 2006)

A major strength of this screening tool is that it not only identifies a specific area of difficulty that could be associated with an SPLD, but it also identifies where overlapping difficulties exist and where similar functional difficulties exist because of a different cause such as physical or sensory disability. Although the range of disabilities and illnesses is vast, there are a finite number of functional difficulties as they are all ultimately defined by the way the individuals physical or mental presentation is translated through his or her cognitive processing and function. Although the APT was designed for SPLD originally it has been shown to be useful for any individual.

In the diagnosis of specific learning difficulty, unless a multidisciplinary team has been involved, it is frequently the case that overlapping difficulties are missed. Within the identification of specific learning difficulty, research has now conclusively demonstrated that overlap of difficulties is the norm and not the exception (McCarthy S. , 2005) and that appropriate diagnosis is best made by collaborative multidisciplinary teams and not by individual professionals with expertise only in one domain.

It is important to stress that the APT is not a diagnostic tool for SPLD but primarily serves as an indicator for those individuals who may need further investigation. It is particularly useful for identifying the learning perceptions of an individual in terms of the above areas and provides data for the production of a report on the learning strengths and weaknesses of any given individual or group in order that supports, interventions and training can be implemented in a given environment (Kirby 2008).

This screening tool has now been trialled in a variety of settings including education, the military, the prison service and employment and was launched by Dr Amanda Kirby in May 2008 and is now available in Ireland on licence.

4.3 Identification of teaching and learning styles from both individual and group perspectives

The screening tool and learning styles questionnaire developed from the PACTS projects have been used together to provide a number of reports on individual and group profiles (McCarthy, S. and Duffin, D, 2006) and can easily be combined to provide a range of information about the way individuals and groups learn. The learning styles questionnaire is described below:

4.4 Kirby Learning Styles Questionnaire

In addition to identifying whether functional difficulties in line with specific learning difficulty identification exist, it is also useful to give the student or the lecturer some reflective insight into his or her individual approach to learning or teaching. We already described some of the models of learning styles identification available and discussed them in terms of current cognitive processing research. The outcome of this discussion demonstrates that no one learning styles model will serve our purpose here.

> There is no such thing as the best model to use. It can be seen that there is a variety of approaches to identify the best ways that individuals learn. Some methods are complex and some are simple. At the start of this section the complexity of the study of cognitive science was mentioned, and, as this is a study which will take some time to uncover the nine-tenths of its iceberg of knowledge still remaining underwater, it is fair to say that none of the models described will fully answer the question.
>
> (McAnaney, D. Craddock, G. Gordon, D, Duffin. D. O'Leary, C. and Whelan, G., 2007, p. 74)

Within the PACTS project, a learning styles identification tool was developed for use in the Institute of Technology Blanchardstown. This model was based on the VAK model with additional questions on past educational experiences and other relevant items such as native language. In the National Learning Network Assessment Service this learning styles tool has been used in conjunction with the adult profiling tool described above and has been shown to provide a significantly broad spectrum of individual information to support the student even when diagnosis was not an outcome.

4.5 Summary

Both these tools, although not diagnostic, are sympathetic to individual analysis under sound psychological research principles. Because they are self administered in an environment where successful achievement is fostered and the students are informed of their purpose as empowering aids to achievement, the data gathered is both pertinent and accurate.

A combination of these two tools has been shown to be of optimal benefit in both empowering students' reflections on their own learning behaviours and in identifying students who may need additional support of diagnosis of specific learning difficulty. As both tools focus on functional difficulties and strengths in learning identified by the individuals the experience of responding to them is accessible and quick and the feedback sheets given offer useful study advice referenced to the responses given

5 SIF: Learning Styles Theme

The research described previously allows this section of the paper to identify the methodology chosen for the Learning Styles Theme and will now describe the format developed to ensure that both lecturer and student learning was appropriately encompassed by the methodology.

5.1 Methodology

In developing an appropriate methodology, the SIF Learning styles theme is mindful that psychological research does now have a considerable corpus of data on perception, attention and memory as key cognitive processes. All these processes operate in auditory, visual and kinesthetic modes and for this reason it is most useful to investigate these processes under a VAK or VARK type of learning styles model as this is the type of model that can be most closely correlated to cognitive measurables within learning in individuals.

