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NATIONAL COLLEGE OF IRELAND

MSc. Learning Technologies

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Apprentice Education - A time for Change?

Tailoring Blended Learning to Facilitate Delivery of Theoretical Content to Apprentices.

Dissertation

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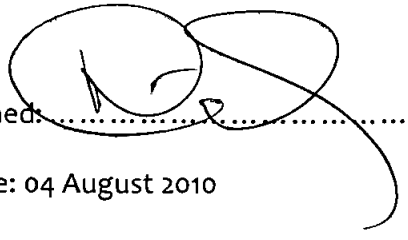
I hereby certify that this material, which I now submit for assessment of the programme of study leading to the award of Master of Science in Learning Technologies is entirely my own work and has not been taken from the work of others save and to the extent that such work has been citied and acknowledged within the text of my work.



Signed: .....

Date: 04 August 2010

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Abstract

The theoretical component of apprentice training is currently delivered to apprentices using teaching methodologies and learning theories that have remained largely unchanged over the last century. The mode chosen by FAS to deliver this theory training is face to face only instruction. This provides little opportunity for "Net Generation" apprentices to utilise online instructional technologies such as those often used by their counterparts in other sectors of education. Recent research finds blended learning is the optimum way for learners to build knowledge and learn. This implies the instructional mode used by FAS is no longer best practice, therefore may require change. This paper examines the merit of employing a blended learning solution when delivering theoretical content to apprentices.

To do this, information was gathered from twenty five phase 6 apprentice bricklayers attending the Institute of Technology Blanchardstown and from twenty two lecturers responsible for delivering construction related apprenticeships in several IOTs. The strategy for collecting information consisted of mixed method research deployed in a sequential fashion. Qualitative and quantitative data gathering techniques included questionnaires, observation, focus group interview and an experimental/control group study. Data gathered was evaluated using Kirkpatrick's four levels of evaluation.

Findings indicate employing a blend of learning modes and theories when delivering theoretical content to apprentices attributed to a 17% improvement in their performance when compared to traditional methods. Further evaluation finds apprentices and their lecturers consider blended learning to be the most effective mode of instruction in terms of facilitating learning.

However, some lecturers and apprentices have relatively low levels of confidence and competency when using instructional technologies and without ongoing training and support for both, a barrier preventing their more widespread use exists.

Notwithstanding this, blended learning provides apprentices with the greatest opportunity to enhance their knowledge and performance while providing the optimum environment and conditions for learning to occur.

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1. Introduction

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1.1 Motivation for the Research

This research paper is a further piece in my continual learning jigsaw. It is a collating and synthesis of experience, information and research, gathered not just over the last two years as a Postgraduate student at National College of Ireland studying Learning Technologies, but over the last twenty years through my involvement with apprenticeship training. During this time my roles have included apprentice, employee, employer and now lecturer. Having experienced apprenticeship training from numerous perspectives, combined with my most recently acquired knowledge of teaching and learning, I believe I am well positioned to offer a focused lens on the optimum methodology used to deliver the theoretical component of apprentice training.

1.2 Scope of the Research

This paper seeks to identify potential benefits which may exist for apprentices and apprenticeship stakeholders, when a blended mode of instruction instead of a face to face only mode is employed while delivering the theory aspect of the apprenticeship training programme. The paper will focus on apprenticeships within the construction industry, more specifically; the trade of Brick and Stone laying will be chosen to represent trades within this sector.

This paper looks at the possibilities of modifying or enhancing aspects of apprentice training with a view to increasing its overall effectiveness for its stakeholders and in particular its apprentices while at the same time meeting their educational needs.

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1.3 Background to the Research

The word "change" and its associated implications can bring about fear, worry, anxiety, or resistance. It may also bring hope, relief, opportunity, flexibility, freedom or improvement. How can a six letter word present such a wide ranging set of emotions within people or organisations, particularly within the context of learning?

Definitions of the word change include... *to make or become different, the action of changing, to move from one system or situation to another, an instance of becoming different.*[1]

In general terms, some level of change is often viewed as necessary if improvements or advancements are to occur. This may apply to individuals, business, education, medicine, economic stability or society in general.

In 1952 the 32nd American president Dwight Eisenhower suggested *"Neither a wise man nor a brave man lies down on the tracks of history to wait for the train of the future to run over him".*[2]

With regard to this paper, the necessity or otherwise for change is explored in relation to the methodology employed by FAS to deliver theoretical content to apprentices during the apprenticeship programme.

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1 Oxford English Dictionary Online

2 Time Magazine: Man of Experience Monday, Nov. 03, 1952

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Apprentice training today within the construction industry is delivered to its students using teaching techniques, theories and methodologies that have fundamentally remained unchanged over a number of centuries. In the main, apprentice training today still revolves around a "Master" imparting their experience, knowledge along with practical and theoretical skills to their apprentice.

The current teaching mode used to deliver the theory component of training to apprentices is predominantly face to face instruction within a classroom setting. This has largely been the sole approach utilised when training apprentices in Ireland since the introduction of the Industrial training Act in 1967. Other than some small personal initiatives undertaken by some educators within this sector, little has changed in how the theory component of the training programme is delivered during this time. This is in spite of much online technological advancement within the education field that has become available (particularly over the last decade) that would enable such an occurrence.

While many education/training providers have embraced and utilised online technology to assist with delivering training material to their students in a more flexible manner, FAS, the state training and employment authority responsible for apprentice training, have been notably slow to encourage or promote the use of online technology to deliver or support the theory component of apprenticeship training.

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This is somewhat of a concern, as if the apprentice training programme of the future fails to utilise either online technology or alternative modalities when delivering theory content, it may be in danger of failing to meet the educational demands, needs or requirements of its students, their employers, associated industries and even the country.

When material is delivered online in addition to classroom based learning (blended) students not only learn more, but interaction and satisfaction of students improves as well (DeLacey & Leonard 2002).

To ensure training of apprentices aligns with current best practice and the mission statements of the key training providers; this paper examines the optimal conditions which facilitate learning while investigating whether the objectives as set out by the theory training providers are being met. In doing so it aims to establish if some level of change may be necessary with regard to how theory content is delivered during apprentice training. Naturally, for any such changes to be successful there is a necessity to identify what educational demands, needs and requirements exist among today's "Net generation" learner. To enable this, literature is examined which profiles learners according to the generation which they belong.

To expand this further, this paper seeks to investigate,

1. What, if any educational benefits exist for apprentices in terms of enhancing their learning experience when a blended learning mode of instruction instead of a face to face only mode is employed while delivering the theory aspect of apprentice training.
2. What, if any differences exist between apprentices (many of whom belong to the "Net generation") and their predecessors (many of whom are now responsible for educating them) in terms of their learning requirements and expectations within the context of training and education.

Further exploration of the subject matter for this paper will be guided by an extensive review of associated literature combined with adopting a qualitative and quantitative approach as the major research methodology.

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1.4 *Overview of the Apprenticeship programme*

In Ireland all apprentices come through a training programme called the Standards Based Apprenticeship (SBA). This programme is the recognised means of training individuals to become qualified crafts people. The apprentice programme is run by Foras Aiseanna Saothair (FAS) - Ireland's National Training and Employment Authority in conjunction with the Department of Education through Institutes of Technology (IOTs) and Employers.

As a result of discussions between employers and unions, and at the request of both, the current "standards based" model of apprenticeship replaced the previous "time served" apprenticeship in 1993 after a comprehensive review of the apprentice training programme was undertaken and implemented by the government of the day.

The SBA programme in Ireland consists of 7 phases lasting approximately four years. During this period apprentices are required to follow a specific course of training over these phases with a number of apprenticeship stakeholders including their employer, FAS, and IOTs.

During each phase, and in order to progress to the next phase, all apprentices must undergo and be successful in a series of practical and theoretical assessments. This ensures they reach the required set standards as set by FAS.

On successful completion of all 7 phases, an apprentice is awarded an Advanced Craft Certificate. This is a Further Education and Training Awards Council (FETAC) award which is positioned at level six within the National Framework of Qualifications (NFQ).

Table 1 Apprenticeship Structure

STRUCTURE OF APPRENTICESHIP PROGRAMME		
PHASE	LOCATION & STAKEHOLDER	DURATION
1	ON THE JOB WITH EMPLOYER	12 WEEKS (MIN)
2	OFF THE JOB WITH FAS	20 – 22 WEEKS
3	ON THE JOB WITH EMPLOYER	26 WEEKS
4	OFF THE JOB WITH IOTs	10 – 11 WEEKS
5	ON THE JOB WITH EMPLOYER	26 WEEKS
6	OFF THE JOB WITH IOTs	10 – 11 WEEKS
7	ON THE JOB WITH EMPLOYER	10 WEEKS (MIN)

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1.4.1 Apprenticeship Stakeholders

There are a number of stakeholders involved in the apprenticeship programme. In terms of delivering the theory element of apprenticeship, FAS and the IOT's play a pivotal role in this process. While the role of employers is also crucial, it tends to focus much more on the practical element of training rather than the theoretical. Because FAS are ultimately responsible for the design of apprentice training and the IOT's largely responsible for delivering the theoretical element of this design, it is of critical importance both of these stakeholders have coherent mission statements that align seamlessly. Furthermore it is paramount the objectives set out within are being met with regard to the delivery of apprentice training.

FAS

Statutory responsibility for the SBA in Ireland lies with FAS. Originally labelled An Comhairle Oiluna, the Industrial Training Authority (AnCO) FAS have had this responsibility for the last 43 years. Financially, in 2008 FAS had a total expenditure of €1,108 million. Expenditure on the apprenticeship programme accounted for approximately 12% of this figure (€130 million) [3]

3 FAS Annual Report 2008

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Today, the overall objective of FAS as outlined in its mission statement is *"To promote a more competitive and inclusive knowledge based economy in collaboration with all stakeholders, by enhancing the skills and capabilities of individuals and enterprises"* [4]

Within the current apprenticeship structure, FAS are directly responsible for delivering Phase 2 of the programme at 20 FAS Training centres located around the country. This phase is delivered by FAS Instructors who themselves are subject matter experts. These Instructors guide apprentices through a 20 – 22 week course in their particular trade, consisting of pre defined, industry agreed, practical and theoretical trade related tasks during this time.

Institutes of Technology

There are 14 Institutes of Technology (IOT) throughout Ireland. These institutes provide a wide spectrum of courses ranging from apprenticeships to higher technical education through to Honours Degrees (level 8 on NFQ) and beyond to Doctoral level (level 10 on NFQ)

4 FAS Statement of Strategy 2006 - 2009

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IOT's provide programmes which reflect current and emerging knowledge and practices. They promote self-management, critical analysis, decision making and entrepreneurship. They foster graduates ready to undertake roles, responsibilities and challenges in business, industry, the professions, public services and society. [5]

IOTs play a key role in apprenticeship at key points throughout a student's apprenticeship. Almost all of the IOTs are responsible for delivering phase 4 & 6 of the apprentice programme.

These phases are carried out over a 10 - 12 week period respectively and follow a pre defined, industry agreed, syllabus set by FAS. This phase consists of trade related practical, theoretical, drafting, scientific & mathematical skills. Tuition in all of these trade related components is provided by the Department of Education through lecturers who are subject matter experts in the specific trade.

Employers

All employers of apprentices are obliged to demonstrate, to the satisfaction of FAS, they "*have the capacity to provide relevant on-the-job training, to comply, as a minimum, with the schedules of training as determined by FAS and to provide relevant on-the-job training and release for the relevant off-the-job training* [6]

[5] Institutes of Technology Ireland

[6] Statutory Instrument No. 168/1997 Labour Services Act 1987 – apprenticeship Rules 1997

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Once an apprentice is taken on by an employer, that employer has an obligation to register the apprentice with FAS within 14 days of the individual starting work.

Within the current apprenticeship structure, employers are responsible for delivering Phase 1, 3, 5 & 7. Phase 1 of the system is regarded as an introduction to apprenticeship, safety, the work environment and the basic fundamental skills of a trade. Phase 3, 5 & 7 consist of practice and development of the skills and knowledge learned in "off the job" phases. During "on the job" phases, all employers of apprentices are obliged to carry out assessment of skill, knowledge and attitudes in performing trade related tasks in order to ensure the required standards are being met.

Trade Unions

Trade unions have the capacity for input on the structure and content of the apprentice Programme via the National Apprenticeship Advisory Committee (NAAC) This body was formed in 1991 and was charged with drafting the Standards Based Apprenticeship. Its original committee was made up of 20 members. *Nine from FAS, five from Employers Organisations, five from Trade Unions and one from the Education sector*[7] This committee are responsible for advising the board of FAS on all matters relating to apprenticeship.

7 Recreating apprenticeship: Lessons from the Irish Standards Based Model p 252 – Field, O Dubhchair

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Apprentices

Anyone who wishes to undertake an apprenticeship in Ireland is generally required to identify an employer, within their chosen trade, who is prepared to employ them. The individual must then endeavour to gain a commitment from the employer to register them with FAS and to guide them through an apprenticeship. There is plenty of anecdotal evidence to suggest there is little in the way of support for would-be apprentices when seeking employment as an apprentice.

There is no maximum age whereby an individual may become an apprentice; however it is not possible to begin an apprenticeship before the age of sixteen. With regard to educational requirements, those considering an apprenticeship must obtain a minimum of grade D in any five subjects in the Department of Education and Science's Junior Certificate* examination or approved equivalent.

** The Junior Certificate examination is held at the end of the junior cycle in post-primary schools and is placed at Level 3 on the Irish NFQ. The junior cycle caters for students in the 13 to 15 year old age bracket. Students normally sit for the examinations at the age of 14 or 15, after 3 years of post-primary education.*[8]

8 State Examinations Commission

Learning outcomes at level 3 relate to a low volume of practical capability and of knowledge of theory. The outcomes relate to the performance of relatively simple work and may be fairly quickly acquired. Outcomes at this level may also confer a minimum employability for low skilled occupations and include functional literacy and numeracy. [9]

Exceptions for those who do not meet minimum entry requirements are often granted. This is normally achieved as a result of the individual concerned successfully completing a FAS approved pre-apprenticeship course in conjunction with undergoing a structured assessment interview approved by FAS.

In the case of mature students (over 25) who do not meet minimum entry requirements, access may be granted if the individual has more than three years experience in a work activity that is relevant to the trade in which they wish to enrol. A structured assessment interview, approved by FAS, is also part of the process for individuals who fall into this category. Unlike all other stakeholders, apprentices have no direct input or representation on the NAAC. Indeed, apprentices have no recognised formal channel to offer feedback or suggestions throughout their apprenticeship.

9 Outline National Framework of Qualifications – Determinations made by the National Qualifications Authority of Ireland. Pg 19

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The exception to this was in April 2007, some fourteen years after the introduction of the Standard Based Apprenticeship, when a research document was published by FAS entitled "*Apprenticeship Follow-Up Survey – The views and experiences of 1999 registrants*" which reflected the opinions and views of apprentices who came through the programme.

In collaborating only once in a formal capacity with the key stakeholder, FAS appear not to be fulfilling a large part of their overall objective outlined within their mission statement.

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2. Literature Review

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2.1 Introduction

Within this chapter a review of relevant literature is carried out. This looks at blended learning as a mode of instruction during training and the associated use of technology during the process. To contextualize the literature the review firstly provides a historical background to apprenticeship. This is followed by defining and assessing common learning theories and a number of modes of learning including face to face, e-learning and blended learning. It proceeds by creating a profile of today's learner and identifies their educational needs within the context of recent educational paradigm shifts. It then assesses the use of online technologies in education to establish possible effects for learners, educators and educational institutions. The final section explores blended leaning as a learning paradigm, focusing on potential benefits to apprenticeship stakeholders which may be achieved when delivering training using this method.

2.2 History of Apprenticeship

The word apprentice derives from the Latin word, *apprendere,* meaning "to learn." Apprenticeship as a form of education has a long history, and can be traced back as far as 1795BC within Babylonian law.

Laws governing Indenture were included in the Code of King Hammurabi of Babylon, within which, laws 188 & 189 outline that any Artisan should treat any child who is within their care to be treated like an adopted son, stating,

If an Artisan take a son for adoption and teach him his handicraft, one may not bring claim for him. If he does not teach him his handicraft that adopted son may return to his Father's house.[10]

The inclusion of such a directive in what are the oldest known written laws clearly signify the importance our ancestors placed upon passing on and sharing the knowledge of a craft. In times gone by apprentices were bound to their employers or "Masters" as they were then called for a period of eight or more years. During this time it was the Masters responsibility to pass on their knowledge to their Apprentice. Learning a craft had always been viewed as a coveted form of education and to become a Master Craftsman a noble profession.

In terms of meeting their obligations, the following extract from a 1640 Indenture in New England outlines the nature of what was expected of apprentices of the time and what they could expect in return. It also demonstrates how apprentices of the time were expected to build knowledge largely by tapping into the knowledge of one source - The Master. This of course is the antithesis of what much of today's literature suggests regarding how knowledge is best built.

"Know all men that I, Thomas Millard, with the consent of Henry Wolcott of Windsor unto whose custody and care at whose charge I was brought over out of England into New England, doe bind myself as an apprentice for eight years to serve William Pynchon

10 Babylonian Law - The Code of Hammurabi; Eleventh Edition of the Encyclopaedia Britannica, 1910-11

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of Springfield, his heirs and assigns in all manner of lawful employment unto the full extent of eight years beginning the 29 day of Sept 1640. And the said William doth condition to find the said Thomas meat, drink & clothing fitting such an apprentice and at the end of this time one new set of apparel and forty shillings in money: subscribed this 28 October 1640" [11]

Obviously, apprentices are no longer bound to their employer or "Master" as Thomas Millard was to William Pynchon. Literally speaking, there is no expectation among today's apprentice that their "Masters" of today (FAS, IOT's and Employers) pass on or share their skills and knowledge while providing them with *meat, drink & clothing along with forty shillings on completion of their training!*

However, this glimpse into the past raises the following question. What are the expectations of learners today in relation to the way in which they learn? This will be explored later in this chapter.

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11 Extract from Washington State Dept of Labour & Industries (apprenticeship History) http://www.lni.wa.gov/TradesLicensing/apprenticeship/About/History/default.asp

2.2.1 Apprenticeship in Changing Times

As the previous historical references outline, apprentices and apprenticeship have in some ways changed considerably over the centuries. However, in many ways has actually remained quite similar - almost rigid some may argue. The training paradigm of apprenticeship i.e. the Master and their apprentice remains. This is in spite of much evidence to suggest the educational needs and demands of learners today have significantly changed to those of their predecessors and the Master - Apprentice approach to training is not the optimum way for learners to learn.

To facilitate the diverse range of demands from students of today *individuals and educational and training systems must become more flexible".*[12]

In order to place flexibility within education and training in a national context, a report undertaken by the Expert Group on Future Skills Needs (EGFSN) on behalf of the Department of Enterprise, Trade and Employment to identify the skills required for Ireland to become a competitive innovation-driven, knowledge-based, participative and inclusive economy by 2020 states,

"The skills requirements of the economy are not static. Generic, transferable skills, such as literacy, numeracy, IT and people skills, will be increasingly valued; employees will be required to demonstrate flexibility and an ability to continually acquire new knowledge and skills.

12 National Employment Action Plan 2002 p. 36

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Employees will be required to have a greater breadth of knowledge, and the demand for higher qualifications will increase. In the absence of policy change, a significant proportion of Ireland's workforce will remain low-skilled in 2020. The result will be an undersupply of skills at the higher levels, and an over-supply of those at the lower levels."[13] Align this with the current economic downturn and with the requirement for today's learner to demonstrate diversity and it would appear if the way training is delivered to apprentices remains unchanged, apprenticeship as a model of education may fall someway short of the Department of Enterprise, Trade and Employments 2020 vision. It may also be a case if existing modes of instruction used to deliver apprenticeship training remain unchanged and out of kilter with other sectors of education, it may fail to future proof its graduates. To use an analogy which aligns to the apprenticeship scenario, Nobel Prize winner in literature, George Bernard Shaw muses... *"The only man I know who behaves sensibly is my tailor; he takes my measurements anew each time he sees me. The rest go on with their old measurements and expect me to fit them"*. Apprenticeship training faces somewhat of a dilemma – it must be in a position to meet increased demands from students in a flexible manner. It must do this in spite of economic and budgetary constraints. In order to go some way towards doing this other sectors within the education field are making more use of online learning technologies and blended learning solutions.

13 Tomorrows Skills, Towards a National Skills Strategy. 5th Report EGFSN 2007 Pg 6&7

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2.3 Defining Learning

To comprehend any form of instruction used in the process of learning, a general definition of learning is required. This in itself is a challenge as there is a multitude to choose from, each one having something to offer. However for the purpose of this paper an effort is made to define learning in the context of how it occurs amongst learners. To do this learning theories from those who are regarded as key players in the field are considered.

The most common learning theories used in education fall into three main categories.

- ✓ Behaviourism
- ✓ Cognitivism
- ✓ Constructivism

2.3.1 Behaviourist Approach to Learning

It was Ivan Pavlov (1849 – 1936) who during the 1890's while undertaking research on the physiology of digestion noted that dogs he was using as part of his research salivated prior to any food being given to them. This only occurred in the dogs when the person serving their food was wearing a lab coat. Pavlov observed the dogs reacting as if food was on the way every time they saw a person in a lab coat.