The following simplified table shows how perception, attention and memory impact on learning through the three modalities. As can be seen from the 'outcome' column memory plays a key role in learning, not only in being able to recall the information of the curriculum but, most importantly, in being able to access and organise the understanding of the information itself.

The overall methodology of the SIF learning styles theme has been developed through a deconstruction of learning to some of its cognitive components and its channels in order that both students and lecturers gain a better understanding of learning. From the student perspective the individual is encouraged to reflect on his or her own manner of learning by engaging in a learning styles exercise and is simultaneously screened to identify whether there is sufficient atypicality in his or her profile to warrant further investigation and, possibly, individualized supports. The two elements of the methodology are, Information gathering and Continuous professional development and the outcomes sought are inclusive module delivery and student benefit.

Table 2: Learning channels relationship to cognitive processing.

	Perception	Attention	Memory	Outcome
Auditory	Understanding and interpretation of what is heard	Ability to sustain concentration in order to perceive meaning and context of sound input.	Ability to retain and recall information in a range of situations including sentence processing	Music and sounds can support access to memory
Visual	Understanding and perception of what is seen	Ability to sustain concentration in order to perceive meaning and context of visual input	Ability to retain and recall information in a range of situations	Colour, images and symbols can aid and prompt memory
Kinaesthetic	Ability to coordinate motor skills to achieve practical tasks	Ability to complete tasks through practice and achieve automaticity	Supports sequence and organisation in practical tasks	Performing an activity or sequence of movements can prompt memory
Language	Understanding in decoding and encoding utterances	Capturing segments of sufficient length to ensure correct interpretation	Use of articulatory loop to 'hold' linguistic information whilst decoding/encoding	Mental Lexicon contains information needed in language processing

(Duffin, forthcoming)

5.2 Information Gathering

In ITB the APT is completed by all students during induction in an online format so that the data can be collated speedily and so that students receive immediate feedback. The learning styles questionnaire is scored separately and students receive learning styles reports and, where relevant an invitation to investigate their learning further. The Learning styles questionnaire will very shortly also be available online.

Screening for specific learning difficulties, although this term never needs to be mentioned, allows the examination of the cognitive profiles of any students who may warrant a potential diagnosis or may simply present with a more atypical profile by an examination of weaknesses and strengths under the four areas of identified functional difficulty referred to in section 3. Placing this profile examination in the context of learning styles examination provides a user-friendly rationale which allows the individual to identify the best ways to organize his or her learning in line with the degree of analysis that has been undertaken in his or her case. In this way the service offered is not one that seeks out those with difficulties in order to attempt to 'repair' them, but is an inclusive college wide commitment to supporting optimal learning overall within which more atypical learners are seamlessly incorporated.

From the lecturer perspective, engagement in the learning styles exercise and in the screening exercise offers a similar opportunity for self reflection and, more importantly, provides the basis for a continuous professional development program using cognitive processing and learning styles information to develop more inclusive teaching modules.

Their teaching modules will be more inclusive in two ways, their overall delivery will be aimed at the range of different types of learner contained within the terms visual auditory and kinaesthetic and their specific delivery to any one group will be informed by the group learning profile of the group as a means of a report compiled from the information presented by the learning styles questionnaire completion and screening tool completion of the class group. Additionally the lecturers have identified trends in their own delivery and include this information in the preparation of materials for module delivery.

5.3 Continuing Professional Development

CPD development and delivery has been a targeted initiative of the National Learning Network for the past three years (Duffin, D and McCarthy S, 2006) after it was found that awareness raising sessions and theoretical training days did not consistently lead to outcomes within the pragmatic day to day work environment

Within the learning styles theme there has been awareness raising and theoretical information delivery as this is still an essential part of up-skilling. It is the additional element of a series of workshops and continuing one to one support offered within the learning styles theme to tutors and lecturers in small groups and as individuals that makes this project so innovative in being able to secure sustained and growing enhancement of curriculum delivery.

As a result, the development of the continuing professional development sessions offered to participating lecturers which are delivered in weekly workshops and awareness raising sessions offered to the teaching body on a regular basis have been pragmatically rather than theoretically tailored to the contexts within which they are delivered.

5.4 Summary

The methodology selected takes a two pronged approach consisting of information gathering and continuing professional development. Information gathering includes screening for SPLD and for learning styles and identifies ways to organise teaching and learning activities for optimal success. It is equally relevant to individuals with or without specific learning difficulties as it focuses on learning rather than on learning difficulty. The CPD element of the methodology goes beyond awareness raising and theoretical sessions by providing small group and one to one support to lecturers in the context of specific module delivery.

5.5 SIF: Activities Semester 1

In describing the activities of the Learning styles theme it will be necessary to include the following:

- Planning and Development
- Information Gathering
- Workshops
- Dissemination
- Student Perspective
- Lecturer Perspective

This section will conclude by indicating the future intentions of the learning styles theme in years two and three, before offering conclusions and recommendations for this paper overall.

5.6 Planning and Development

A key challenge for this project was to ensure sustainability after the lifetime of the project. The goal was to initiate a process of institutional change, where the learning needs and profiles of students were understood by all, and catered for as common practice in the classroom. Adopting change requires a change in attitude and values, as well as in practise and regardless of the value of that change, it can only happen if the institute is ready for the change, and it has the support of both faculty and management (Heyword, 2006).

The Institute's readiness was evident from the active involvement by both management and faculty in the PACTs and E4 project, the institute's unique relationship with the National Learning Network, and the institute's mission statement:

> *The mission of the Institute is to serve its students and the community by meeting the skills needs in the economy and increasing the level of participation in third-level education and training, particularly in Dublin North-West and its environs. The Institute will do this:*
> - *by achieving consistently high standards of relevance and quality in teaching, research, development and consultancy.*
> - *by offering a welcoming and supportive environment to students from all educational and social backgrounds and to adults wishing to increase or update their level of technical skills.* (ITB, 2008)

The task in the planning stage was to encourage and facilitate the active support of management and faculty. A project review group was established consisting of the registrar, heads of school, heads of department, HR manager, finance manager and head of development. This group is kept abreast of project progress, and in return gives valuable input on ensuring project activities can be accommodated and supported within the operations of each department.

There was encouraging support from members of faculty from the outset of the project. In planning this project, it was agreed that key to its success was to recognise the time commitment required by faculty to change teaching practices. Three members of staff engaged with the project each semester and were allocated timetabled hours to undertake project related research, which incorporated changing teaching practice and monitoring the impact of that change. As the research was directly led by daily practise it was immediately relevant to the individual lecturer as well as providing a valuable resource for peers.

Weekly workshops and advice session for the three participants, hosted by trainers from the National Learning Network, delivered formal instruction on inclusive teaching practices, and informal discussions between participants and trainers. Workshops were tailored to the group's requirements with respect to the learning profile of their student groups, and the nature of the material being delivered. The first semester focused on first year modules only, and subsequent semesters included second to fourth year modules.

5.7 Information gathering

First year students, and students of participating lecturers, were profiled using both the Adult Profiler and the Learning Styles questionnaire. Students received an individual report outlining their learning preferences. Where the profiler identified significant areas of

weakness, a follow on assessment was offered to students. Each lecturer received a summary report outlining the group's range of learning preferences and the prevalence of learning difficulties in their group. 55% percent of students profiled were visual or a combination of visual and other learning channels. Diagram 2 gives a more detailed breakdown of their learning preferences. Throughout the semester, students completed rubric style feedback sheets evaluating the teaching methods used. These require students to tick which one of a range of options most closely matched their experience in the lecture or tutorial. Besides give immediate and relevant feedback of the learning experience of the whole group these can be completed very speedily.

This proved both beneficial in terms of giving students a say in what happened in the classroom, and also informative as results were not always as expected based on the learning profile of the class. For example, one group of predominantly visual learners gave very positive feedback on the use of transformation methods to convert textual data into a graphical representation. A second group, again of predominantly visual learners, did not find this approach as useful, although did like information presented in a graphical format.