Pavlov tried to establish a connection between these events. He carried out a further experiment where a bell (neutral stimulus) was rung each time the dogs were given food (unconditioned stimulus). He noted the dogs salivated on sight of the food (unconditioned response). Once again, like the lab coats, through repetition the dogs made an association between the bell ringing and receiving food (conditioning), thus each time the bell rang (conditioned stimulus) the drooling began (conditioned response).

This led Pavlov to believe learning transpires as a result of a change in behaviour that is shaped by the external environment as opposed to the internal thought process. Behaviourists held the view that internal thought processes were *too complex, and were incapable of being measured in a scientific manner*. The mind in this regard was treated as a *"black box" meaning* it is immeasurable and incomprehensible and simply facilities the conversion of stimuli to responses (Friedenberg & Silverman 2006).

Figure 1 - Scheme of the Black Box

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Behaviourists believe that once *contiguity and reinforcement occurs during the procedure, learning can take place* (Merriam & Caffarella 1999, p.251). This view is demonstrated within the comments of J.B Watson (often regarded as the grandfather of behaviourism) when he declared...

"Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist... doctor, lawyer, artist, merchant-chief and, yes even beggar man and thief, regardless of his talents, abilities, vocations, and race of his ancestors (Watson 1930, p.104)."

Behaviourism disregards any notion that there may be an internal component to an individual's learning (Grippin and Peters 1984). In essence behaviourism is the acquisition of a new behaviour as a result of either classical conditioning which Pavlov (1927) describes as a reflex response to a stimulus or operant conditioning which Skinner (1938) describes as reinforcement of behaviour via reward or a punishment. Behaviourist theory focuses on changes which occur in the observable behaviours of the learner. Behaviourists hold the belief that changes in such behaviours demonstrate the act of learning.

This leads to the first definition of learning being offered with behaviourist theory in mind... Learning is a conditioned response to an external stimulus which results in a learner demonstrating an observable change in behaviour.

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2.3.2 Cognitive Approach to Learning

By the 1960's behaviourist approaches to learning were being heavily challenged. A significant paradigm shift in the field of instructional design towards cognitivism was occurring. This was spearheaded by pioneering developmental psychologist Jean Piaget (1896 – 1980). The shift developed as a result of the belief that *people are not "programmed animals" that merely respond to environmental stimuli; they are rational beings that require active participation in order to learn, and whose actions are a consequence of thinking. Changes in behaviour are observed, but only as an indication of what is occurring in the learner's head* (Huitt 2001). This effectively means opening the "black box" - quite a different approach to behaviourism, where there is no need to open the "black box" (Gardner 1985).

There are two main principles of cognitive theory. The first is that the memory processes information in an active, organised fashion. The computer metaphor is often used in this regard, i.e. information comes in, it's processed and leads to a particular outcome. Information is *guided by a control process that determines how and when information will flow through the system* (see Fig. 2 Tomei 2004).

The second principle is that previous knowledge plays a key role in the learning process. Cognitivism does not simply look at behaviour alone to explain learning, but focuses on how the brain works to promote such learning. It takes into account an individual's *internal developmental processes while interacting with the environment* (Clark & Caffarella 1999, p. 5).

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This internal mental process refers to learners categorising and encoding data into their short term and long term memory as outlined by Tomei in Fig. 2

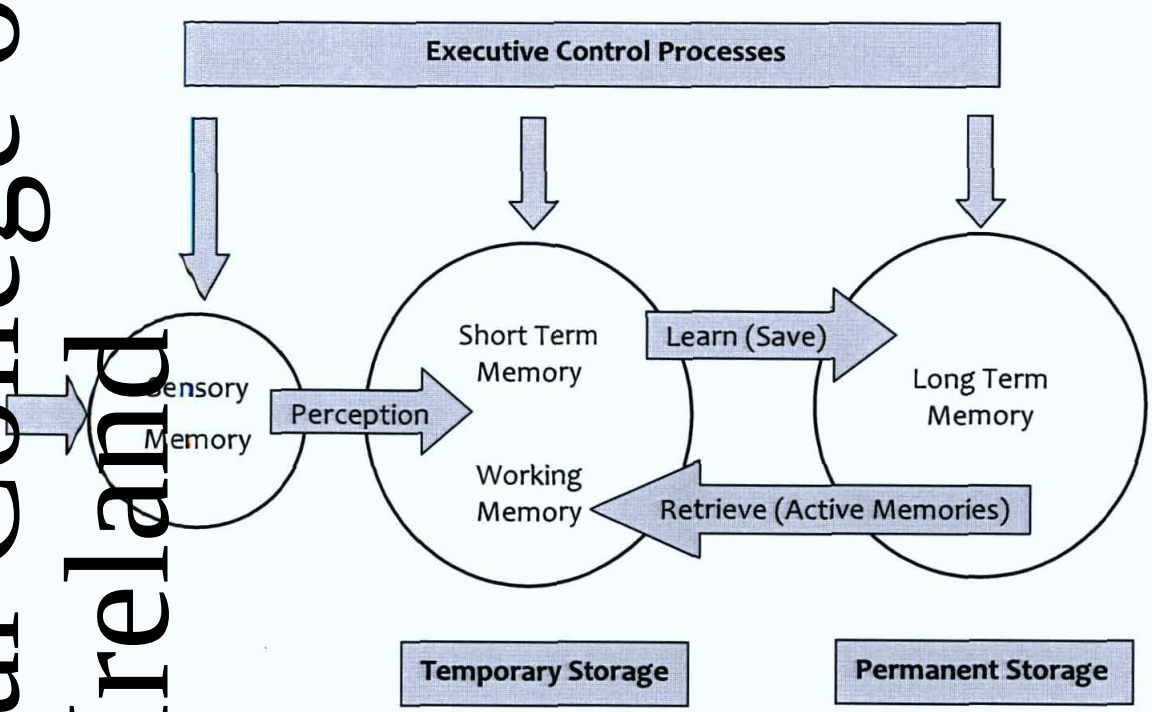

Figure 2 Three-Stage Control Process (Tomei 2004)

This process is iterative. Newly acquired knowledge is shaped to fit with the learner's existing knowledge, and existing knowledge is itself modified to accommodate the new information (Piaget 1985). This duel accommodation of existing and new knowledge is regarded as schema - *organising and orienting attitude that involves active organisation of past experience* (Driscoll 2000).

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Derry (1990) offers a cognitive model which outlines how learners can make connections between old and new knowledge. Within it can be seen how learning is generated. Once information is meaningful to the learner it is *easier to learn and remember* (Cofer 1971 in Good & Brophy 1990). If however the information is relatively meaningless the learner *can link it to prior schema thus making it easier to retain* (Wittrock et el. 1975, in Good and Brophy 1990)

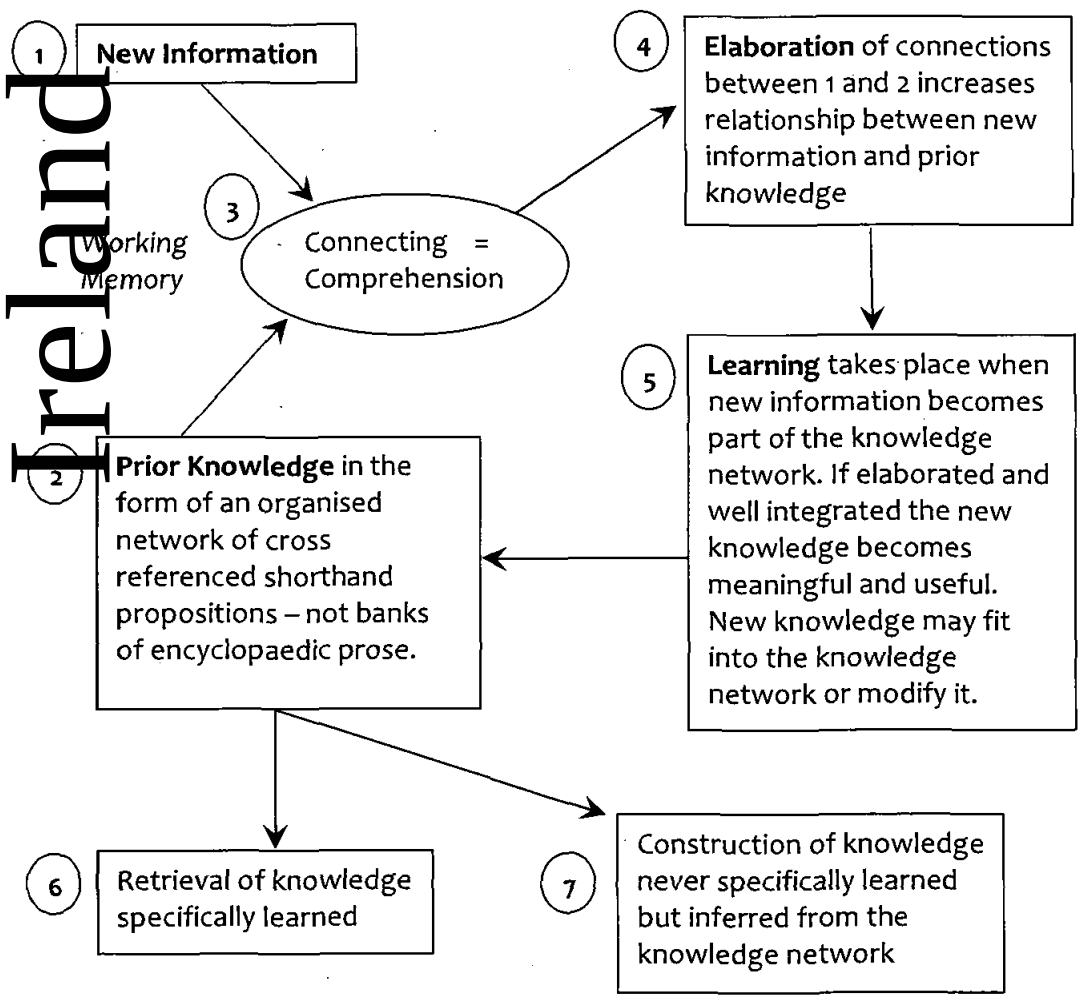

Figure 3. Learning & Remembering Meaningful Information: A Cognitive Model (Derry 1990)

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One of the most widely used cognitive models is presented by Robert Gagne (1916 - 2002). It forms the backbone of much instruction that takes place today, including online instruction. While Gagne was *considered by most to be representative of behaviourism, his theory of learning and events of instruction evolved progressively to approach a more cognitive theory* (Mergel 1998 citing Davidson 1998). [14]

Gagne's *conditions of learning* outline the factors as well as internal and external conditions which influence learning.

As illustrated by Tomei's graphic in Figure 2, Gagne also recognised that the environment can often trigger the learner's senses. Initial information gathered is registered within the short term memory of the learner in a way that is identifiable. This new information is stored within the short term memory for approximately *twenty seconds* where it is encoded before travelling to and entering the learner's long term memory (Gagne & Glaser, 1987). On arrival into the long term memory it becomes meaningful as it relates to existing information or knowledge. When required, this information can now be recalled into the working memory and stimulate the required actions. The executive control processes referred to by Tomei (perception, learn, retrieve) determine how information is stored and retrieved thus symbolising the learners cognitive strategy which has been influenced by the external environment.

14 Source: http://www.usask.ca/education/coursework/802papers/mergel/brenda.htm

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Gagne (1965) developed a process called the *nine events of instruction* to align with his conditions of learning. This model is widely used in education. Personal experience of this model gained as a result of utilising it when teaching is that it is exceptionally useful for both lecturer and student in terms of structuring and assisting the process of learning. A benefit of this model is it influences the learning process in a manner that is both efficient and effective. Table 2 outlines the nine events of instruction and the corresponding cognitive process.

Table 2 Gagne's 9 Events of Instruction

GANGE'S 9 EVENTS OF INSTRUCTION		
	INSTRUCTIONAL EVENT	INTERNAL MENTAL PROCESS
1	Gain Attention of the Learner	Ensures Reception
2	Inform Learner of Objectives	Establishes Expectancy
3	Stimulate Recall of Prior Learning	Enables Retrieval from Long Term Memory
4	Present the Stimulus/Learning Material	Ensures Selective Perception
5	Provide the Learner with Guidance	Enhances Encoding of the Material
6	Elicit a Performance from the Learner	Generates a Response from the Learner
7	Provide Feedback to the Learner	Reinforces the Learning Material
8	Assess the Learners Performance	Enables Retrieval of Material
9	Enhance Retention and Future Retrieval	Assists with Future Retrieval and Transfer

Having established a cognitive perspective, the second definition of learning may now be offered... Learning is a mental process of adjusting existing schema by elaborating on meaningful information through identifying connections between old and new knowledge. Resulting behaviour is as a result of this cognitive process.

2.3.3 Constructivist Approach to Learning

Research carried out by constructivist theorists such as Vygotsky (1896 - 1934) Dewey (1859 - 1952) and Bruner (1915 -) over time began to merge with the perspective of many cognitive theorists.

A number of similarities exist between cognitive and constructive approaches to learning. Constructivism is built around the premise that each learner is an individual who views knowledge as a matter of personal perception and comprehension. The learner then shapes newly acquired knowledge to fit with existing knowledge, and existing knowledge is modified to accommodate new knowledge.

The main difference between the two however is that constructivists believe learners learn by "doing" or actively building knowledge and skills (Bruner 1991) as opposed to simply "observing" alone thus enabling the learner to go beyond the information given (Bruner 1973). An example of this is learning to ride a bike. One tends to learn how to do this not by gaining theoretical knowledge alone but by engaging in the practice of cycling the bike.

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Riding the bike is perfected only after a considerable amount or repetition, self discovery and practice. This process is what constructivists believe enables optimum retention of knowledge. This approach to learning often utilises critiquing, collaboration and practice, in a way that promotes self discovery which in turn enables a learner to obtain information in a fashion that makes it more readily viable in problem solving (Bruner 1961)

A number of assumptions can be made about constructivism (Merrill in Educational Technology 1991). These include...

- ✓ *Knowledge is constructed from experience.*
- ✓ *Learning is a personal interpretation of the world.*
- ✓ *Learning is an active process in which meaning is developed on the basis of experience.*
- ✓ *Conceptual growth comes from the negotiation of meaning, the sharing of multiple perspectives and the changing of our internal representations through collaborative learning.*
- ✓ *Learning should be situated in realistic settings; testing should be integrated with the task and not a separate activity.*

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In terms of utilising a constructivist approach for learning, active practice is the key (Carvin 1994). The process involves a teacher becoming a facilitator, who provides learners with experiences which enable them to imagine, forecast, influence, pose questions, investigate, visualize, and create (Gray 1997).

A third definition of learning may now be offered from the constructivist perspective. Learning is the acquisition, modification and building of knowledge based on personal perception gained not as a result of observation alone, but in conjunction with a process of active practice and self discovery.

In synthesising each of the aforementioned theories, a more generic definition of learning is offered,

Learning is a continual process. It requires active participation from the learner, in order to gather information (using technology where appropriate) which will generate knowledge that is relevant to, and meets personal needs.

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2.3.4 Connectivism - A new Approach to Learning

As outlined the most common learning theories used in education today fall into three main categories. Behaviourism - The mind is a black box, Cognitivism - The mind is like a computer and Constructivism - The mind constructs knowledge.

As with most theories, some regard them highly while others do not. What is difficult to argue against in relation to all of these theories however is they were designed at a time when technology was not what it is today and certainly was not utilised in education as it is today. Connectivism however is a recent learning theory offered by George Siemens that may go some way towards addressing this. It is however no less resistant to change than the underlying trends it proposes to address (Siemens 2006). In providing a rationale for the connectivist theory Siemens explains,

"Our theories of learning and knowing have not kept pace with societal and technological progress. The result is a fundamental mismatch between how we pursue and provide education, and the context and characteristics of knowledge. We are preparing learners for an era that no longer exists, with a skill set that does not enable effective navigation of today's complex, adaptive world. To counter the growing learning and knowledge challenges of educators and business leaders, connectivism is presented as a model of learning and knowing aligned with society's needs today".[15]

15 Connectivism: Learning and Knowledge Today: Global Summit 2006: Technology Connected Futures. Sydney 17 - 19 October 2006 (Siemens 2006)

There appears to be some valid argument for the need to modify existing theories or introduce new frameworks that build upon those traditionally used. Siemens argues theories which acknowledge *the tectonic shifts in society where learning is no longer an internal, individualistic activity and provide insight into learning skills and tasks needed for learners to flourish in a digital era.*[16]

In simple terms connectivism evaluates how technology impacts on learning and how it has become an important way of connecting sources or "nodes" so learners can build "knowledge networks" which facilitate learning.

Siemens argues the volume of knowledge in the world is expanding exponentially and we as humans cannot possibly know it all. Connectivism therefore places more importance on the need to connect to sources of information and form mental connections between each rather than focusing on just the content alone to create knowledge.

Tracey (2008) suggests this redefines what it means to learn and emphasises the need for learners to organise their own personal knowledge networks that recognise meaningful patterns among distributed sets of information. He describes this as "*the new process of learning*" where we don't hold (or need to hold) all knowledge in our heads right now.

16 Siemens, G. (2005) - A Learning Theory for the Digital Age.

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Instead, components of knowledge are hosted elsewhere (such as non human appliances) and through *judicious networking* we assume it as our own. In this way learning occurs by accessing our knowledge networks whenever needed.

Downes (2008) also supports Siemens theory saying *"Knowledge is composed of connections between entities i.e. people, computers, books, society's etc"* [17]

He contends a learner's knowledge of a subject grows and evolves, having access to additional information they require is more important than that they already possess. Siemens captures the essence of connectivism by claiming...

"Our mind is a connection creating structure. The pipe is more important than the content within the pipe" (ibid)

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17 Downes, S. (2008) - A Quick Introduction to Connectivism - http://www.ustream.tv/recorded/688902

The general principles of Connectivism as outlined by Siemens (2006) are listed within Table 3.

Table 3 General principles of Connectivism

	GENERAL PRINCIPLES OF CONNECTIVISM
1	Learning and knowledge require diversity of opinions to present the whole and to permit selection of best approach.
2	Learning is a network formation process of connecting specialised trusted nodes or information sources.
3	Knowledge rests in networks.
4	Knowledge/learning may reside in nonhuman appliances and learning is enabled/ facilitated by technology.
5	Capacity to know more is more critical than what is currently known.
6	Learning and knowing are constant, ongoing processes (not end states or products).
7	Ability to see connections and recognize patterns and make sense between fields, ideas, and concepts is the core skill for individuals today.
8	Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
9	Decision-making is learning - choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

Source: Technology Connected Futures. Sydney 17 - 19 October 2006 (Siemens 2006)

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The concept and principles of connectivism as a model for learning and continually building knowledge (*ongoing process*) appears to reflect what some educators (including myself) often put into practice - perhaps even unknowingly to some on a daily basis.

Assembling connections with the aid of technology (*connecting*) between entities (*diversity of opinion*) such as people, computers, books, peers, etc. (*trusted nodes*) allows a bank of accurate up to date knowledge (*currency*) to be created (*knowledge network*). This in turn accommodates any changes which may occur in the specific professional environment (*shifting reality*).

In terms of learners benefiting from such an approach, they can access, utilise and build upon (*capacity to know more is more critical*) the network(s) identified by the educator who has the professional capacity to synthesise relevant information (*see connections, recognize patterns and make sense between concepts*).

The learner can then amass relevant nodes in order to build personal holistic network which in turn generates knowledge. This enables the learner to make a valued judgement based on *current, relevant, and contextually appropriate information* gathered to form a personal opinion or to formulate answers to their questions. (*Decision-making is learning*).

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To illustrate the connectivist model, the following diagram (see Figure 4) can be used to see how a sample of nodes may be accessed to form a personalised knowledge network.

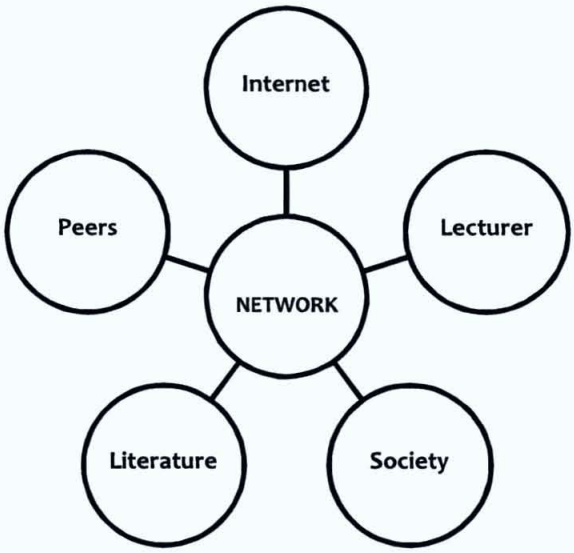

Figure 4 - Connectivism: Network Nodes

To instantiate this theoretical model a weblog (blog) was utilised as an example of how a knowledge network might look within the mind of an apprentice. Apprentices had full access to this as research for this paper was being carried out. This blog is discussed in more detail later.

Interestingly, in its current format the apprenticeship model doesn't seem that far away from the connectivist framework. The one key element however which is absent is the consistent use of technology (or non human appliance) to facilitate connections between sources (nodes).

Without this, conveniently accessing the various nodes (including blogs, forums, instructional videos, peers, employers, educators, FAS and IOT's etc.) to enable the construction of a knowledge network is futile in today's technologically advanced world.