This could be explained by the requirement for logical, sequential processing required to transform textual data in a spider map, as was being used in this instance.

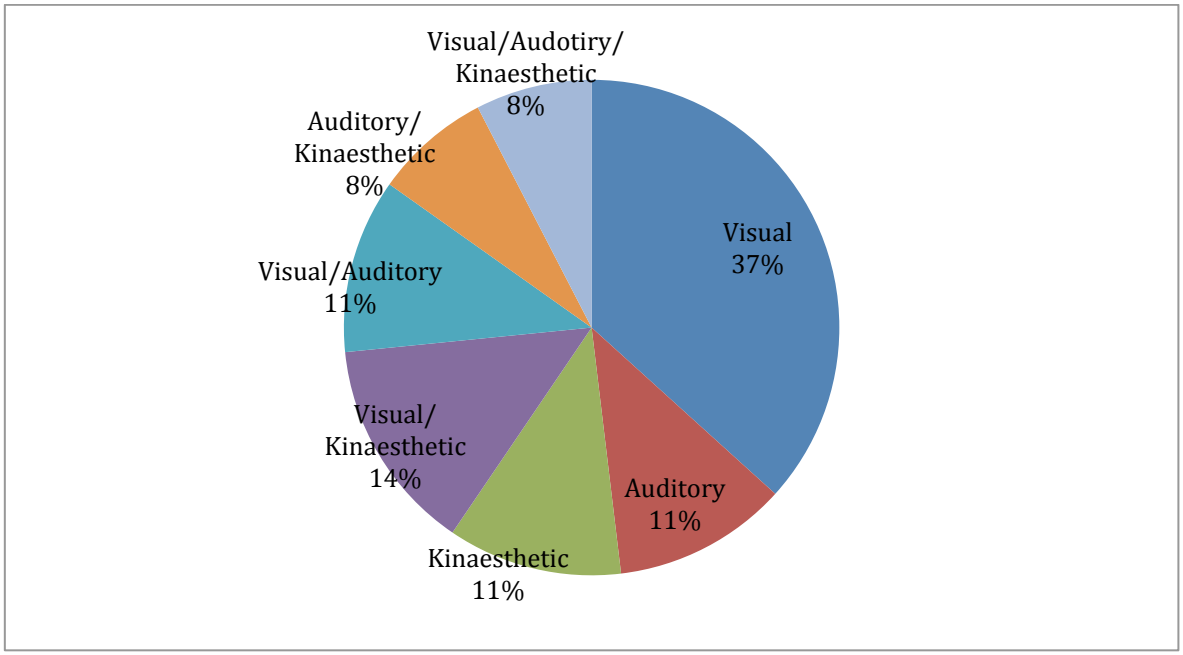

Diagram 2. A breakdown of the learning preferences of 161 students profiled in year 1

A formal questionnaire completed by students at the end of semester 1 and 2 (academic year 2007-8) has provided the project with encouraging qualitative feedback on the work done to date. The purpose of the questionnaire was to record the student's opinion on a variety of teaching methods, and their evaluation of the impact of those methods on continuous assessment results and preparation for the final exam. We also recorded the extent to which a student understood his/her own learning preferences (Duffin, D. and Gray, G, 2007)

The following results emerged:

- 97% stated that differential teaching techniques improved their understanding of course material.
- 93% attributed improved continuous assessment grades to the teaching methods used in class.
- 94% said the techniques used made classes more enjoyable.
- 98% stated that the techniques helped when studying course notes.

(Duffin and Gray 2008, page 47)

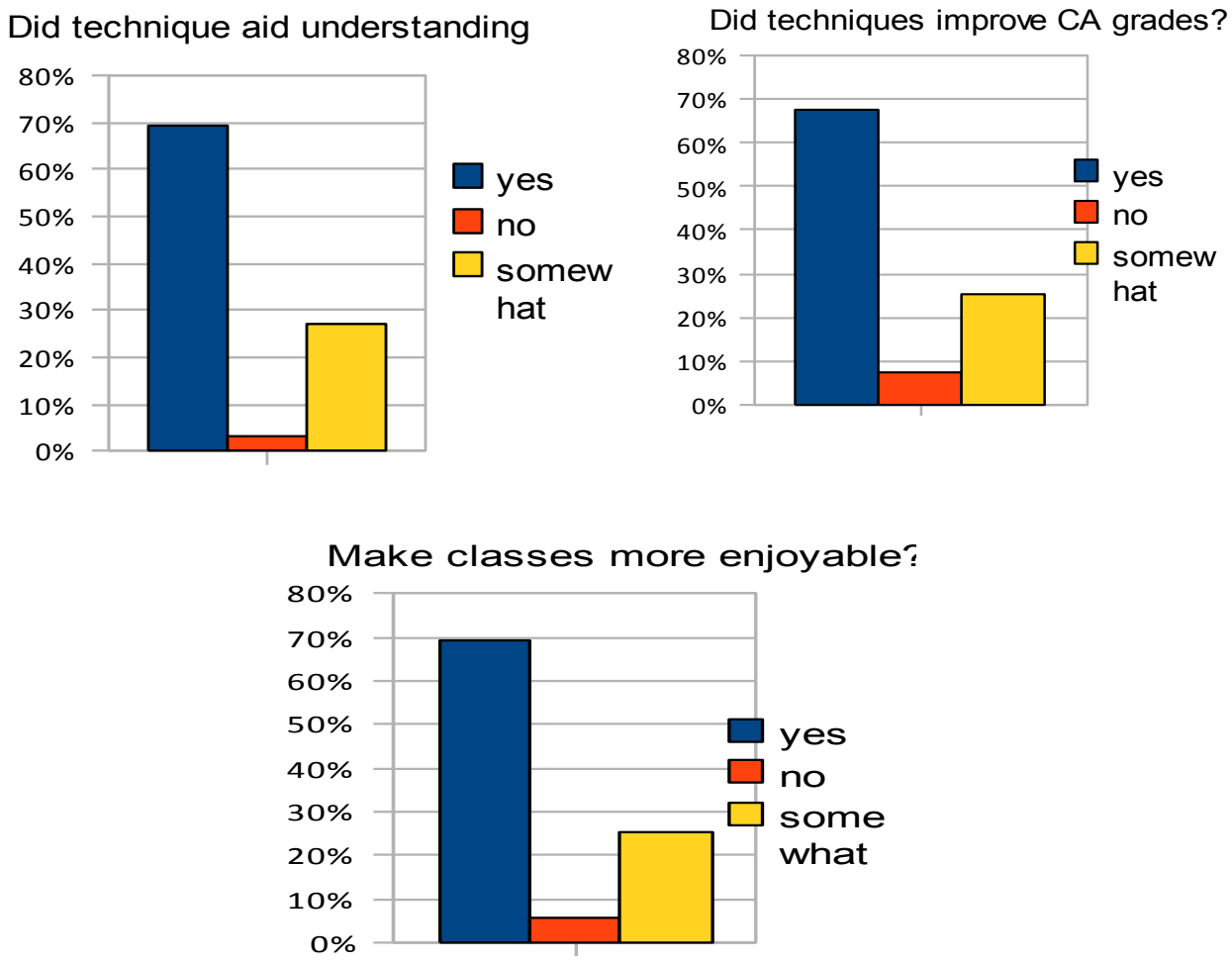

Diagram 3: Student Survey Results

Interestingly, the one classroom technique that appeared in top ranking methods of all groups, regardless of the predominant learning style in the group, was in-class discussions. Initial surveys showed over 40% of students did not have a good understanding of their learning preferences at the time of profiling. Follow on tutorials on learning channels and study tips for each channel improved this figure to over 75% of students understanding their learning preferences, and, consequently, what study techniques best suit them.

This finding suggests that is it not sufficient to merely inform students of their learning styles. To maximise the benefit of student profiling, awareness of learning styles needs to be re-enforced by subsequent information sessions and explicit practical examples in lectures and tutorials.