With this final learning theory in mind a further personal definition of learning is offered. Learning is the process of generating knowledge through selecting appropriate sources (nodes) to build information (a knowledge network). This knowledge can lie within the mind of the learner or within non human appliances. Accessing this knowledge conveniently when required facilitates learning.

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2.3.5 Learning in the context of Apprentice Training.

As a result of the variety of opinion seen while assessing the most common learning theories, it is easy to understand why defining learning and how it occurs is often a challenge. In assessing these theories however it becomes evident they are often intermingled with one another during the delivery of apprentice training - forming a type of "blended theory". Such diversity is no bad thing. Diversity has the potential to enrich the educational experience of learners by fostering a community of inquiry through communicating with those who hold opposing views to their own. This tends to cultivate a collaborative environment of mutual respect while encouraging critical thinking. Malcolm Forbes (founder of Forbes Magazine) smartly defines diversity as *"the art of thinking independently together"* [18]

This "thinking independently together" can quite easily be applied to apprentice training. Amalgamating learning theories in order to use the most appropriate theory at the most appropriate stage enables the most appropriate theoretical approach. Apprenticeship lends itself well to this concept. By having both practical and theoretical components the most common tried and tested learning theories can be incorporated where best suited.

For example, during the practical element of apprentice training a behaviourist approach to learning is often taken. A form of operant conditioning takes place.

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18 Source: http://www.brainyquote.com/quotes/quotes/m/malcolmfor151513.html

During practical tuition apprentices receive instruction from a qualified craftsperson on how to carry out a particular practical task. The apprentice then carries out this task exactly as instructed, repeatedly if necessary. The act of learning is demonstrated when the apprentice displays new observable behaviours that are in line with the instructions given to them. The reward for the apprentice comes in the form of acknowledgement from the instructor and successful completion of the task to the standard required.

Cognitive and constructive approaches to learning are also prevalent within apprentice training. There are often occasions during training when apprentices are required to carry out a particular practical task having received theoretical information only from a qualified craftsperson. This obviously requires apprentices to actively participate in order to learn. To do this the apprentice must perform cognitive procedures which will stimulate the required actions in order to successfully carry out the task. In observing the apprentice's cognitive strategy, instructors can see how newly acquired information has been shaped to fit existing knowledge. Constructivist theory is also utilised during this process as the apprentice is "learning by doing". In doing so they are constructing knowledge based on their own personal experience through a process of self discovery.

While the theory of connectivism is relatively new, elements of this theory are actually quite widely utilised during apprentice training, albeit unknowingly to some educators and apprentices.

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During training apprentices continually seek and gather information from FAS, IOT's, their employer, peers, work colleagues, lecturers etc. These individuals and organisations can all be regarded as sources or nodes of information. As previously outlined the key element of connectivism which is missing during apprentice training to enable the meaningful connection of nodes to form a knowledge network is the use of technology. Using appropriate technologies has the potential to assist apprentices in building and accessing their own network at a time and place of their convenience. In doing so a collaborative learning environment is created encompassing all apprenticeship stakeholders as well as the wider community. Building such a network which facilitates learning may provide an opportunity to enhance apprentice training. With this in mind, it may be just as important for apprentices to be exposed to the ways in which information can be accessed and assimilated using technology as it is for them to learn about the information itself. Overall, when the benefits of a diverse theoretical approach, achieved through blending learning theories, are aligned with the benefits often associated with blended learning (discussed later), it would appear an optimum best fit learning solution is generated for all apprenticeship stakeholders.

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2.4 Profiling today's Learner

It is frequently suggested today's learner gathers, evaluates and processes learning material in a very different way to that of their predecessors. This is often attributed to the explosion of online/digital technologies combined with today's learner being part of a generation regularly labelled "the Net Generation", "Millennials", "Generation Y" or "Digital Natives". These are individuals born between 1976 - 2000 who have grown up in a digital age with mobile phones, texting, email, and internet (Tapscott 1998). They get their information instantly online through Web 2.0 tools like Wikis, Blogs, YouTube and Twitter etc. and *are 73% more likely to use the internet for research than a library* (Jones 2002, p.3). As outlined earlier, personal experiences and environment plays a central role in the learning process. In general, individuals ultimately become products of their experiences and environment. Today's millennial learner is a product of a generation surrounded by technology, convenience, speed, and variety, thus shaping their personal experiences and environment. *There is a widespread consensus among educators, marketers and policymakers that digital technologies have given rise to a new generation of students, consumers, and citizens who see the world in a different way. Growing up with the internet, it is argued, has transformed their approach to education, work and politics.* [19]

19 The Economist - The Net generation - Unplugged. Mar 4th 2010

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An overview of the distinguishing characteristics of four generations allows millennials to be benchmarked against their predecessors in terms of description, attributes, likes and dislikes (see Table 3). By identifying generational characteristics it may assist with the research carried out later which will seek to establish whether a mutually beneficial correlation exists between educators preferred modes of providing instruction to millennials compared to the preferred modes amongst millennials for receiving instruction.

Table 1 Overview of the 4 Generations – (Modification of Oblinger & Oblinger 2005 - Educating the Net Generation)

	Silent Generation	Baby Boomers	Generation X	Net Generation
Born	1900 - 1946	1947 - 1964	1965 - 1977	1976 - 2000*
Description	Greatest Generation	Me Generation	Latchkey Generation	Millennials
Attributes	Command & Control Self Sacrifice	Optimistic Workaholic	Independent Sceptical	Hopeful Determined
Likes	Respect Authority Family Community Involvement	Responsibility Work Ethic Can Do Attitude	Freedom Multitasking Work-Life Balance	Public Activism Latest Technology Parents
Dislikes	Waste Technology	Laziness Turning 50	Red Tape Hype	Anything Slow Negativity

* 1976 - 2000 - (Tapscott 1988)

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Millennial learners appear to have a sense of connection, not just to each other, but to the world around them. In addition they seem to possess an internal sense of "specialness". Howe & Strauss in Junco & Mastrodicasa (2006) argue this is brought about from their experience of...

(a) Dominating national dialogue in the US in the early 1980s - political focus was shifted to enhancing the development of children through educational systems. (Strauss & Howe, 2006 in Junco & Mastrodicasa 2006, p.8).

(b) Their large size when compared to other generations making them an important object of attention - whether from their Boomer parents telling them they are special or from companies trying to sell them products (Howe & Strauss, 2003 in Junco & Mastrodicasa 2006, p.8).

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This "specialness" seems to be supported within the findings derived from detailed data collected by Jean Twenge from 1.3 million young Americans. It finds, *"In the 1950s, only 12% of young teens agreed with the statement "I am an important person" whereas by the late 1980s, 80% claimed they were important"* (Twenge 2006 in Reeves 2006. p.8). Learners today appear to have higher expectations when it comes to their learning. Vicky Phillips, Chief Education Analyst at GetEducated.com describes today's traditional college student as being *between the age of 18 and 21 years old and* arrives onto a college campus *demanding things like recorded or online lectures, webinars, virtual workshops and other tools commonly used in online or distance education.* The primary reason for this is convenience. The demands of today's lifestyle and the associated time pressures mean students *need and want to study at a time and place of convenience to them.* [20]

In addition to the need for convenience in general, Howe & Strauss (2000) argue today's learners are *team oriented,* and therefore often demand opportunities that are enabled by technology to communicate, discuss and share information with peers.

20 What is Hybrid or Blended Education? Online Education Facts & Statistics by Vicky Phillips, Chief Education Analyst GetEducated.com published January 14, 2009.

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While the use of technology in education is important to millennials, it alone is not a silver bullet solution according to the students themselves. They comment,

- ✓ *Teachers are vital to the learning process.*
- ✓ *Computers can never replace humans.*
- ✓ *Learning is based on motivation, without teachers, motivation would cease to exist.*
- ✓ *A major part of school is building social skills - computers don't enable this.* [21]

In spite of appreciating educator input millennials also believe science and technology can be used to fix complicated problems (Howe & Strauss 2000). They believe they can make a difference in the world. As a result, they are regarded as different to the previous generations in terms of how they avail of and utilise technology, especially while learning. Dziuban et al (2006, p.3) describe millennials as *the most diverse generation in the history of our nation who can navigate complicated software with such ease that they intimidate members of the previous generations. Most have grown up in a time where the concept of not having access to a computer or the internet is alien to them. They have grown up in a household where its commonplace for both parents to work fulltime, often leaving them to fend for themselves and having to structure or balance their own educational and social activities.*

21 Educating the Net Generation Oblinger & Oblinger (2005)

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Indeed it may be argued these two differences alone, have contributed towards many of today's young students or young adults in the workforce appearing to be more comfortable than previous generations with multitasking and making their own decisions and choices – including how and when they learn. All generations possess the ability to do a number of tasks at once. However, many of those belonging to the Net Generation appear to be much more adept, certainly where technology is concerned at the concept of multitasking. Perhaps this is because they live in a world where multitasking is now a way of life or even expected of them.

It's not uncommon for a millennial to be working on a college or work related project at both, while having dinner in front of the TV and at the same time be downloading music, surfing the internet, having multiple conversations with friends, colleagues or family either face to face or via text message or online instant messaging while dipping in and out of their Blog, Face book or Twitter pages in the process!!

Pensky's (2001) observation appears to be accurate in this instant when he suggests millennials *develop hypertext minds, and leap around* [22]

22 Digital Natives, Digital Immigrants, Part II: Do They Really Think Differently? On the Horizon, vol. 9 <http://www.marcprensky.com/writing/>

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Computer giant IBM also regards today's new employees as *experts at multitasking who want flexible schedules.* These workers insist they will *get it all done, on time, but want to do it their way, fitting work around life.*[23]

So when a picture of today's learner is painted, it begs the question whether the way in which the vast majority of learners receive their education (i.e. on campus, face to face with lecturers, who often utilise learning theories and practices which appear not to fully acknowledge or accommodate the use of technologies which exist today) is appropriate or meets not just their educational needs but their generational needs? This is explored later within the research wherein apprentices and their lecturers are surveyed in relation to preferred modes of instruction i.e. the preferred methods lecturers have when delivering training and the preferred methods apprentices have when receiving training.

23 IBM Learning Solutions - On demand learning: Blended learning for today's evolving workforce. Pg 6 Published, September 2005

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2.4.1 Identifying Learning Needs & Associated Barriers.

One of the world's great minds, Albert Einstein is credited with many wise words. Perhaps the most relevant in relation to education and training are...

"The only thing that interferes with my learning is my education"

It is only really within the last fifteen or twenty years that "traditional" methods used to deliver education have begun to slowly change from what they were a hundred years ago. Some would argue that this in itself is proof that traditional delivery or the "sage on the stage" or "Master & Apprentice" approach to education is obsolete and evidence of a flawed education system which has not moved with the generational needs. Roger Schank believes one of the reasons the education system has remained largely unchanged over such a long period of time is because *our school system hates innovation.* [24]

Innovation appears to have been forced on some sectors of the educational system through students having access to technologies that are convenient, accessible and low in cost - yet embracing change appears to be a slow or even nonexistent process for others sectors of education - particularly apprenticeship.

The danger of not implementing innovative approaches in training and education has the potential to be hugely damaging going into the very near future.

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24 Roger Schank - http://www.rogerschank.com/innovation.html

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Ireland's fulltime student numbers are projected to grow from *155,000 at present to almost 190,000 within five years and to 270,000 by 2030 - a 75% rise* and according to Higher Education Authority (HEA) chief executive Tom Boland *"this requires a shift to more flexible teaching and learning techniques where students can study anytime and anywhere"* [25] On top of this, author of *Growing up Digital - The Rise of the Net Generation*, Don Tapscott holds the view that *lecturers have to abandon the traditional lecture, and start listening and conversing with the students - shifting from a broadcast style and adopting an interactive one. Students should be encouraged to discover for themselves, and learn a process of discovery and critical thinking instead of just memorising the professor's store of information. They need to encourage students to collaborate among themselves and with others outside the university. Finally, they need to tailor the style of education to their students individual learning styles.* [26]

Howe & Strauss (2000) content millennials lean towards collaborative activity, are intrigued by new technologies and are focused on performance and grades. In order to tailor learning for millennials, Oblinger & Oblinger (2005, p.3.3 -3.4) suggest educators must become a link between students and technology, be trained, not only in the skills of how to use technology itself, but on how to use these skills with their students.

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25 Irish Independent: Colleges told to Merge or Die - John Walshe 29th April 2010

26 Tapscott D. (2009) The Impending Demise of the University: Edge Foundation 4/06/2009

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When today's third level students, most of who belong to the Net generation, enter educational institutions, they are often met by faculty who belong to Generation X (1965 - 77), The Boomer Generation (1947 - 64), or possibly even The Silent Generation (1900 - 46). The paradox here is that many (although most certainly not all) Net generation students demonstrate an ability for using technology and online educational resources that is superior to some faculty members.

Glenn (1997) suggests a major barrier in getting teachers to use technology is that every faculty member has differing levels of technology competence.

Prensky (2001) regards this digital divide between what he calls *digital natives* (today's learners who were born into a digital age) and *digital immigrants* (those not born into the digital age but have adopted) as the single biggest problem facing education today and suggests that it *lies at the root of a great many of today's educational problems*. While Prensky's analysis and description of digital natives and digital immigrants is both insightful and useful, his hypothesis appears to be somewhat of a generalisation. To imply millennials possess higher levels of technological ability than their predecessors, simply as a result of growing up in a digital age using computers, mobile phones, iPods and internet etc, would seem presumptuous. Perhaps the assertion of Dziuban et al outlined earlier that millennials *can navigate complicated software with such ease that they intimidate members of the previous generations* is less of a generalisation, could be applied to technology in general, and therefore maybe more accurate and appropriate.

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From both the educator and learners perspective, there is little doubt the use of technology in some capacity is a wonderful tool to have in the educational tool bag. Using technology inside and outside of the classroom provides an assortment of benefits such as convenience, connectivity and control in the learning process (Shih & Allen 2006). Interestingly, the use of technology itself in courses is not always seen by learners as a benefit but rather as a way of improving learning during a course. Kvavik & Caruso (2005) suggest regardless of age or gender for learners who consider using IT during training as a technique for enhancing learning opportunity, the most important factor is the skill of the instructor. The instructor's skill in this regard impacts significantly on the student's perception on the effects of IT use in courses.

Again there seems to be somewhat of a conflict here in the way today's learner and today's educators view technology used to support education or training. Many of today's Net Generation learners appear to view technology which supports their learning as *something* which can be configured or adapted to meet their needs. Whereas some educators appear to hold the opinion that utilising such technologies requires significant change on their part, including adaptation of methods used quite successfully up to now. This can sometimes lead to resistance. Several explanations are often given as to why educators resist integrating technology into courses. They include a lack of resources, dated or damaged technology and lack of knowledge as a result of little or no training (Dexter 1999 in Dowling & Harland 2001).

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The most common grievance however amongst educators is the time it takes to integrate instructional technologies into their course (Schrum 1999 in Dowling & Harland 2001). Dowling & Harland (2001) observe that some educators *are uncomfortable with the idea that technology is the tool being used to change their teaching methodology.* They say *the reason for these "excuses" is an underlying scepticism that even if a teacher changes their philosophy on teaching, technology will not be able to revolutionise student learning enough to make it worth the effort the change would require.* They conclude "*technology should not be looked upon for what it is but for what it can do*". This is an especially powerful statement, particularly the "*what it can do*" component. Technology itself according to learners assists learning but if the educator *is skilled in using and integrating technology into the course, it makes a significant difference in the learner's perception of the impact of technology.* It would therefore seem if the educator commits to and is adequately supported with incorporating technology into courses, a win - win situation could occur for educator and learner. There is plenty of anecdotal evidence to suggest educators are willing to use and integrate appropriate technologies into courses to support learning. However a lack of training coupled with little time to explore and experiment with these technologies often hampers their capabilities and knowledge thus greatly reducing their chances in doing so. (Norman 2000 in Dowling & Harland 2001) suggests one of the biggest barriers to effective use of technology in education is *the lack of professional development.*

Simply providing or making available technological resources on their own in educational institutes is not enough. Sufficient professional development opportunities for staff to be trained on them are an essential accompaniment.

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2.4.2 Implications of Change for Educational Institutions

Prensky (2001, p.1) argues today's *students have changed radically. They are no longer the people our education system was designed to teach.*

As a result of their experiences these Digital Natives crave interactivity - an immediate response to their each and every action. Traditional schooling provides very little of this compared to the rest of their world. It is for this reason he claims while in schools... *it generally is not that Digital Natives can't pay attention, it's that they choose not to.*

Those who attended second level school or college in the late 80's or before can testify that the educational model generally used was to create a bank of knowledge within the brain of the learner in preparation for entering the world of work. This knowledge could then be tapped into where and when required (store and recall) generally in a career that would largely remain unchanged over a lifetime.

Tapscott (2009) refers to this, as *education designed for an age when industry needed workers who did what they were told.* He continues by saying *because almost every fact is instantly available online, the old model of teaching is nonsensical.*

This age is long gone and the concept of a job or career for life has disappeared with it. This has been replaced with the need for individuals to engage in learning for life. However, many education and training systems, including apprenticeship, *do not satisfy the needs of a lifelong learning approach to training and development.*

To facilitate the diverse range of demands, from both companies and individual employees, educational and training systems must become more relevant, flexible and adaptable, and continually adjust their approach to learning.[27]

Microsoft chairman Bill Gates goes further in his assessment of the way in which education and training is delivered to today's learner commenting *"Our high schools are obsolete. By obsolete, I don't just mean that they are broken, flawed and underfunded - although I can't argue with any of those descriptions. What I mean is that they were designed 50 years ago to meet the needs of another age. Today, even when they work exactly as designed, our high schools cannot teach our kids what they need to know. Until we design high schools to meet the needs of the 21st century, we will keep limiting - even ruining - the lives of millions of Americans every year. Frankly, I am terrified for our workforce of tomorrow".* (Gates, 01 March 2005, Los Angeles Times)

27 Ireland's National Employment Action Plan, 2002

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Much of the literature suggests it's no longer appropriate or required for the education system to churn out learners pumped with information in the hope or assumption they will work on assembly lines, manufacturing plants or factories for the rest of their days. People move with the times and educational institutes and the methodologies they use to deliver training needs to do the same. Today the world of work is agile and fluid and it requires educational systems, modes of delivery, graduates and employees to match. Many have commented in this regard.

Today, it is not what you know that really counts, it is how you navigate in the digital world, and what you do with the information you discover. [28]

Convenient, instant access to information and technology is gradually shifting the importance of "store and recall" to one which involves *bringing together information (know what), technique (know how) and understanding (know why).*[29]

Writer Alvin Toffler captures the need for continual reinvention by predicting *the illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.*[30]

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28 Don Tapscott, Think tank: Bring on a teaching revolution: Education should open pupils' minds, not impart facts. Sunday Times January 11, 2009

29 National Employment Action Plan 2002 p33

30 Learning for the 21st Century - http://www.p21.org/downloads/P21_Report.pdf

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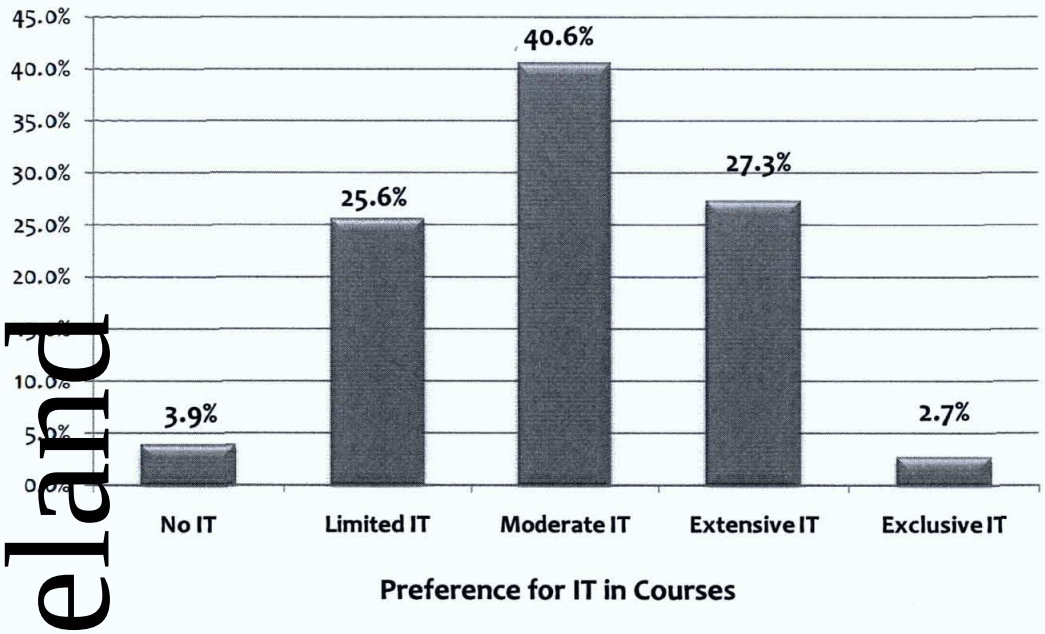
As outlined earlier, acquiring knowledge requires participation and practice on behalf of a learner. Today's learners recognise the benefits of utilising digital resources and technology to aid the acquisition of such knowledge. Using technology suits the Net Generation profile - it facilitates experiential learning enjoyed by most millennials thus enabling *assembly of information, tools and frameworks from a variety of sources* (Oblinger & Oblinger 2005, p.5). However, in terms of educational institutes and their lecturers using such technology, learners expect them to use it moderately and without difficulty. They also require a balanced approach when using technology to support learning to enable the convenience they demand. An EDUCASE survey of 18,039 students* finds that the most valuable benefit of using technology during courses is...