5.7 Workshops

The second strand of the project was to provide continuing professional development for academic staff. Experience on previous projects (E4E, 2007) (PACTS, 2006) suggested that no one teaching approach suits all, but rather academic staff should be equipped with a tool box of approaches which can be adapted to suit the module content and learning styles present in a particular class group. Formal training covering a number of teaching approaches including active learning techniques, visualisation techniques, the use of technology in education and aiding concentration and memory. In addition, weekly, informal conversation with NLN staff and peers was reported to be as beneficial as the formal training sessions. All faculty participants to date have stated that involvement in the project resulted in the standard of their delivery improving; job satisfaction increasing, awareness of the needs of learners had improved and student engagement in class work had also improved. 80% of participants attributed improvement in attendance rates and assessment results to their involvement in the project. At this early stage in the project, review of the impact of the work done can only be qualitative. It is hoped a longer study will be able to demonstrate a quantifiable improvement in performance as a result of change in teaching practice (Duffin, D. and Gray, G, 2007, p. 42)

5.8 Dissemination

Dissemination of the work done was facilitated by an end of semester 'Show and Tell' session. Presentations by project participants covered the learning profile of their group, problems encountered with their module in previous years, new approaches adopted, examples of materials developed, and feedback from students on the effectiveness of approaches tried. At the time of writing, two such events have taken place. Feedback from these sessions has been exceptionally positive and encouraging.

5.9 Student Perspective

Initial data collected suggests that the project is achieving increased student engagement in course work, increased attendance levels, and a reduction in the numbers of students failing. Students profiled have greater self awareness of their own learning style and preferences, and have been exposed to a greater range of learning techniques to better equip the learner and extend critical thinking. 84% of students stated this learning experience is better than any previous educational experience they have had. Lecturers also reported an improvement in student engagement (Duffin, D. and Gray, G, 2007, p. 42 and 47)

5.10 Lecturer Perspective

The biggest challenge for any lecturer or teacher is coming to understand why one student will understand material that has been presented and another will not. In a comprehensive study of teacher awareness across four levels of education in Ireland McCarthy 2005 found that there was an overall lack of awareness of SPLD:

> There has never been a study of specific learning on this scale carried out in an Irish population before now. The results are of huge significance to the Irish Education System, as they portray a significant lack of awareness and knowledge of SPLDs……
> (McCarthy S. , 2005, p. 92)

Lecturers involved in the project reported a shift in mindset with respect to their understanding of diversity of cognitive processing, and how best to present module content to optimise learning in the classroom.

5.11 Learning Styles Theme 2008 and 2009

The goal for the next two years is to continue screening and profiling individuals and groups whilst making the workshops available to as many lecturers as possible as well as the chosen participant lecturers for any one semester. Qualitative data to date suggests overall and individual benefits under a learning styles approach; the task of the future is to demonstrate these early findings in a quantative manner.

6 Conclusions and recommendation

Although this project is still in its infancy it is possible to draw a range of conclusions on its findings to date:

I. The recognition that diversity of cognitive processing across society is the norm is more important than attaching weight to any particular model of learning styles identification.
II. It is pointless to identify individual or group learning styles without examining the relevance and relationship to teaching and lecturing practice. If learners are encouraged to be aware of their learning styles they will need support in applying them to study practices and teachers will similarly need to become aware of their 'teaching styles' so that synergy can be achieved within the teaching and learning partnership.
III. Inclusive projects of this nature aim to change and sustain approaches to institutional practise and programme delivery overall and must have buy in and engagement from all levels of the institution.
IV. Theoretical and awareness raising CPD is far more effective with additional pragmatic follow up in group and individual settings.
V. All the participating lecturers found the process of benefit, they reported a change of mindset in respect of their roles and practise and engaged in research that demonstrated this was the case.
VI. Student involvement and feedback has been shown to be essential to their engagement in the learning process and was noted by all participating lecturers.
VII. This project is impacting on students' retention, attendance, performance and achievement.

The single most important recommendation is that initiatives using learning style identification must use the knowledge gained from individual or group screening in a pragmatic manner that will positively impact on learning and teaching outcomes. The knowledge gained must be applied within an organisational structure that includes macro and micro outcomes related to its overall mission, vision, values and strategic planning.