- ✓ *Convenience (50.3%).*
- ✓ *Connection/Communication (19.7%).*
- ✓ *Management of Course Activities (13.5%).*
- ✓ *Learning (12.7%).*
- ✓ *Only 2.8% of students regard technology as having no benefit with regard to supporting their learning, however it should be noted that convenience connectedness, and communication can support learning.*

* Students in this sample attended 30 Doctoral Institutes, 12 BA Institutes, 2AA Institutes. Two thirds are female, 39% are between 18 and 19 years old, 48% between 20 and 24, and 13% over 25. Only 1.1% were over 50. 92% are full time students.

In terms of balance when using technology while learning, EDUCASE *finds learners prefer IT in their courses but typically to a moderate degree.* [31]

Table 5 Student Preference for using IT in Courses Source: Kvavik & Caruso EDUCASE 2005.



The balance demanded by today's learners extends beyond how technology is used to support their learning. Balance is also a career aspiration of the net generation. In 2008 Universum Communications conducted a survey of 195 Colleges and Universities in the USA. The survey involved 43,313 college graduates belonging to the Net generation on the cusp of graduating. Amongst the findings within this comprehensive survey was the number one (64%) career goal of today's net generation college graduates is to balance their personal and professional life.

31 Kvavik & Caruso (2005) EDUCASE: Student & Information Technology 2005 Convenience Connection, Control & Learning

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Balance in teaching methodologies combined with an appreciation for generational differences and appropriate use of learning theories appear to be essential if educational institutes are to keep pace with while facilitating student needs.

In terms of appreciating these differences comparison can quite easily be made with the relationship between educational institutes and their students and employers and their employees. President of Generational Imperative Chuck Underwood, who counsels companies on managing age differences in the U.S, says *"It's imperative that companies understand these generational differences so they can be bridged. Businesses that get it will flourish -- those that don't will flounder."* [32]

This is particularly sobering when aligned to the prediction that *50% of all high school classes in the U.S will be delivered online by 2019 (Christenson et al 2008)*

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32 The Dallas Morning News - As more Gen Xers supervise older workers, conflict is inevitable. Robertson & Moos. 19th July 2005

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2.5 Blended Learning in Education

As outlined previously, educational institutes face somewhat of a dilemma. They must be in a position to meet ever increasing demands from students including providing convenience with the aid of technology and be able to do this in spite of budgetary and staffing constraints. In order to go some way towards meeting these demands in challenging times many educational institutions are making more use of blended learning solutions.

Blended learning is about *finding a harmonious balance between online access to knowledge and face-to-face human interaction* (Osguthorpe & Graham 2003, p.229). The potential benefit of this type of approach to training and learning for the modern apprentice includes proven and effective pedagogy, greater accessibility and improved interaction while learning. Courses delivered using a blended approach *tend to foster a community of inquiry, critical thinking and collaborative learning among learners as a result of the learner being in control of their learning* (Garrison & Kanuka 2004, p.98).

A blended learning approach to apprentice training which utilises instructional technologies may act as one of the pipes George Siemens described earlier

"The pipe is more important than the content within the pipe"

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2.5.1 What is Blended Learning?

Blended learning is an approach to training which combines or "blends" online and face-to-face learning. This combination is sometimes called hybrid learning. Unlike traditional face to face learning where the teacher is often the central figure of information, blended learning exposes learners to various sources and modes of delivery through the use of technology. It places the learner at the centre of the educational experience with access to a variety of resources (see Fig. 5).

Its objective is to provide the most efficient and effective instruction experience by combining e-learning in its various formats, with more traditional formats such as class room based training. *Blended learning is the effective combination of different modes of delivery, models of teaching and styles of learning* (Procter 2003, p.1).

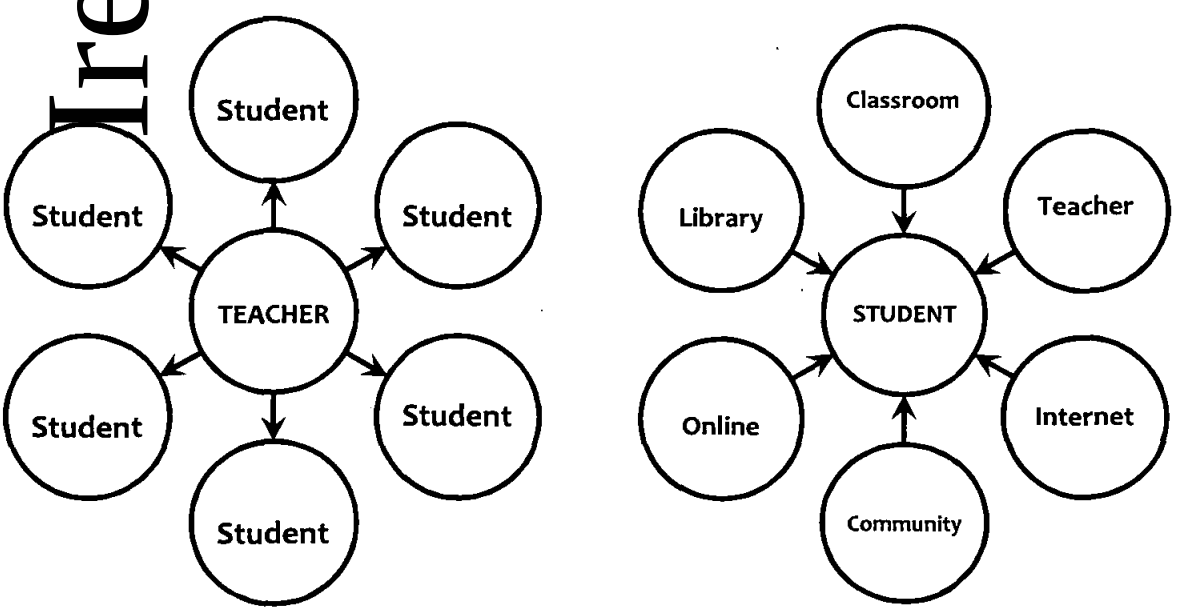

Figure 5 Visual comparison between Face to Face (left) & Blended learning (right)

Much of the research appears to indicate that utilising a blended approach to education is mutually beneficial to both the educational institution and its learners. Corcoran (2009, p.4) suggests blended learning has *the capability to draw the maximum benefit from technology while retaining the best features of face-to-face teaching thus making it ideal for supporting engaging learning activities.*

While the importance and value of face to face tuition during apprenticeship training cannot be overstated, it alone is not a perfect fit in terms of meeting the needs of many apprentices. E-learning by itself in this instance is not a viable option due to the nature of apprentice training. Apprentices by their very nature are hands-on and because blended learning *leverages e-learning where it's most appropriate, without forcing e-learning into places it does not fit, it would appear to be an appropriate alternative to face to face tuition only* (Bersin 2003, p.1)

2.5.2 Foundations of Blended Learning

Early e-learning initiatives while heralded by many were frowned upon by others. Those opposed to e-learning were sometimes considered traditionalists in the education sector who held the belief that a teacher or instructor is essential and central in the educational process. There may be some credence given to this argument, especially when dropout rates for those undertaking on line courses are compared with those undertaking classroom based courses.

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Parker (1999) claims with the expansion of distance learning the problem of exceedingly high attrition rates has become evident and states e-learning student dropout rates in some institutions exceeds 40%. Tyler-Smith (2006, p.1) cites numerous others (Flood 2002, Forrester 2000, in Dagger & Wade, 2004) suggesting dropout rates from e-learning courses in the US to be as high as 70% - 80%.

In traditional classroom based learning, the overall dropout rate in the US higher education system is reported at between 40% and 45%. This has been fairly consistent for most of the last century (Tinto 1982 in Berge & Huang 2004).

Phillips (2000) suggests one of the reasons for high levels of dropouts in the early days of elearning was because learners often lose interest when nobody on the other side (such as an education provider) cares what the learner is doing.

On top of e-learning dropout rates there is some anecdotal evidence to suggest that those students who did complete early on-line degrees may not have been held in the same high esteem by employers as their counterparts who completed the same degree in the traditional classroom manner.

A poll on the Geteducated.com shows there is still a mixed perception of qualifications which were obtained through on-line education only.

When asked if employers accept accredited on-line degrees, *44% of respondents answered yes – the distinction no longer matters, 36% said sometimes – some employers don't trust them, 24% said almost always – some do, some don't and 4% said no – most bosses view them negatively.*[33]

Ardana (2007) interestingly observes with the emergence of the Net generation who have been weaned on computers, it would not be surprising if within another generation, there is a complete swing whereby the on-line degree becomes the one which is respected and coveted.

As e-learning has developed over the years the experience gained from pioneering e-learners demonstrates *a single mode of instructional delivery may not provide sufficient choices, engagement, social contact, relevance, and context needed to facilitate successful learning and performance* (Singh 2003, p.51).

In recent years however improvements in e-learning technologies have gone someway to breaking down initial resistance. Procter (2003, p.2) suggests *the most important contribution that has been made by e-learning is not the technology per se but the fact that it has forced open a debate into teaching and learning.*

33 Source: http://www.geteducated.com/component/poll/4-employer-acceptance

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2.5.3 Why use Blended Learning?

Blended learning is viewed by many leading educational providers as the optimum and preferred way to deliver training material to learners. Learners tend to share this viewpoint. The rationale for educational providers and their learners holding this perspective can generally be categorised into five areas,

- ✓ Improved organisational and individual performance.
- ✓ Increased access to knowledge.
- ✓ Convenience and flexibility for learners.
- ✓ Use of Instructional Technologies.
- ✓ Cost vs. benefit of blended learning.

These five areas are explored over the following pages with the objective of seeking literature to support these views.

Improved organisational and individual performance

Going into the future, the Irish government's skills roadmap for 2020 outlines 500,000 individuals within the Irish workforce will need to be up skilled, and to progress *by at least one level on the National Framework of Qualifications (NFQ) over and above their current level of education and training.*[34]

34 Chapter 4 Supply & Demand for skills to 2020, Tomorrows Skills: Towards a National Skills Strategy.

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Align this with the ever increasing personal and professional demands that are placed on people in today's society and it's easy to see why FAS must ensure apprentice training is delivered to its apprentices in a convenient and flexible fashion. Learning must be made available to learners at a time and place that meets their needs. More increasingly blended learning is seen as a way in which this can be done while addressing the following three key issues (Graham 2005)

- ✓ *Improved Pedagogy.*
- ✓ *Increased Access and Flexibility.*
- ✓ Increased Cost Effectiveness.

Bersin (2003, p.1) finds after nearly two years of research on blended learning, and detailed interviews with more than thirty companies, *blended learning is replacing e-learning as the next big thing and blended learning programs are perhaps the highest impact, lowest cost way to drive major corporate initiatives.* In addition to this a study undertaken by the e-learning guild established the top three reasons for using blended learning were...

- ✓ *It's more effective than classroom learning alone (76%).*
- ✓ *It has higher learner value and impact, the effectiveness is greater than for non blended approaches (73.6%).*
- ✓ *Learners like it (68.6%).* [35]

35 E- Learning Guild (2003) The Blended Learning Best Practices Survey

The e-learning guild findings are highly valuable and important as they fulfil the criteria as set out by Kirkpatrick (1998) for measuring the effectiveness of training programs from a learner's perspective. Kirkpatrick suggests for any training to be effective for the learner it must be first of all measured and subsequently have a positive outcome in all of the following areas.

- ✓ *Reaction* – Did the student like the training?
- ✓ *Learning* – Did the student learn from the training?
- ✓ *Behaviour* – Did the student use the training?
- ✓ *Result* – Did the training have an impact on the bottom line for the student and/or the organisation?

Further support for blended learning over e-learning alone comes from Thomson Learning. They set out to determine if there was any significant performance difference on real world tasks among three groups of learners undertaking a Microsoft Excel course. The first group used a blended learning solution, the second an e-learning solution alone, and the third group received no training at all.

The findings of this study included...

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- ✓ The group using the blended learning solution performed tasks 30% more accurately than the group using the e-learning solution alone.
- ✓ The group using the blended solution performed tasks 159% more accurately than the group who received no training.
- ✓ The group using the e-learning solution alone performed tasks 99% more accurately than the group who received no training.
- ✓ The group using the blended solution performed tasks 41% faster than the group using the e-learning solution alone.[36]

Blended learning is also found to be more effective when compared to classroom based learning alone. Research carried out by Dean et al (2001) at the University of Tennessee involving a blended learning programme offered to mid career doctors concur with findings previously highlighted. In collating Dean's findings, Singh (2003, p.59) comments *blended learning programs can be completed in approximately half the time, at less than half the cost, using a rich mix of live e-learning, self paced instruction, and physical classroom delivery and was able to demonstrate an overall 10% better learning outcome than the traditional classroom learning format.*

36 Thomson (2002) - Job impact Study - The next generation of Corporate learning Pg 8-9

The reason for this was *the richness of the blended experience that included multiple forms of physical and virtual live e-learning combined with the ability of the students to test their learning in the work context immediately and to collaborate with peers in adaptation to their unique environments.*

Considering the findings, it appears the face to face methodology employed by FAS to deliver the theoretical component of apprentice training falls short of best practice. A critical facet to fulfilling its own mission statement while achieving optimum organisational and individual performance is that FAS ensure they provide training to apprentices in a manner which *enhances their skills and capabilities.* Blended learning appears to provide a greater opportunity to achieve this over face to face only learning.

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Increased access to knowledge

Francis Bacon is credited with coining the phrase *"knowledge is power"*. While it's generally accepted knowledge is powerful, perhaps today a more appropriate quote for the fast paced world we live in might be, *"Access to knowledge is power"*. Michelle Selinger, Executive Education Advisor at Cisco Systems states *"we live in a knowledge society in which connectivity allows us to access all kind of information at unprecedented speed and in multiple formats"* [37]

Today convenient access to information and knowledge is vital. Wetmore (2007) claims half of what we know today was unknown ten years ago, and the quantity of knowledge in the world has doubled in the last ten years, and is doubling every eighteen months. Given this information, it would seem urgent action is required by FAS to facilitate such rapid change.

Kapp & Mc Keague (2002, p.2) observes *half of what we know today will be obsolete in eighteen months and half of what we need to know in eighteen months we don't know today*. Without increasing a learner's access to ever changing information it's difficult to see how this requirement to continually update ones knowledge can be accommodated. Once again based on the findings to date however it would appear blended learning can play a key significant role in FAS enabling this.

37 The Education Forum: http://educationforum.ipbhost.com/index.php?showtopic=3286

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Convenience and flexibility for learners

There's a growing body of evidence that suggests blended learning accommodates convenient access to information and diversification amongst learners thus assisting in meeting the knowledge needs of learners in a more effective manner than classroom based or e-learning alone. Research carried out by the Chartered Institute of Personnel Development (CIPD), on a sample of 729 employers/organisations found *almost all (95%) feel that e-learning is more effective when combined with other forms of learning.* [38]

Through blending different learning modes a happy medium appears to exist. By employing a blend of face to face and on-line instruction during training a balance appears to occur which meets the needs of people in today's society. Judith Osterman, Director of distance education at the University of Nevada (where distance learning enrolments have jumped from a few hundred in 1998 to over 24,000 in 2007) believes the explosion in online education is down to the convenience factor. She suggests *many students work and or have family responsibilities. With distance education, there are no issues with family, travel or parking. The shift has been towards options ... In reality, distance education is all about people's needs.* [39]

38 CIPD (2008) Learning & Development Annual Survey Report

39 GetEducated.com - Web Article Published 14 Jan 2009 http://www.geteducated.com/distance-education-primer/7-distance-education-primer/83-what-is-hybrid-or-blended-education

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Similarly blended learning has the capacity to provide apprentices with flexibility and convenience in terms of access, location, time, mode and technology use, thus meeting their own needs and the organisational requirements of FAS.

Use of Instructional Technologies

Wilen-Daugenti (2007, p.2) suggests that educational institutions need to be conscious of three trends if they are to understand how the next generation of internet technologies will impact on learners and schools. These are...

- ✓ *Today's college-aged students are rapid adopters of new technologies, devices, and applications.*
- ✓ *Online technologies offer an opportunity for individuals to contribute and collaborate regardless of location.*
- ✓ *Learners are taking more responsibility for their own learning and will continue to do so as quality content continues to become available on the web.*[40]

40 Wilen-Daugenti (2007, p.2) 21st Century Learning Environment: Next-generation Strategies for Higher Education.

Within the last five to ten years an astonishingly large number of online technologies have been developed - Blogs, Wikis, Virtual Learning Environments, Social Networking Sites, Podcasting, YouTube and Mobile Learning to name just a few. These tools are so widely used in today's world by such a variety of people they have allowed education to be shared with the masses and not just those privileged enough to attend schools or colleges. Learning assisted by online technology is here to stay - there appears to be no choice in the matter.

There is plenty of data which suggests use of technology in education and society in general is so enormous it must be quickly embraced by the educational sector in a much greater way than is currently the case if they are to keep pace with learners of tomorrow.

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Wilen-Daugenti (ibid) cites a number of sources which demonstrates the importance of embracing technology in education, for example,

- ✓ *Adults, between the ages of 18 and 26, are often first to adopt new technologies and use them in their daily lives, whether at home, in social activities, or at school* [41]
- ✓ *A 2007 survey by the National Retail Federation, found students and their families will spend about $12.8 billion on electronics, up about 22% from a year ago, fuelled by sales of laptops, digital cameras, and cell phones such as Apple's iPhone.* [42]
- ✓ *A recent Pew study noted three out of four young adults download and view internet videos daily* [43]
- ✓ *We clear the digital decade is accelerating. In a 2006 report, Forrester Research predicted use of consumer technologies, including laptops, HDTV, and camera phones, will double by 2011* [44]
- ✓ *The same report projected broadband use and home networks will triple by 2011.* [45]

41 North American Consumer Technology Adoption Study, Forrester Research, 2006

42 U.S. National Retail Federation, August 2007

43 Online Video, Pew Internet & American Life Project, Mary Madden, July 2007

44 5-year U.S. Forecast of 14 Consumer Technologies, Forrester Research, September 2006

45 5-year U.S. Forecast of 14 Consumer Technologies, Forrester Research, September 2006

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✓ *Web 2.0 and social networking technologies are experiencing rapid growth.*

For example:

- *MySpace adds 5 million members a month.*[46]
- *Two new blogs are created every second.*[47]
- *The English Wikipedia edition contains more than 2 million user-generated articles.*[48]
- *YouTube hosts over 6 million videos, growing at about 20 percent every month.*[49]
- *Flickr contains 3.5 million photos.* [50]

Interestingly since the 2007 CISCO publication (as if to prove how quickly online technology is moving) Twitter, the social networking site, has become an online phenomenon with people utilising the site to share information and collaborate. Figures show it to be growing at a rate of 3712% year on year. [51]

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46 MySpace, 2007

47 Technorati, March 2007, http://www.sifry.com/alerts/archives/000493.html

48 Wikipedia, 2007, http://en.wikipedia.org/wiki/Wikipedia

49 YouTube, 2007, http://www.gadgetizer.com/2006/08/31/youtube-statistics-phenomenal

50 Stewart Butterfield on Flickr, O'Reilly Network, February 2005

51 Neilsen Net Ratings
http://en- us.nielsen.com/main/news/news_releases/2009/june/time_on_facebook

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The growth of social networking sites in particular are an interesting development for the education sector. They have become so popular among today's net generation learner they appear to be further exposing the digital divide between themselves and previous generations referred to earlier.

The Pew Research Centre finds*35% of American adult internet users have a profile on an online social network site, four times as many as four years ago. This however is still much lower than the 65% of online American teens who use social networks.*

Young people are far more likely than older adults to use social networks as can be seen from the figures below.

- ✓ *75% of online adults 18-24 have a profile on a social network site.*
- ✓ *57% of online adults 25-34 have a profile on a social network.*
- ✓ *30% of online adults 35-44 have one.*
- ✓ *19% of online 45 to 54 year olds have a profile.*
- ✓ *10% of online 55 to 64 year olds have a profile.*
- ✓ *7% of online adults 65 and older have a profile.* [52]

52 Pew Research Centre: http://www.pewinternet.org/Reports/2009/Adults-and-Social-Network-Websites.aspx?r=1

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The full data gathered in Wilen-Daugenti's report makes for such incredible reading it would appear if educational organisations such as FAS fail to fully embrace instructional technologies during training (including apprenticeship) they may be failing to meet the educational demands of their learners (including apprentices).

The same may be said for training departments within educational organisations who do not adapt. Not only will they not be giving their employees what they want, but the lack of associated savings may even be detrimental to their survival.

Cost versus benefit of blended learning

Viewing blended learning from an organisational and costing point of view blended learning scores highly once again. Bersin (2003, p.9-10) indicates that most companies, (who have between 250 – 25,000 learners within their organisations) acknowledge that...

- ✓ *Blended learning programs they built solved problems that were impossible to solve in any other way.*
- ✓ *Blended learning forced their organization to refine and focus their thinking about their business problem.*
- ✓ *Optimal blended learning solutions that are defined and based on real requirements for solving real business problems do have a huge and measurable business impact.*

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Mantyla (2001, p.31-53) cites IBM as a good example of how blended learning can work well by outlining the following scenario.

The Management Development (MD) division of the computer giant needed to go from training 13,000 managers in the US to training 30,000 worldwide while using fewer resources. Traditionally IBM offered training to their management staff over an intensive 5 day period using classroom based training alone. However marketplace changes were widening the development needs of management staff. These needs could not be met through classroom learning alone primarily because,

- ✓ *The MD division was reorganised and downsized in spite of their responsibility increasing from training 13,000 US only managers to 30,000 worldwide managers.*
- ✓ *The existing 5 day classroom based training was not enough to meet with IBMs growing leadership challenges.*
- ✓ *Manager's workload was already high – many working 10 – 12 hours per day, so time off site was not practical or possible.*

Following a comprehensive needs assessment to gather data, IBM derived a solution which included *"reconceptualising MD as an extended year long process instead of a 5 day process and utilising a blended multimodal approach integrating intranet e-learning with classroom learning".*

In terms of cost comparison, Mantyla (ibid) claims that *creating a 250 hour classroom based programme for 6318 managers worldwide would be $400 per day per learner which includes instruction, participant time, travel, and accommodation. This is compared with a $136 per day per learner cost for the blended approach. Five times the content could be delivered at one third of the cost. The result was a $24 million saving on its management training process.*

This is clearly a measure of success in terms of the cost benefits blended learning can bring to an organisation. In the current recessionary climate of cost cutting and staff embargos, blended learning appears to offer a genuine solution to educational institutions such as FAS when delivering training.

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2.6 Research Question

In reviewing the literature it is apparent the way in which education is accessed, delivered, received and processed has changed significantly over the last two decades. Largely as a result of technological advancements many learners now have convenient access to educational material. Some educators are utilising this technology to deliver their material using a range of delivery modes. E-learning and in particular blended learning have become quite prevalent within the field of academic education. Traditional learning theories however (behaviourism, cognitivism and constructivism) commonly used as the bedrock for teaching and learning over the last century have remained the same. The literature identifies some arguments suggesting these theories need to be modified, blended or replaced to account for the ferocious use of technology by today's net generation learner. This argument appears to centre around the belief that today's learner accesses and processes information quite differently to their predecessors.

Within the literature, convenience, flexibility, the use of technology and balance are identified by today's learners as being essential educational needs during the learning process. Blended learning not only contributes to meeting these needs of the learner, but also many of the needs of educators and educational institutes. Blended learning is successfully used to deliver learning material in the subjects that are often academic in nature. There appears however to be a need to establish if blended learning is an effective way of delivering the theory element of apprentice training.

This is of particular interest as educational profile of the apprentices tends to be somewhat different to those undertaking more academic type courses. For a large number of individuals who decide to become apprentices, they have usually done so as a result of one or all of the following. They may have identified a particular trade or skill as being of interest to them and believe they could develop this interest into something more such as a career or way of life. They may have a practical disposition, ie. perhaps they like to work with their hands. They may have simply made a decision that academic type courses are not for them and would prefer to engage in practical based or technical education. For some there may even be a reluctance to participate further in academic education after second level schooling based on negative experiences they may have had while there.

However, as with any learning there is an element of theoretical knowledge that must be comprehended and apprenticeship is no different. Apprentices are required to undertake a series of theory modules and subsequently pass exams throughout their training. Interestingly there is a large amount of anecdotal evidence to suggest that for some apprentices, because of their very nature, combined with the reasons they became apprentices, the modality used to deliver theoretical content is often not aligned with their profile, expectations, needs or requirements during the training process. Apprentices sometime express a dislike for attending face to face classroom based theory lectures.

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As outlined earlier this is may be a result of these lectures aligning with the academic type course they chose not to sign up for when they decided to become an apprentice. So for some apprentices' classroom based learning alone goes very much against the grain. This sometimes displays itself in the form of anxiety, frustration, and disengagement among some apprentices and may lead to low exam grades in theory exams. A combination of blended learning and blended theories may offer a solution to these challenges.

With the above in mind, the research question emerging is...

By employing a blend of learning modes and theories to deliver theoretical content to apprentices does it enhance their performance and opportunity to learn?

In addition, the proposed research will endeavour to answer the following,

- ✓ What are apprentice's technological capabilities, learning needs and educational requirements?
- ✓ Do exam grades of apprentices sitting theory based exams improve when face to face tuition is supported with on-line instructional material?
- ✓ Does the current mode by which FAS choose to deliver elements of apprenticeship align with the Irish Governments vision for 2020 to up skill the workforce over and above their current level of education and training?
- ✓ What recommendations can be offered that would ensure apprenticeship training keeps pace with technological advancements in the educational sector?

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3. Methodology

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3.1 Background

Institute of Technology Blanchardstown (ITB) is one of a number of IOTs in the country who presently cater for apprentice bricklayers during phase six of the apprentice training programme.

All apprentices who attend ITB during this time have been released by their employer for this "off the job" phase. While attending phase six apprentices are taught the advanced skills associated with the craft of bricklaying over a period of ten weeks. The subject matter is delivered by lecturers in the form of face to face tuition within a lecture theatre combined with practical workshop based labs. On completion of this phase apprentices must successfully pass three theory papers, three practical projects and one technical drawing paper.

The research carried out for this paper focuses primarily on the theoretical element of delivering training to apprentices. It seeks to investigate potential benefits which may exist when employing blended learning as an alternative to that currently utilised during this training process. The research carried out with apprentice bricklayers for this paper was undertaken at ITB. The research carried out with the lecturers of the apprentices was carried out at ITB and a number of other IOTs including Dublin (DIT), Waterford (WIT), Athlone (AIT), & Dundalk (DKIT).

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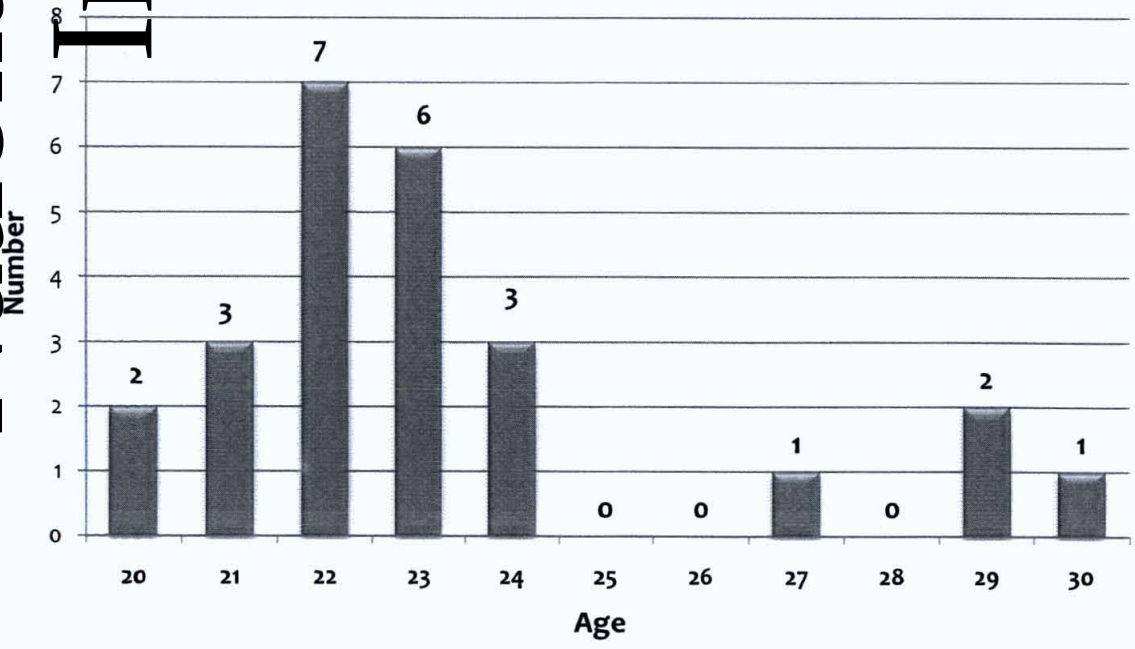
3.2 Sample Group

There were two sample groups in this research. The first was apprentice bricklayers (N=25) and the second, lecturers of apprentices (N= 22).

3.2.1 Apprentices

As a result of being randomly selected from FAS's database thirty two apprentice bricklayers were automatically registered to attend ITB to undertake phase 6 of their training programme. Because ITB is one of four IOT's simultaneously running phase 6 of the apprentice training programme in bricklaying, each individual had an equal probability of being selected from the population to attend ITB. This ensures the sample is representative of the total population (Keppel 1991). The resulting sample was composed of males only and had an average age of 23.2 (see Table 6).

Table 6 - Age Breakdown of Apprentices



Each participant has successfully achieved the objectives as set out for them by FAS during phase 5 (on the job) and are all therefore (theoretically) equal in status. The participants attended ITB from January 2010 to March 2010. It was during this period the research was carried out.

3.2.2 Lecturers

Each lecturer employed by an IOT to deliver phase 4 & 6 of the apprentice training programme (in all trades) is a qualified craftsperson and a subject matter expert. They each have a minimum of five years post apprenticeship trade related experience. For this reason the sampling strategy chosen in this case was purposive sampling and more specifically "expert sampling". *Studies which report expert opinion are likely to benefit from a reflected respect and thus be more credible at least with an audience who unquestionably accepts those people as experts* (Straker 2008). Those who made up the sample lectured at ITB, DIT, AIT, WIT and DKIT. These lecturers were composed of males only; most of whom were between the age of 31 and 45. They had an overall average age of 43 (see Table 7). The trades for which they were responsible for delivering included bricklaying, carpentry, electrical and plumbing (see Table 8).

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Table 7 - Age Range of lecturers

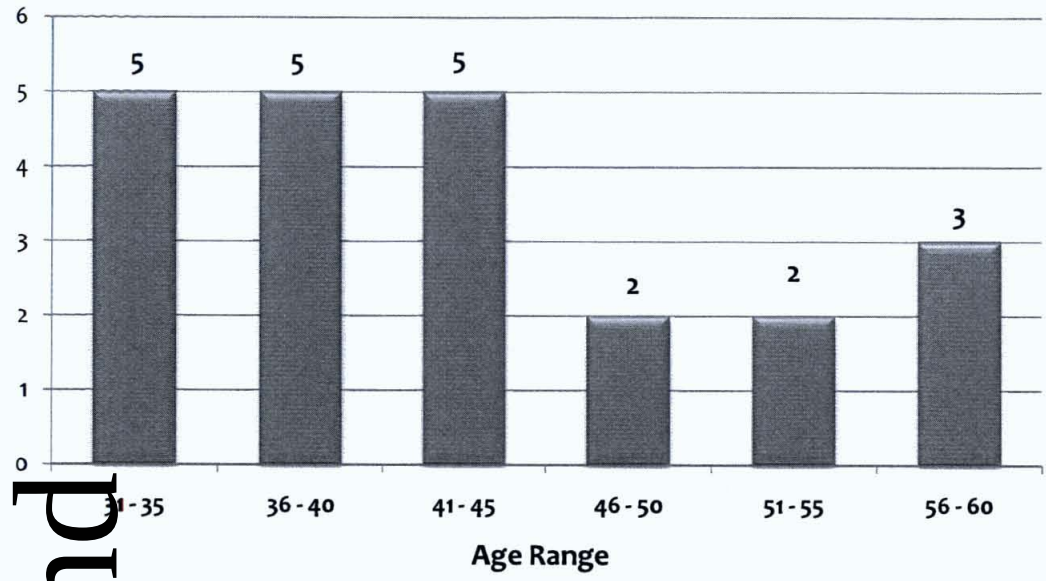
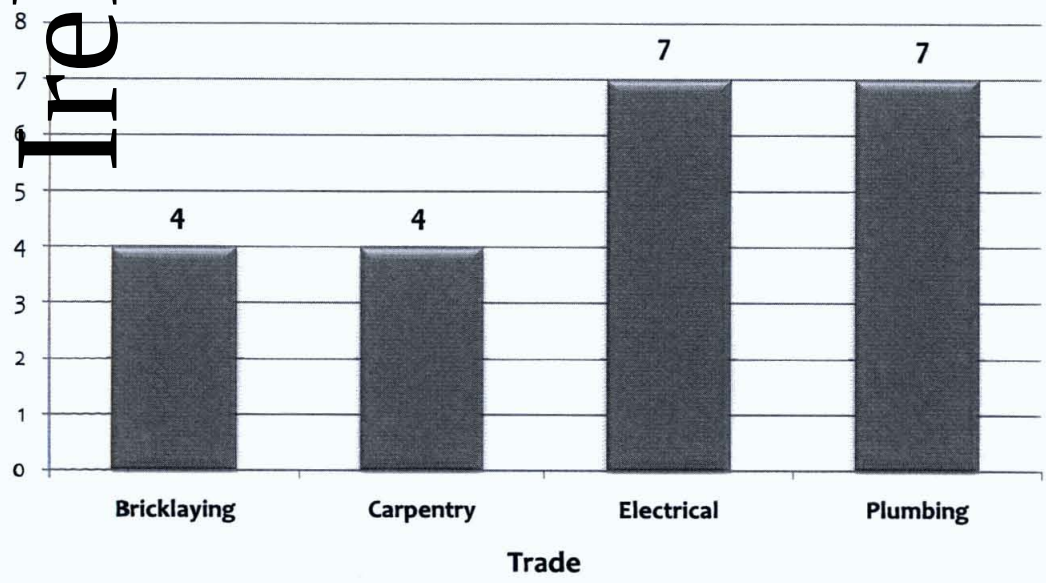


Table 8 - Trade Breakdown of lecturers



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3.3 Research Design

The research undertaken for this paper utilises the process of deduction i.e. specific conclusions are drawn from a set of premises (Wallace 1971).

Wallace offers the "research wheel" to demonstrate how the deductive process works in a sequential fashion beginning by investigating a particular theory or theories before offering a hypothesis. After doing so observations are made (using qualitative and/or quantitative methods for example) and empirical generalisations are then offered.

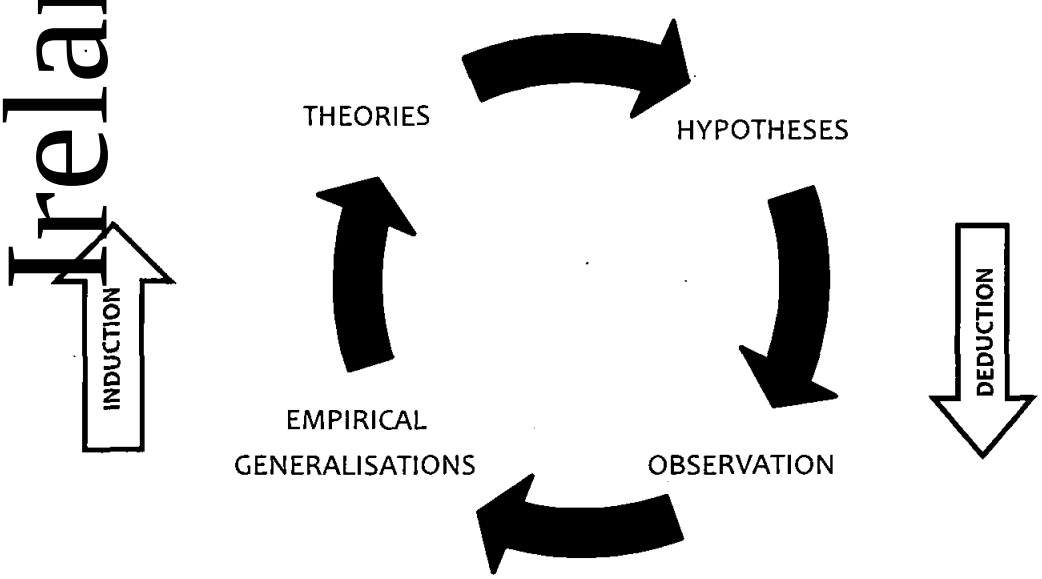

Figure 6 Wallace (1971) Research Wheel

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In preparation for carrying out research for this study, *three elements of enquiry were considered and translated into processes within the research design* (Creswell 2003, p.5). These were,

- ✓ Knowledge Claim.
- ✓ Strategies of Enquiry.
- ✓ Method.

3.3.1 Knowledge Claim

Creswell (2003, p.6) defines a knowledge claim as being the assumptions a researcher begins with regarding "*how and what*" they will learn during their enquiry. These assumptions are sometimes referred to as research paradigms (Mertens 1998). For this paper it's fair to say with regard to "how", a mix of qualitative and quantitative data collection combined with a review of relevant literature and personal experience was viewed as being essential. Concerning "what", the assumption made was apprenticeship training may be enhanced if the pedagogical approach currently used during training was modified.

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The theoretical perspective taken when carrying out the research was of a pragmatist nature. The rationale for using this approach, [*derived from the work of Peirce, James, Mead and Dewey* (Cherryholmes 1992)] was because of the belief that *instead of the research methods being the most important elements of the study, the problem was more important* (Creswell 2003, p.11). In line with a pragmatic paradigm a mixed method approach was used to answer the research question in this instant. Creswell (2003, p.12) suggests, *for the mixed method researcher, pragmatism opens the door to multiple methods, different worldviews, different assumptions, as well as different forms of data collection and analysis.* Pragmatic knowledge claims have what Tashakkori & Teddlie (1998) regard as intuitive appeal, permission to study areas that are of interest, embracing methods that are appropriate, and using findings in a positive manner in harmony with the value system held by the researcher.

3.3.2 Strategy of Enquiry

Research is one of many different ways of knowing or understanding (Mertens 1998). Choosing an appropriate, effective research strategy however is essential for this knowing and understanding to occur. With this in mind, and appreciating the limitations of either a quantitative or qualitative strategy on their own, a multi method matrix (Campbell & Fiske 1959) was utilised to minimise bias which may occur as a result of using a single strategy.

Mixing strategies enables triangulation. Greene et al (1989) claim the results obtained from one methodology can assist or inform another method. This in turn substantiates data by cross referencing from more than two sources (Bogdan & Biklen 2006). Triangulation is not simply aimed at validation; it also has the capacity to expand the researchers understanding of the research material (Olsen 2004). The mixed strategy in this study involved combining research traditions such as action and historical research using experimental, survey and qualitative field research designs.

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3.3.3 Method

A mixed method approach was employed in this paper to gather both numeric and text based information. This method would facilitate a deeper understanding of the research problem when compared to a single method approach. While this approach to the research took longer to design, organise, implement and analyze, it elicited data which was comprehensive and triangulated. This ensured validity and trustworthiness was attained (Guba 1981).

Tashakkori and Teddlie (2003) claim a mixed research methodology is superior to a mono-method approach in three ways. These include its ability to,

- ✓ *Answer questions that mono-methods may not be able to answer.*
- ✓ *Provide stronger inferences through depth and breadth in answers to complex social phenomena.*
- ✓ *Allow the opportunity through divergent findings for an expression of differing viewpoints.*

The mixed method approach used in this paper was implemented in a sequential manner. This enabled the finding of one method to be expanded upon or explored further using a following alternative method. One of the benefits associated with this approach for example was the hypothesis could be tested with apprentices using a quantitative method and followed up using qualitative methods.

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3.4 Procedure & Data Collection

As information was gathered from separate apprenticeship stakeholders (Apprentices & Lecturers) there was a need to select techniques that were most suited to each. It was also essential for each of these techniques to elicit data that would contribute to answering the research question.

The way in which this was done is outlined over the following pages. To ensure clarity the procedures and data collection techniques used with each of the stakeholders are kept separate i.e. first apprentices and then lecturers.

3.4.1 Ethical Issues

Prior to any data collection it was crucial to address any ethical issues which may have arisen throughout the process. Ethics are defined as the *code of behaviour of a particular group, profession or individual or the moral fitness of a decision or course of action.*[53]

The first task in ensuring ethical standards were established was to seek the permission of ITB management to carry out the research on the college campus. They were informed that the research would have no significant negative impact on the college including its students, staff, buildings or resources. Permission was granted accordingly.

53 Collins English Dictionary Online http://www.collinslanguage.com/Default.aspx

In undertaking this paper all elements of the research were carried out with the intention of sticking to the principle of informed consent. This ensured those participating knew in advance what they were becoming involved in and were aware of the associated procedures at all times. This process began by firstly outlining the objective of the research to apprentices and lecturers and identifying the implications of participation. The research techniques and how they would be carried out were explained at the beginning of the research process and each time a new technique was employed. This enabled participants to get a good comprehension of what to expect as a result of participating. No apprentice or lecturer was coerced in any way to participate in the research and those who participated did so of their own free will – voluntarily. It was made clear to all participants; withdrawal was an option at any stage during the process. As there was an element of the research with apprentices that consisted of using a control group and an experimental group, it was made clear that in order to prevent discrimination occurring, both groups would be rotated during the procedure so everyone was exposed to the stimulus concerned. In gathering, collating and reporting quantitative data, there was a need to prevent any information which may be confidential or sensitive from being traced to any individual participant. This was assured by using numerical codes instead of names. In writing up the results of the research only data which is true, accurate and representative of participant's views is presented. The final element of ensuring ethical conformity will be to release the finalised paper to participants in due course.