Bibliography

ARKS. (2001). *Arks keys to learning: what is effective learning?* Retrieved July 28, 2008, from homepages.ed.ac.uk: http://homepages.ed.ac.uk/calarks/arks/Materials/ktl2001/KTL_Chapter1.pdf

ARKS. (2000). *Adult Education project funded under the European Union Socrates Programme.* . Retrieved July 28, 2008, from http://homepages.ed.ac.uk: http://homepages.ed.ac.uk/calarks/arks/indexe.html

Clark, D. R. (2008). *The Three Representational Modes (TRiM).* Retrieved September 20, 2008, from www.nwlink.com: http://www.nwlink.com/~Donclark/hrd/learning/theories

CRC. (2007). *Education 4 Employment: Final Report.* Dublin: Central Remedial Clinic.

Duffin, D and Gray, G. (2007). *SIF: Learning styles Theme. End of Year Report.* Available on request from authors: Unpublished.

Duffin, D and McCarthy S. (2006). *The Principal's Manual.* Dublin: City of Dublin VEC.

Duffin, D. (2004). *Language processing in speech or sign: similar or different?* (P. McDonnell, Ed.) Coleford, England: Douglas McLean.

Duffin, D. and Gray, G. (2007). *2008 SIF: Learning Styles Theme: End of Year Report.* Dublin: ITB/NLN.

Duffin, D. (1999). Deafness and Language Acquisition. *Teanga: Irish Association of Applied Linguistics , 18*, 93-105.

Duffin, D. Gordan, D. and Nolan B. (2008). *Publications/INTED Conference Proceedings*. Retrieved from *www.iated.org: www.iated.org/icer12008/index.php?section=21*

Duffin, D. (forthcoming). Lecturers and Lecturing / Learners and Learning: A Collaborative Model of Inclusivity to Maximise Potential in Higher Education. *Unpublished PhD Research (in progress)*. Dublin: ITB.

Duffin, D. (2006). Working Towards An Inclusive Model Of Practice: E4 Project Training In An Institute Of Technology. *ITB Journal* , 131-174.

E4E. (2007). *Education for Employment Project Annual Report 2007.* Dublin: Central Remedial Clinic.

Emmorey, K. (2002). *Language, cognition, and the brain: Insights from sign language research.* Mahwah, N.J.: Lawrence Erlbaum Associates.

Eysenck, M. W and Keane, M. T. (2005). *Cognitive Psychology: A Students Handbook.* New York and Hove: Psychology Press.

Eysenck, M. W and Keane, M. T. (2001) *Cognitive Psychology: A Students Handbook (4th Edition) England: Ps* (5th ed.). New York and Hove: Psychology Press.

Fleming, N.D. (1995). I'm different; not dumb. Modes of presentation (VARK) in the tertiary classroom,. In A. Zelmer (Ed.), *Proceedings of the Annual Conference of the Higher Education and Research Development Society of Australasia. Volume 18*, pp. 308 - 313. Australia: HERDSA.

Gardner, H. (2006). *Multiple Intelligences: New Horizons in Theory and Practice.* New York: Basic Books.

Gordon, D, Craddock, G and Lynch, B. (2004). Using the De Bono 6 HATS Techniques as a Learning Styles Model. . *ELSIN Seminar* . University of Durham: UK.

Harley, T. (2008). *The Psychology of Language: From Data to Theory.* (3rd ed.). New York and Hove: Psychology Press.

HEA. (2005). *Progressing the Action Plan: Funding to Achieve Equity of Access Report.* Dublin: HEA.

Henderson, H. and Wachs, T. (2007). Temperament theory and the study of cognition–emotion interactions across development. *Developmental Review , 27 no. 3*, 396-427.

Heyword, J. (2006). Factors in Adopting of Change; Identity, Plausibility and Power in Promoting Educational Change. . *36th ASEE/IEEE Frontiers in Eduction Conference.*

ITB. (2006). *Making Education Accessible: Priorities for the next five years. Strategic Plan 2006-2011.* Dublin: ITB.