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3.4.2 Procedure & Data Collection (Apprentices)

No information was available on the apprentices prior to their arrival into ITB to undertake phase 6, other than the fact they had successfully come through all previous phases. For this reason it was decided to carry out an information gathering and readiness survey. This involved carrying out a pre course questionnaire with apprentices which was satisfactorily piloted with five previous students who attended ITB as apprentice bricklayers. The goal of the questionnaire was to establish...

- ✓ The average age.
- ✓ Academic qualifications.
- ✓ Convenience of access to a computer.
- ✓ Level of ability to access and navigate the internet.
- ✓ Ability to use email and frequency patterns.
- ✓ Level of ability regarding accessing instructional videos and podcasts.
- ✓ Existing attitudes towards computer use and technologies in education.
- ✓ The predominant learning styles within the group.
- ✓ Preferred mode of learning.

This was carried out during week one of the course in a classroom environment. A hardcopy of the survey was given to each apprentice and each question read aloud. Clarity was provided where necessary.

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3.4.3 Control Group Study

On completion of the pre course questionnaire an experimental control group study was carried out. Its objective was to identify any effects that may occur as a result of applying a stimulus (combining online material with face to face tuition - blended learning) to one group while applying no stimulus (only received face to face tuition) to the other group. The hypothesis being there is significant improvement in the performance of students who are exposed to blended learning when compared to those exposed to traditional face to face learning only.

The procedure when carrying out the control group study involved...

- ✓ Dividing the study population.
- ✓ Establishing a baseline.
- ✓ Applying the stimulus.
- ✓ Measuring the impact of the stimulus.

This element of the data collection required the study population to be divided into two groups (control and experimental). Conveniently, FAS automatically (and randomly) divide the thirty two apprentices sent to ITB into two groups of sixteen – Group A and B. This is to facilitate running practical workshops which are only permitted to have a maximum of sixteen apprentices at any one time to comply with health and safety regulations. Both groups are combined at all other times during the course.

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The next step involved establishing a baseline of the study population by measuring their existing knowledge of two subjects which were to be delivered during the course. This was done by carrying out a short in class pre-test thus eliciting quantitative data. Four days prior to the pre-test, the population were supplied with basic notes on the material to be tested and encouraged to review it.

The two subjects chosen were Sulphate Attack on Clay Brickwork (S.A) & Camber Arch Construction (C.A). The first was chosen because of its scientific nature and considered to be one of the more challenging topics on the course. The second was chosen because it is a theory subject with a practical workshop element. By having this practical element it provided further opportunity for supplementary data to be collected through observation in the workshop.

Before any stimulus was applied, the total population attended a classroom based lecture on both of the chosen subjects.

When applying the stimulus, in order to avoid the possibility of discrimination, the first group of sixteen students (Group A) were treated as the control group when S.A was delivered in week two of the course. The second group of sixteen (Group B) were treated as the experimental group. This order was then reversed when C.A was delivered in week four of the course. Group A became the experimental group and Group B the control group.

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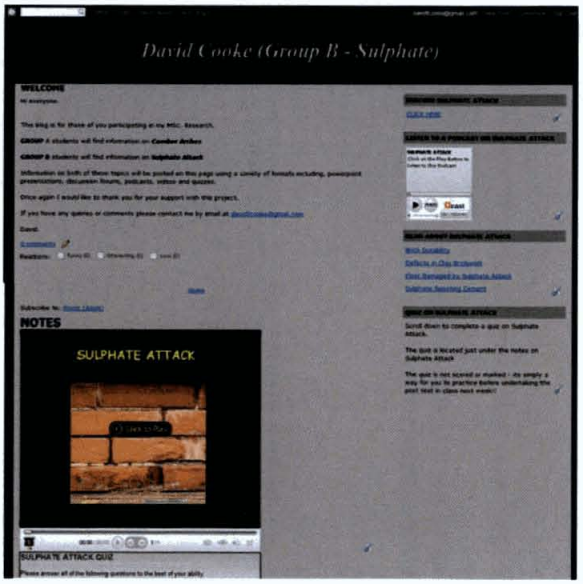
The vehicle used to administer the stimulus was a blog (Screenshots below).

This was done by providing each of the experimental groups with access to their own blog on Sulphate Attack in Clay Brickwork and Camber Arches respectively. Each experimental group was given access to their blog for one week before having to undertake a post-test on the subject. Each respective blog was identical to one another except for the subject matter. They both provided access to learning material in the form of podcasts, online instructional videos, lecture presentation notes, imagery, discussion forum, additional reading material and a quiz.

Camber Arch Construction Blog for Group A

http://davidfcookeresearch2.blogspot.com/



Sulphate Attack Blog for Group B

http://davidfcookeresearch.blogspot.com/

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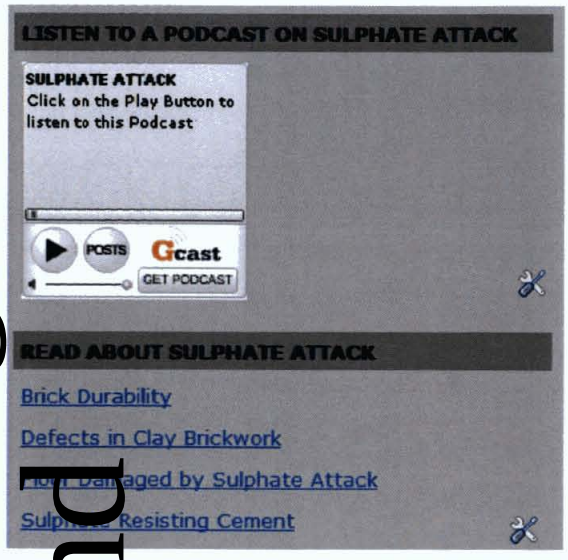
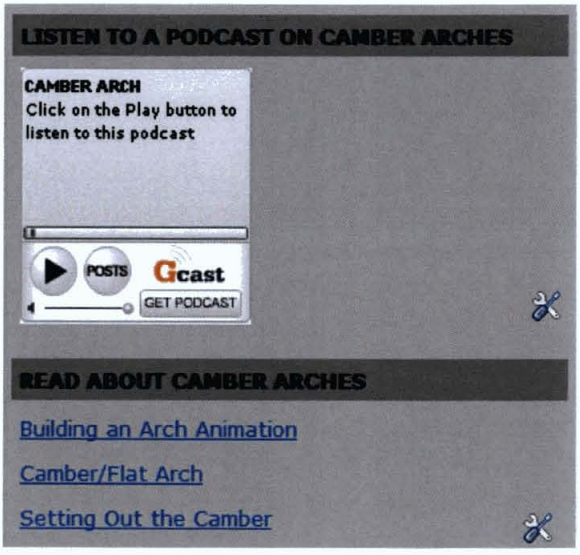
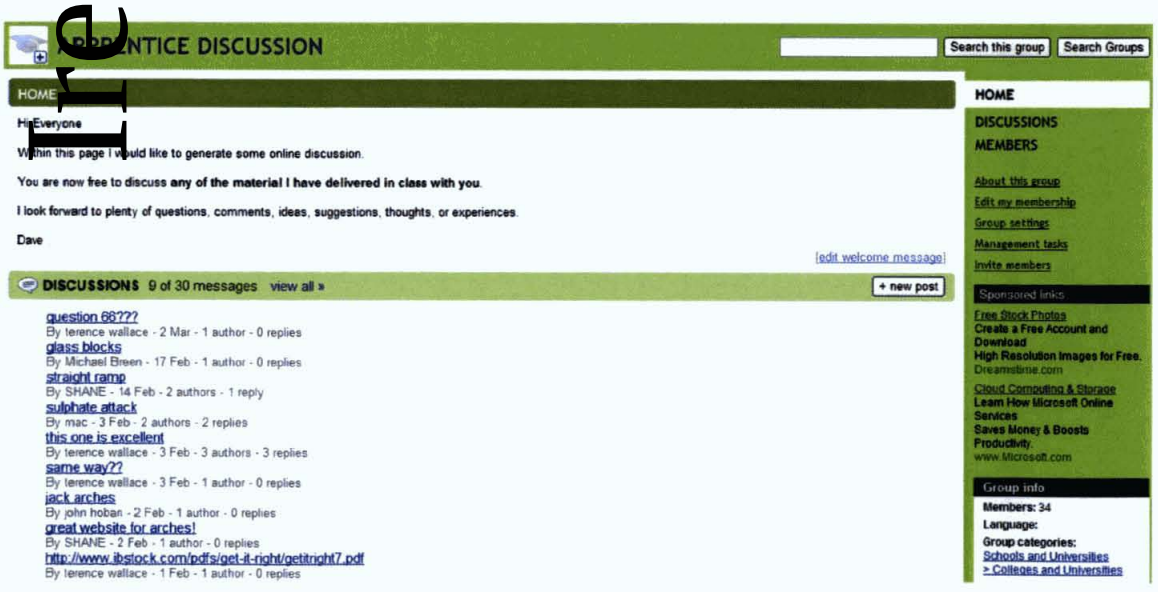
Podcasts were created and selected subject specific reading material identified.





A discussion forum was set up and utilised by the lecturer and apprentices.



http://groups.google.ie/group/bricklaying?lnk=

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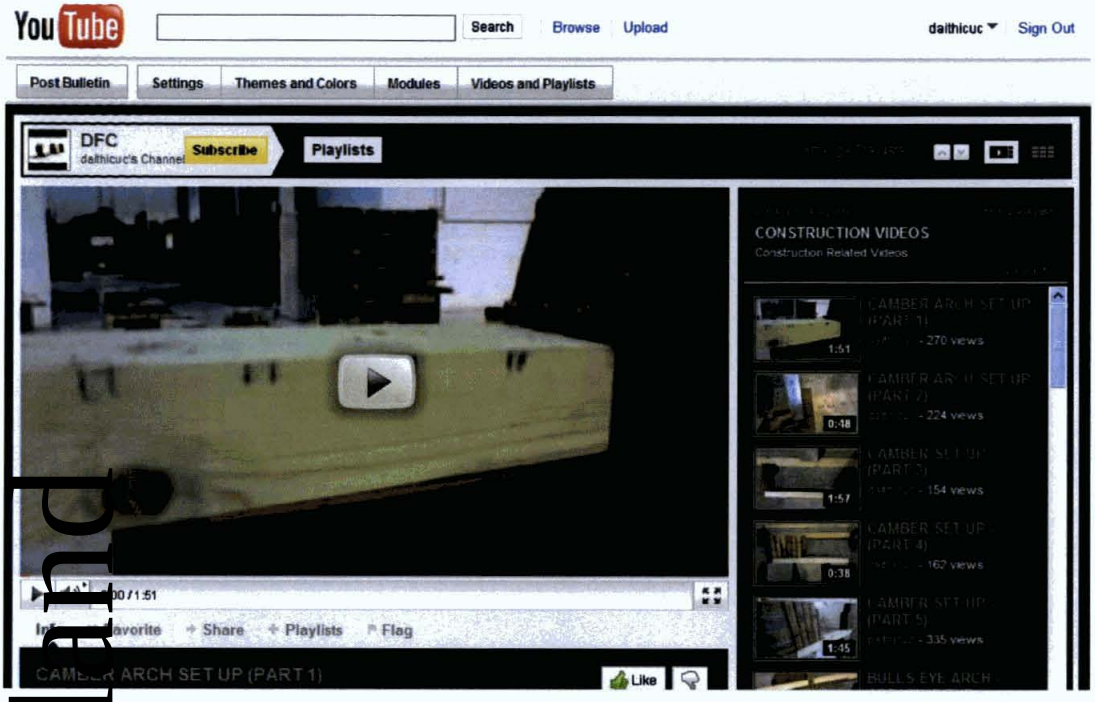
Several instructional videos were created and made available via YouTube.



http://www.youtube.com/user/daithicuc

Quizzes to reinforce learning were also made available.

CAMBER ARCH QUIZ

Please answer all of the following questions to the best of your ability.

Feel free to use class notes or any other reading material available to you.

* Required

Which 3 of the following are alternative names for a Camber Arch? *

- ☐ Flat
- ☐ Venetian
- ☐ Georgian
- ☐ Square
- ☐ Vault

SULPHATE ATTACK QUIZ

Please answer all of the following questions to the best of your ability.

Feel free to use class notes or any other reading material available to you.

* Required

Select which 4 of the following are most likely to be effected by Sulphate Attack *

- ☐ Rising Walls
- ☐ Partition Walls
- ☐ Flueliners & Chimney Stacks
- ☐ Mortar
- ☐ Concrete
- ☐ Party Walls

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Once each experimental group had been exposed to the stimulus for one week a post-test on both topics was carried out with both experimental and control groups (see Fig. 7). This post-test consisted of a number of questions including those contained within the pre-test. The test was carried out in a classroom environment and once again elicited quantitative data. This data could now be compared to that gathered in the pre-test. *Differences in before and after observations between the groups regarding the dependent variables(s)* (scores) *can be accredited to the intervention* (independent variable) (Kumar 2005, p.104).

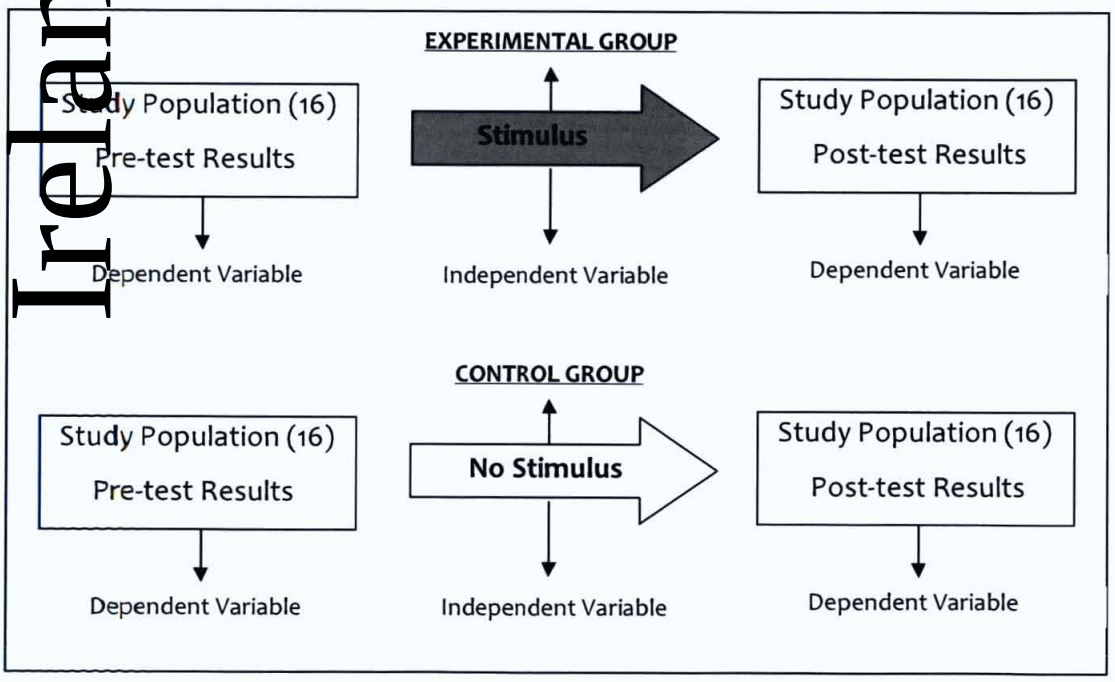

Figure 7 - The Control Experiment Design

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To establish any significance of the effects of the stimulus, pre-test and post-test scores were entered into the computer Statistical Package for the Social Sciences (SPSS). The requirement of SPSS then was to carry out a test which would deal simultaneously with the effect of two or more independent variables (face to face only and blended learning) on the dependent variables (scores). The test identified which would enable this type of examination was a two-way ANOVA test. This test *takes the effects of both of the independent variables into account at the same time thus allowing the simultaneous effects of both independent variables on the dependent variable to be established. In doing so, it determines whether the effect of one of the independent variables is being caused or modified in some way by the other independent variable* (Miller et al 2002, p.150).

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*data[1].sav [DataSet1] - SPSS Data Editor

File Edit View Data Transform Analyze Graphs

1 : score 68

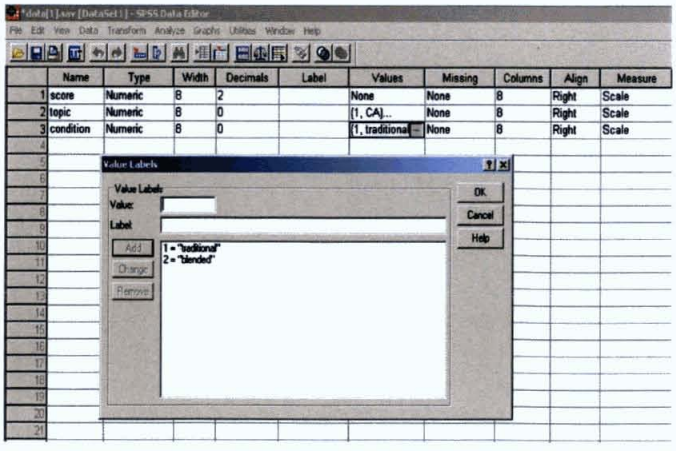
	score	topic	condition
1	68.00	2	1
2	72.00	2	1
3	.	2	1
4	86.00	2	1
5	74.00	2	1
6	39.00	2	1
7	100.00	2	1
8	64.00	2	1
9	90.00	2	1
10	32.00	2	1
11	83.00	2	1
12	79.00	2	1
13	62.00	2	1
14	77.00	2	1
15	61.00	2	1
16	74.00	2	1
17	79.00	2	2
18	89.00	2	2
19	77.00	2	2
20	88.00	2	2
21	63.00	2	2
22	72.00	2	2
23	100.00	2	2
24	92.00	2	2
25	84.00	2	2
26	91.00	2	2
27	83.00	2	2
28	59.00	2	2
29	66.00	2	2
30	98.00	2	2
31	79.00	2	2
32	73.00	2	2
33	80.00	1	2
34	80.00	1	2
35	.	1	2
36	90.00	1	2
37	100.00	1	2
38	97.00	1	2
39	100.00	1	2
40	76.00	1	2
41	100.00	1	2
42	65.00	1	2

Data View | Variable View

This involved generating a dataset from the pre-test scores and post-test scores of both groups and inputting these into the data sheet (Column 1 opposite).

The topic was identified by entering a value of 1 to represent Camber Arch Construction and 2 to identify Sulphate Attack in Clay Brickwork (Column 2 opposite).

The Independent variables or conditions were identified by entering a value of 1 to represent traditional face to face learning 2 to identify blended learning (Column 3 opposite).



3.4.4 Observation

In choosing the Camber Arch as one of the subjects within the research an opportunity existed to employ observation as a further method of gathering data. This research was carried out within the construction workshop. Its objective was to assess whether there was an observable difference between the control and experimental group regarding the quality of workmanship and efficiency of methods used while physically constructing the Arch. Mack et al (2005, p.14) argue *there is no substitute for witnessing or participating in phenomena of human interaction. Observing and participating are integral to understanding the breadth and complexities of the human experience.* By conducting this field research a measurement of the effects of both face to face and blended learning have on apprentices in a real working environment could be taken. Because the research being implemented in this paper was sequential by observing the apprentices in the workshop at this stage had the added benefit of providing "food for thought" in advance of designing the apprentice and lecturer questionnaires.

It was relatively convenient to observe the target group as they were timetabled for workshop activities on Monday afternoons, all day Wednesday and all day Thursday. The observation took place over two weeks at these times in week 5 and 6 of the course. The nature of the observation was identical to that used at any other time while in the workshop i.e. employing a watchful presence and assisting where necessary.

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The process involved using a real time observation instrument that combined a performance checklist with low inference quantitative observation (See Appendix D).

Specifically apprentices were observed to determine,

- ✓ Whether they carried out all construction procedures in line with the theoretical information delivered.
- ✓ The level of knowledge and competence displayed while carrying out the task.
- ✓ If any clarification or assistance was sought during the process.

The observation sheet used for this procedure was divided into three sections.

Section 1 - Was to determine if the apprentice had carried out the correct sequence of operations in order to construct the Camber arch. This required input into the checkbox provided. If the apprentice carried out the listed task "✓" was placed into the box provided. If they did not, an "x" was placed in the box.

Section 2 - Was to establish how well the apprentice appeared to be carrying out the physical procedures under the headings of knowledge and competence.

It required the input of a "✓" into the most appropriate checkbox using a scale which ranged between very good and very poor.

Section 3 - Was to discover if the apprentice carried out the listed tasks with or without assistance from a lecturer, peer, notes or books. It also sought to establish how regularly (if at all) the apprentice sought assistance.

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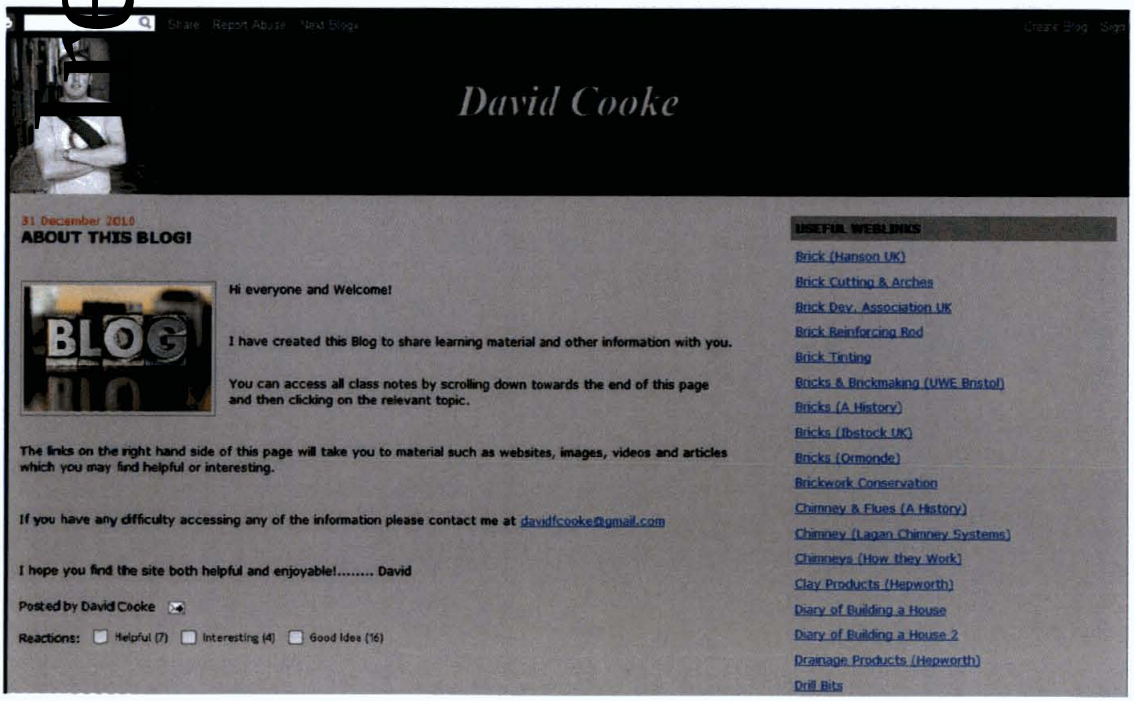
It required input into the checkbox provided. If the apprentice required the assistance of a lecturer, peer notes or books - a "✓" was placed into the appropriate box. If they did not require any assistance - an "x" was placed into the box.

To indicate how regularly the apprentice sought assistance (if at all) a "✓"was placed into the most appropriate checkbox on the scale of four numerical options.

On completion of each session any notes taken during observation were documented.

4.4.5 **Experiment - Implementing the Blended Learning Solution**

From the beginning of the course the total study population was given access to a main course blog (www.davidfcooke.blogspot.com).



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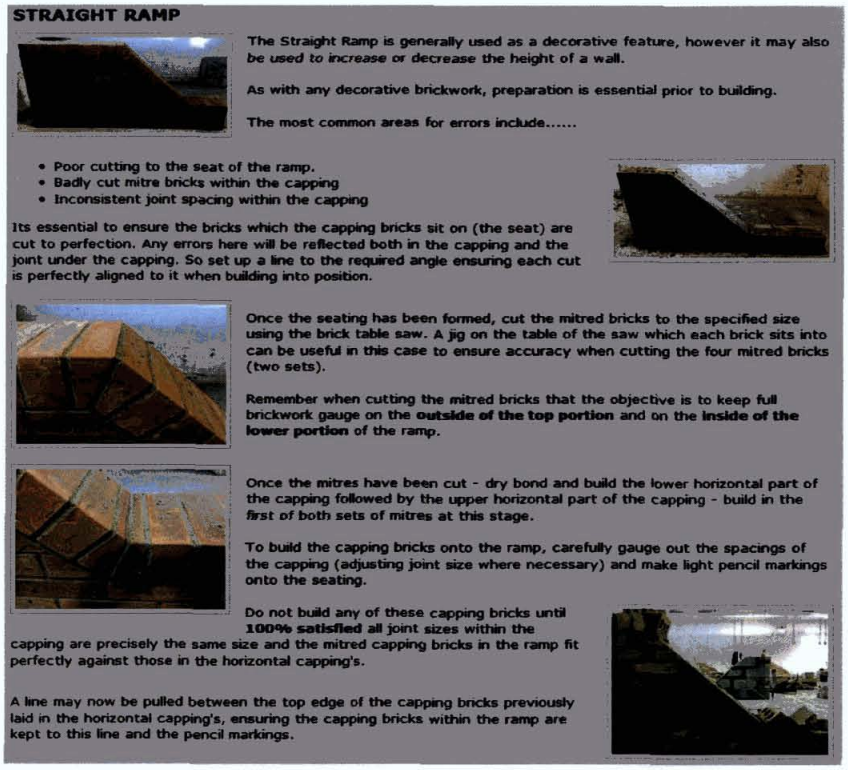
The purpose of using this blog throughout the course was to support learning which took place in the classroom and to enable convenient access to the learning material. Several instructional methods were used to deliver learning material including; blog posts, podcasts, online instructional videos, lecture presentation notes, imagery, discussion forum, further reading material and quizzes (See screenshots).



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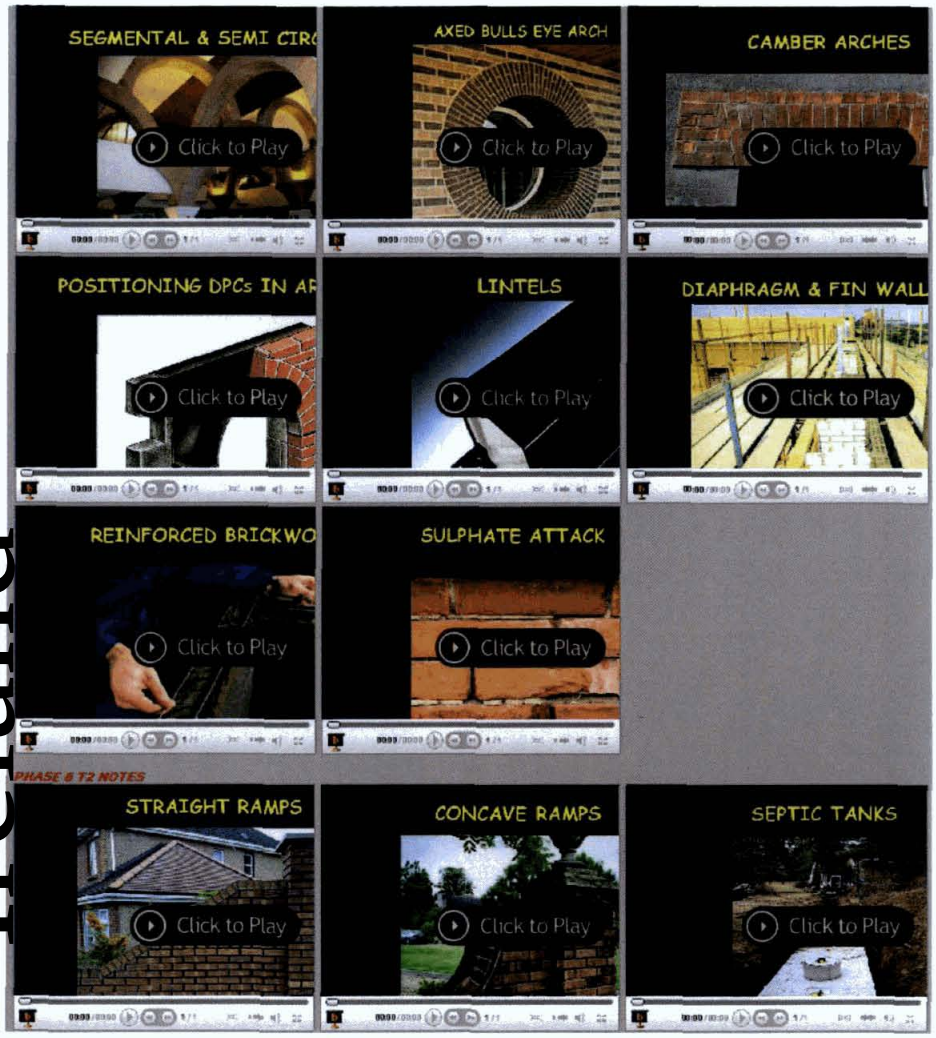

The blogs used for administering the stimulus on C.A and S.A to both experimental groups were taken out of the equation once the post-testing and workshop observation was completed on these topics. All material on these blogs was then transferred to the main course blog. This ensured everyone had access to all material once this stage of the experiment was completed.

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As well as supporting classroom learning and offering convenience in terms of access, the blog was a way to operationalise a blended approach to theory training. It furnished apprentices with the opportunity to implement a multifarious approach to their learning if they choose to do so. To successfully carry out this strategy it required that apprentices receive an induction to the blog in terms of access, participation, opportunities and limitations. Once this was done, apprentices were free to utilise and or contribute to the blog as they wished. Levels of participation were closely monitored through individual and group discussion with apprentices to ascertain perception, value and relevance. During face to face tuition continual reference was made to the additional material and resources available on the blog and apprentices were encouraged to avail of these. Apprentices who had difficulty accessing or using the blog were facilitated in a two hour computer class on Tuesday and Friday afternoons over a period of eight weeks. Some elements of the blog required more attention than others, such as the blog posts and discussion forum. Posts required regular updating with information and images relevant to activities occurring in the workshop and the outside working environment. The discussion forum also required some level of direction and facilitation with regard to technical queries. By employing a blended approach to apprenticeship training which was aided by online technologies it offered an ideal opportunity to gather quantitative data from the study population. This was done during week nine of the course using a questionnaire and focus group discussion.

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3.4.6 Post Training Questionnaire

On completion of the theory element of the course apprentices were presented with an online post training questionnaire. This was first piloted one week in advance with four of the study population who had demonstrated high levels of competence using computers. This pilot run raised no significant issues with regard to either content or the use of the technology.

The most convenient and effective way of gathering the information while maintaining anonymity was by collective administration with the aid of the online survey instrument *Question Pro* (See Appendix A).

The questionnaire was emailed to the study population at the beginning of a computer lab arranged solely for this purpose (Students who initially had no email address at the beginning of the course were provided with one during week two of the course and were subsequently using it throughout). By having a captive, willing audience optimum opportunity for gathering quality data while achieving a high response rate existed. (Kumar 2005, p.129) suggests researchers should not miss the opportunity of availing of a captive audience when administering a survey, as it *provides a high response rate, the opportunity to explain the relevance, purpose and importance of the study and the ability to clarify any questions the participants may have.*

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The objective of the questionnaire was to establish the study populations attitudes, perception, experiences and reaction to using a blended learning when delivering Phase 6 of the apprentice training programme.

To do this, the questionnaire consisted of thirty eight questions which were qualitative and quantitative in nature and divided into the following categories,

- ✓ Accessing course material made available online.
- ✓ Using online technologies.
- ✓ Participating in blended learning courses.
- ✓ Managing one's own learning.
- ✓ Personal preferences regarding learning modes.
- ✓ The effects of blended learning.

To enable participants identify the researcher and the surveys objectives an introductory section at the beginning of the questionnaire was created. Within this section confidentiality and anonymity were also guaranteed. They were assured there was no possibility of them being identified by any means. Any data used from their contribution would be correlated to a survey number only which had no connection to any personal information.

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Questions 1 – 9 were a mix of dichotomous, multiple choice, open ended, closed, and rating scale type questions.

Their purpose was to determine the following in relation to the use of the Blog,

- ✓ Ease of access.
- ✓ Reason(s) for accessing.
- ✓ Regularity of access.
- ✓ Barrier(s) to accessing.
- ✓ Levels of satisfaction in relation to finding information which was sought.
- ✓ Levels of enquiry regarding exploring additional material to that sought.
- ✓ Whether its availability encouraged revision of classroom or workshop learning.

Questions 10 – 25 were a mix of rank order, dichotomous, multiple choice, open ended, closed, and rating scale type questions.

Their purpose was to determine the following in relation to the learning material available and participant preferences,

- ✓ Satisfaction levels with the variety of learning modes available.
- ✓ Preferred learning mode(s).
- ✓ Levels of participation via contributions and/or collaboration.

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- ✓ Effects (including secondary) of participating or collaborating.
- ✓ Level of understanding gained through connecting segments of information in multiple formats.
- ✓ Level of interest and engagement when compared to face to face only learning.
- ✓ Most effective learning modality based on participant experience.

Questions 26 – 29 were all rating scale type questions. Their purpose was to determine the following in relation to participants managing their own learning,

- ✓ Whether using a blended approach encouraged self directed learning at a time and in a location of convenience.
- ✓ Levels of dependency on the blog in relation to sourcing additional information to that delivered in a classroom.
- ✓ Whether utilising the blog promoted a deeper understanding of material.
- ✓ Whether the blended approach facilitated with the development of problem solving skills which could be used in practice.

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Questions 30 – 38 were a mix of word association, dichotomous, closed, and rating scale type questions. Their purpose was to determine the following in relation to knowledge and experience of using online technologies, perceptions of various learning modes and attitude towards blended learning,

- ✓ Levels of knowledge regarding use of online technologies before and after the course.
- ✓ Perception of online technologies in terms of their ability to facilitate a deeper understanding of subject material while training.
- ✓ Overall levels of satisfaction with the blended approach used during the course. This was done using 4 levels of evaluation (Kirkpatrick 1998).
  - Reaction (Did they like it).
  - Learning (Did they learn from it).
  - Behaviour (Was there a change in behaviour).
  - Results (What impact did it have on exam results).

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3.4.7 Focus Group Interview

On completion of the post training questionnaire a short informal face to face focus group discussion was held with six of the study population. In choosing individuals it was important to ensure a well balanced group which was a fair representation of the full study population. To ensure this, information gathered in the post training questionnaire was analysed. Individuals were subsequently chosen using purposive sampling on the basis of their usage of the blog, technical capabilities and perceptions of the blended approach used during the course. The objective of carrying out a focus group discussion was to check the accuracy of the data already collected and to further explore areas of interest identified within the post training questionnaire. Silverman (1993) contends as far as interviews are concerned, they are primarily used to produce data which enables a genuine understanding of people's experiences.

Areas identified for further exploration in advance of the discussion included,

- ✓ Establishing motives or barriers regarding accessing the online support blog.
- ✓ Identifying whether providing learning material in a variety of formats enables meaningful connections to be made thus facilitating greater comprehension.
- ✓ Perceptions of blended learning and utilising online technologies while learning.

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The discussion was conducted in a small meeting room within ITB during week ten of the course and lasted approximately thirty minutes. A rapport had already been built up with the participants throughout the course. This allowed the discussion to be quite quickly guided towards meeting their objective. Notes were taken during the session and findings written up immediately afterwards. A synopsis of the discussion was drafted and shown to the focus group participants to ensure it was an accurate account – All participants acknowledged that it was.

3.4.8 Procedure & Data Collection (Lecturers)

The rationale for surveying lecturers of apprentices was threefold.

Firstly, all lecturers delivering apprenticeship training were once apprentices themselves. Thus of all apprenticeship stakeholders lecturers would most likely relate to apprentices best. Dukta (1995, p.10) argues *there is no substitute for an informed, authoritative person who can relate to respondents on their own terms.*

Secondly, it was important to gather data from the lecturer's perspective which was representative of the situation as it is "on the ground" while delivering theory training to apprentices.

Thirdly, to compare the views of lecturers to those held by their apprentices in terms of using instructional technologies and blended learning to deliver theoretical content during apprentice training.

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In seeking this information there were three specific goals. To establish,

- ✓ Lecturers most frequently used method for delivering their course material.
- ✓ What (if any) computer technology lecturers utilise to deliver their course material.
- ✓ Lecturer's knowledge/perception/opinion of online instructional tools such as Virtual Learning Environments, Blogs and Wikis etc.

To do this, a questionnaire consisting of twenty questions was designed. Questions were qualitative and quantitative in nature, and divided into the following categories,

- ✓ Area of Expertise.
- ✓ Method of Delivery & Technological Knowledge.
- ✓ Perception of Modes of Delivery.
- ✓ Personal/Additional Information.

The questionnaire was first piloted with two lecturers at ITB a week before going live. No significant issues with regard to either content or the use of the technology were identified. The most convenient and effective way of gathering this information, while maintaining anonymity, was with the aid of the online survey instrument *Question Pro* (See Appendix C).

A link to the questionnaire was emailed to the study population (using an existing database of email addresses of lecturers involved in apprenticeship training) in February. To enable participants identify the researcher and the surveys objectives, an introductory section at the beginning of the questionnaire was created. Within this section confidentiality and anonymity were also guaranteed. Lecturers were assured there was no possibility of them being identified by any means. Any data used from their contribution would be correlated to a survey number only, which had no connection to any personal information.

Questions 1 – 3 consisted of dichotomous type questions.

Their purpose was to determine the following in relation to the area of expertise of the participants,

- ✓ Trade in which they lectured.
- ✓ Phase of apprenticeship they were responsible for delivering.
- ✓ Number of years delivering apprenticeship training.

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Questions 4 – 12 consisted of dichotomous, multiple choice, open and rating scale type questions.

Their purpose was to determine the following in relation to the methods used by the participants to deliver learning material and their knowledge of online technologies,

- ✓ Tools used to support classroom based learning and the frequency of use.
- ✓ Effects of technology regarding how theoretical information is shared with and delivered to apprentices over the last 5 years.
- ✓ Effects of technology regarding how theoretical information will be shared with and delivered to apprentices over the next 5 years.
- ✓ Levels of satisfaction with the method(s) currently used to deliver theoretical content to apprentices.
- ✓ Levels of knowledge using a variety of online learning technologies.

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Questions 13 – 18 consisted of dichotomous, multiple choice, open and word association type questions.

Their purpose was to determine the following in relation to the perceptions held by the participants regarding various modes of delivery,

- ✓ Whether online technologies have a role to play in apprenticeship training going into the future.
- ✓ Whether online technologies provide apprentices opportunities to gain a deeper understanding of subject material during training.
- ✓ Identifying barriers to incorporating online learning tools into apprenticeship training.
- ✓ Most effective learning mode in terms of facilitating learning.
- ✓ Opinion of a number of online technologies used for learning.

Questions 19 & 20 consisted of demographic and open type questions.

Their purpose was to determine the following in relation to the participant and their personal opinions,

- ✓ Age bracket.
- ✓ Views in relation to the methodology used to deliver apprenticeship training.

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4. Results

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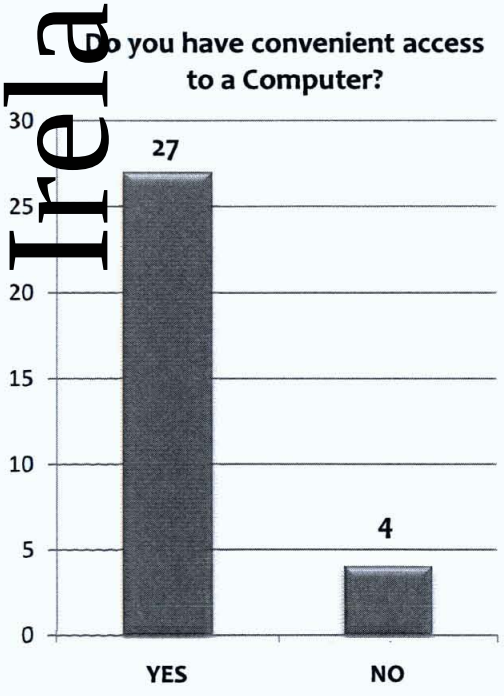
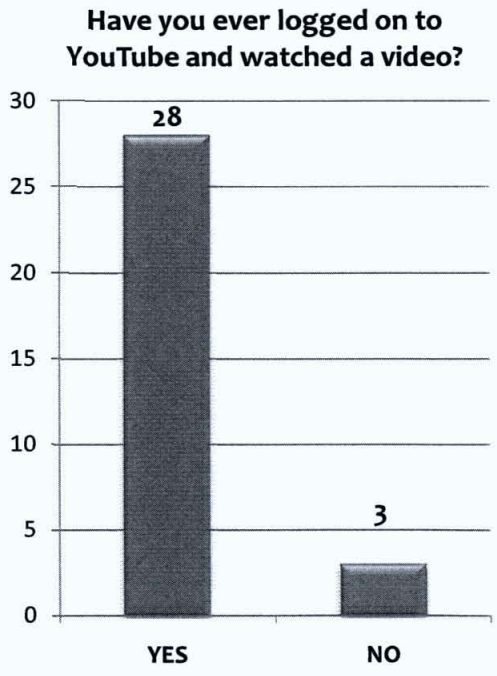
4.1 Pre Course Questionnaire - Apprentices Readiness

The objectives of this exercise are outlined on page 104. The following data was gathered from 31 apprentices during this process. An additional reason for collecting this information was to establish the readiness of apprentices to engage in a course which utilises a blended modality during delivery. It demonstrates the work needed to be done to enable apprentices effectively engage in the course. This included creating email addresses for some participants in addition to providing instruction on using email, podcasts and discussion forums.