ITB. (2006). *Making Education Accessible: Priorities for the next five years. Strategic Plan 2006-2011.* Retrieved November 9, 2008, from www.itb.ie: *http://www.itb.ie/site/itbinformation/documents/StrategicPlan.pdf*

ITB. (2008). *Mission Statement*. Retrieved September 29, 2008, from ITB: http://www.itb.ie/site/itbinformation/mission.htm

Keirsey, D. (1998). .*Please Understand Me II: Temperament, Character, Intelligence.* Del Mar, CA: Prometheus Nemesis Book Company.

Kelly, E. (2008). *Education for Employment Report on Partner Organisations Experiences.* Dublin (available on request): Central Remedial Clinic.

Kirby A, Davies R, and Bryant A . (2005). Do Teachers know more about specific Learning Difficulties than General Practitioners? *British Journal of Special Education* (32.3), 122-126.

Kirby, A. and Kaplan, B, J . (2003). *Specific Learning Difficulties.* Oxford: Health Press.

Kirby, A. and Smythe, I. (2008). Do-It Tool Manual (Manual for Adult Profiling Tool Licence). Avaialble as part of Training.

Kirby, A. (2007 , November). VEC Principals and Assistant Principals Annual Conference. *Keynote Address.* Ireland: Johnstown House.

Kolb, D. (2005). *The Learning Style Inventory* (Version 3.1 ed.). Boston, MA.: Hay Resources Direct.

Lawlor, G. (2007, November 29). *E4 Project Annual Report 2006.* Retrieved November 19, 2008, from The E4 Project: *www.e4project.ie/content//assests/pdf/e4_2006.pdf*

MBTI Basics. (2008). Retrieved September 20, 2008, from Myers&Briggs Foundation: http://www.myersbriggs.org/my-mbti-personality-type/mbti-basics/

McAnaney, D. Craddock, G. Gordon, D, Duffin. D. O'Leary, C. and Whelan, G. (2007). *Teaching and Learning in Further and Higher Education: A Handbook by the Education for Employment Project.* Dublin: Central Remedial Clinic.

McCarthy, S. (2004). A Collaborative Model of Service Delivery for Individuals with Specific Learning Difficulties. *ITB Journal, 10*, 85-103.

McCarthy, S. (2005). An Investigation into the Level of Awareness and Understanding of Specific Learning Difficulties among Education Professionals from Pre-school Level to Third Level education. Dublin: Unpublished dissertation submitted in partial fulfillment of the of the requirements for the Higher Diploma in Professional Psychology (Educational).

McCarthy, S. and Duffin, D. (2006). Empowering The Teacher, Equipping The Learner. *IATSE Conference Proceedings.* http://www.iatse.ie/Conference.aspx.

McCarthy, S. and Duffin, D. (2007). Specific learning difficulties from the Student's Perspective: The challenge of understanding the experiences of individuals with specific learning difficulties. *IATSE Conference Proceedings* . Dublin: http://www.iatse.ie/Conference.aspx.

MSN Encarta. (2008). *Intelligence.* Retrieved November 8, 2008, from Microsoft® Encarta® Online Encyclopedia: *http://encarta.msn.com/encyclopedia_761570026_6/Intelligence.html*

NCSE. (2006). *Guidelines on the Individual Action Plan Process.* Retrieved November 10, 2008, from National Council for Special Education: *http://www.ncse.ie/publications/final_report/pdf*

Nowak, A. And Vallacher, R. (1997). The Emergence of Dynamical Social Psychology. (Robin, Ed.) *Psychological Inquiry* (8 No. 2), 73-99.

PACTS. (2006). *Partners Collaborating in Training on Specific Learning Difficulties Final Report.* Available on request from *dawn.duffin@nln.ie*: Unpublished report.

REHAB GROUP. (2007). *REHAB Group Annual Report 2007.* Retrieved November 9, 2008, *from www.rehab.ie: http://www.rehab.ie/about/PDFS/RehabAnnualReport2007.pdf*

Smith, A. (1996). *Accelerated learning in the classroom.* Stafford: Network Press.

Wechsler, D. (2003). *Wechsler Adult Intelligence Scale downloaded*. Retrieved September 27, 2008