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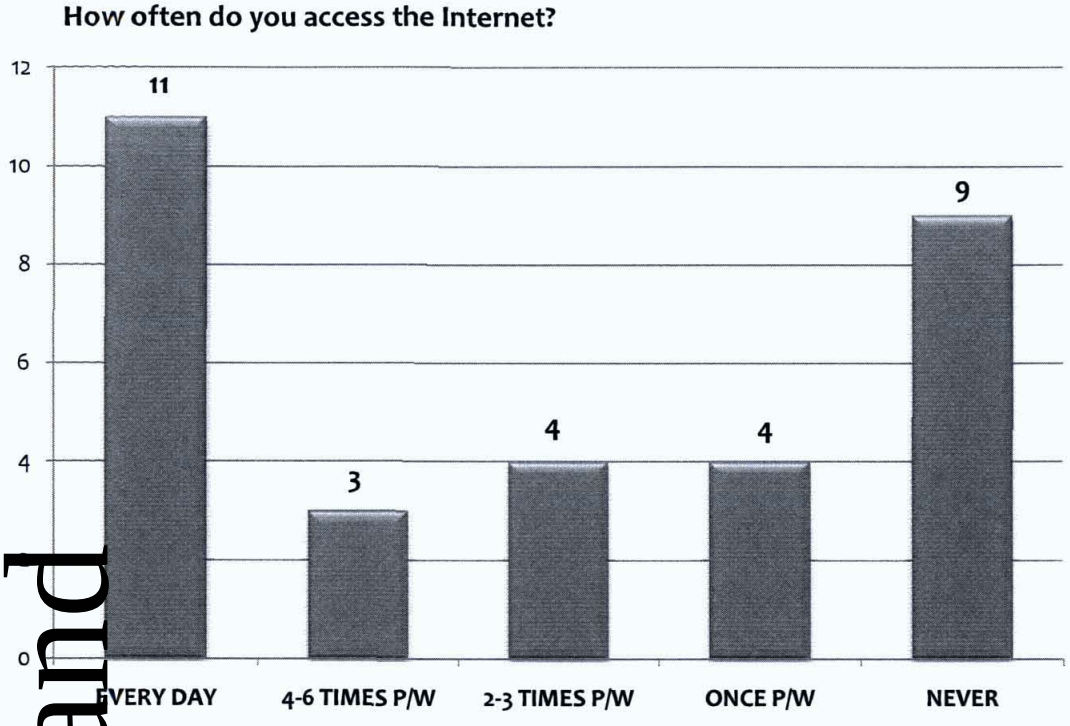

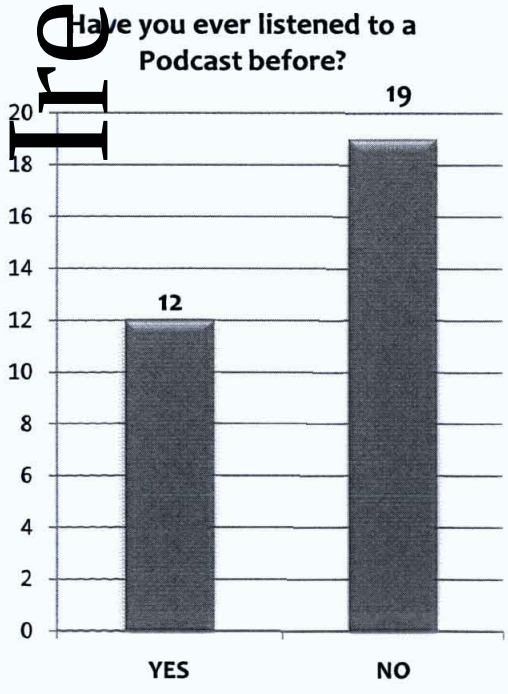

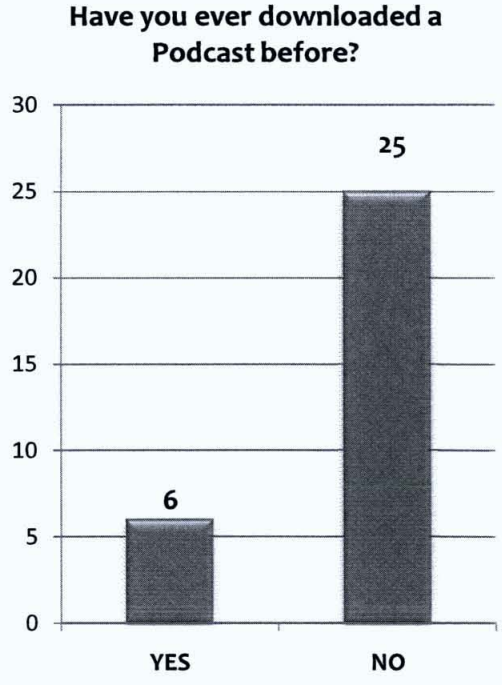

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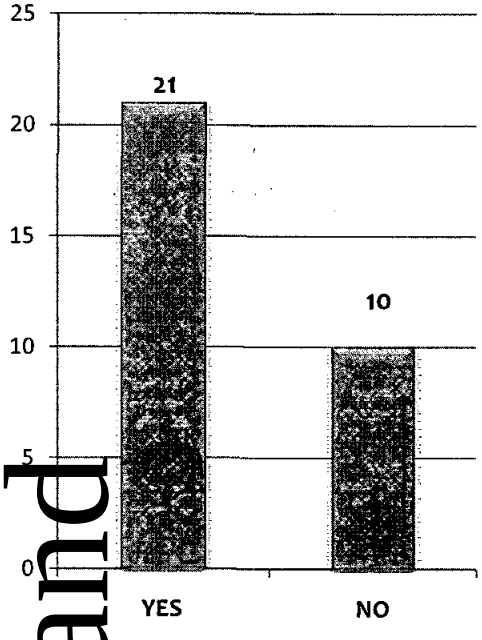

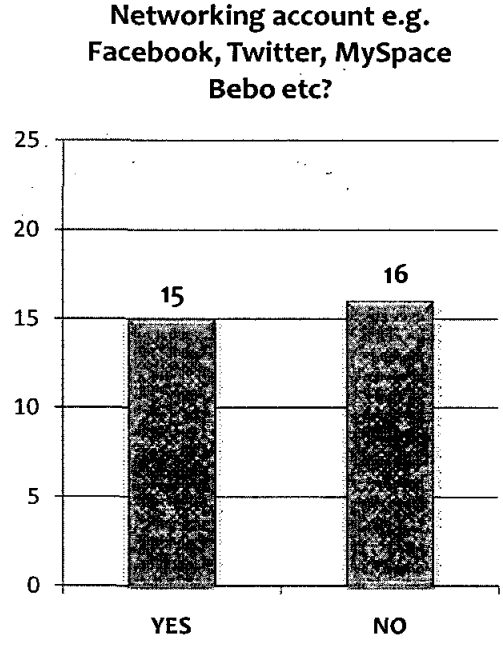

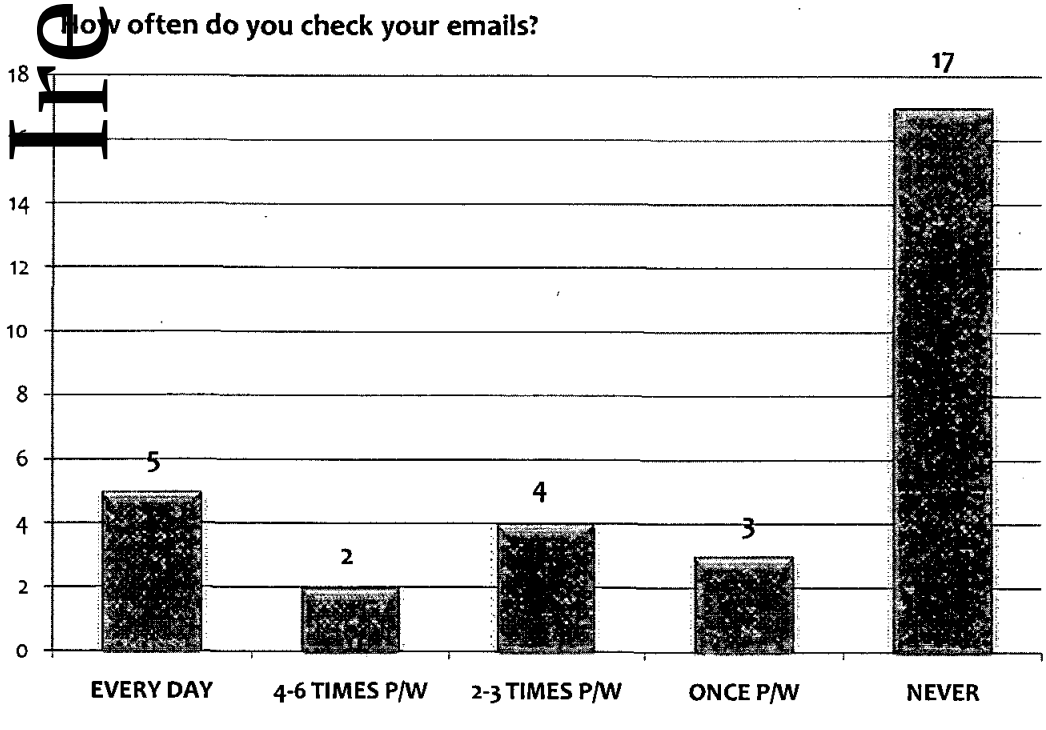

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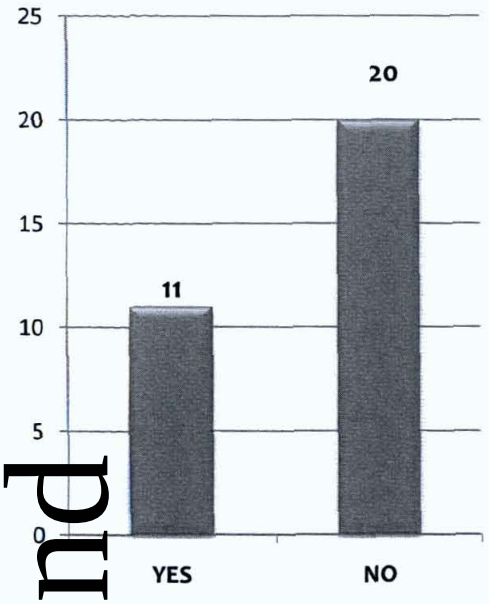

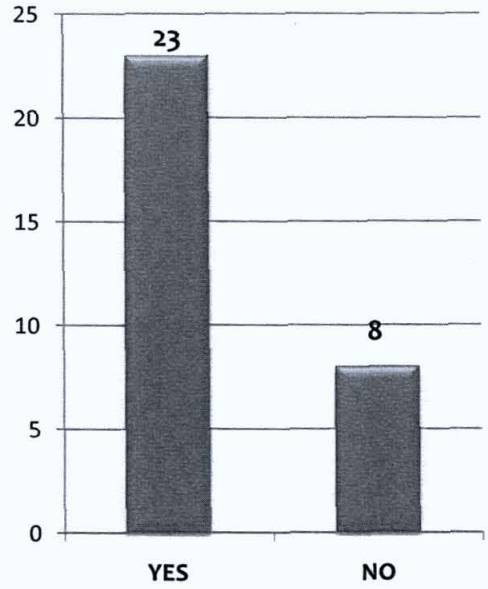

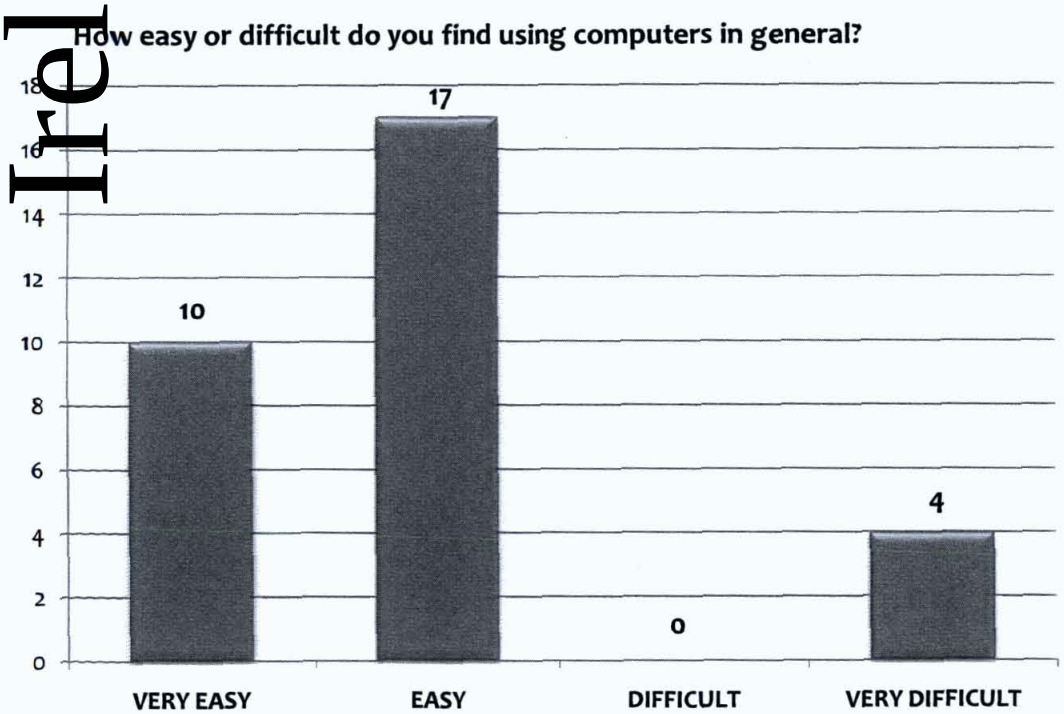

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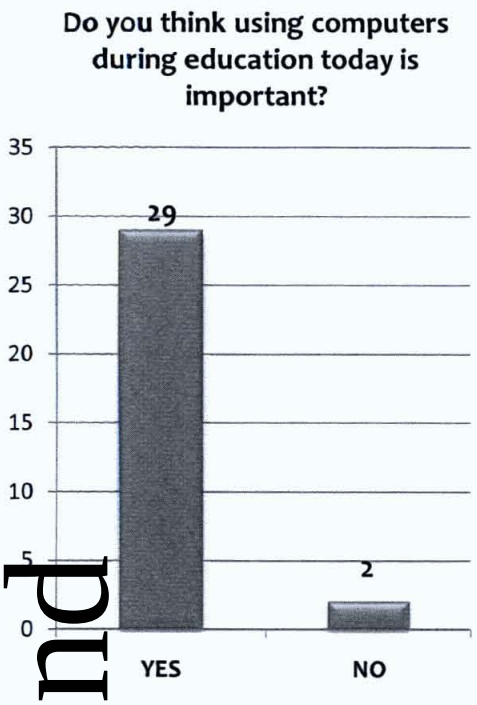

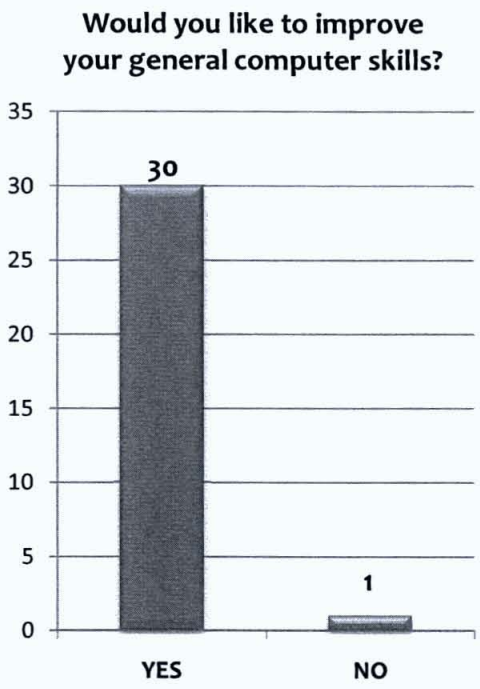

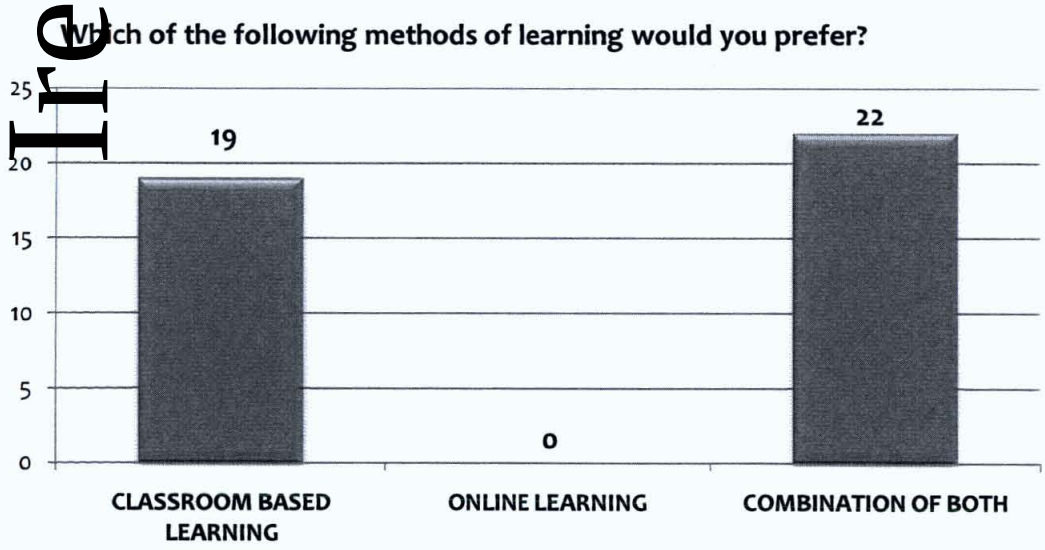

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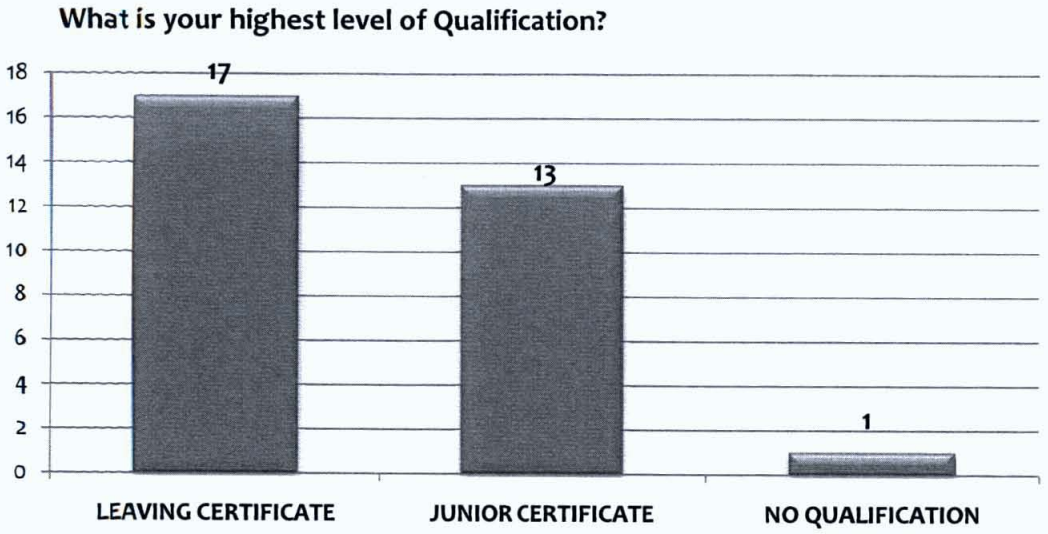

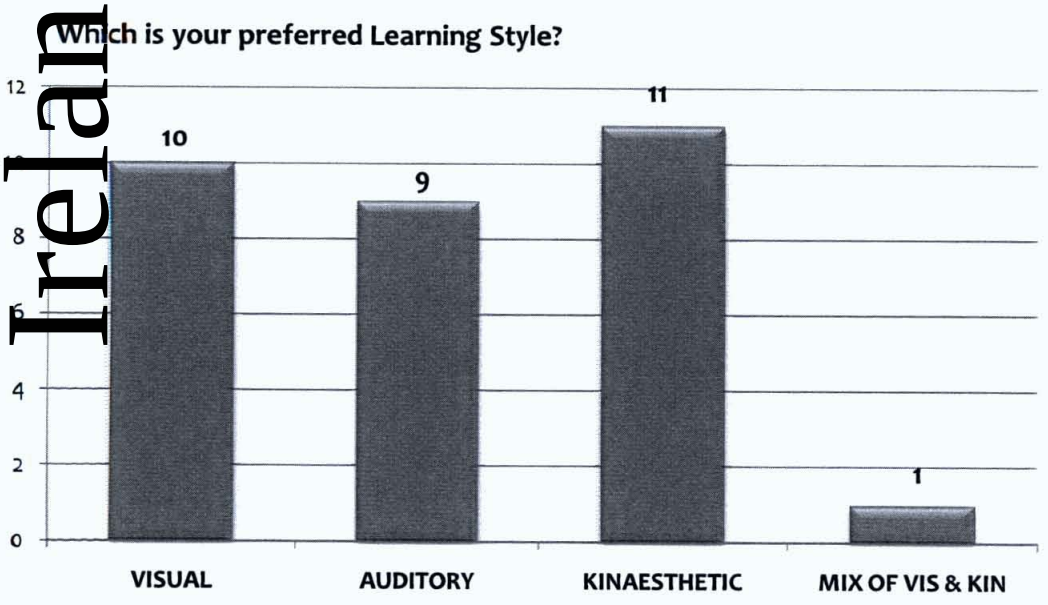

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The initial data elicited from the participants demonstrated that the majority 87% had convenient access to a computer. However, in spite of 87% finding using the internet easy or very easy, frequency of internet access among participants over the period of a week was quite low. Thirteen percent (13%) accessed the internet only once, while a surprising 29% did not access it at all - a total of 42%.

In terms of using online technologies, 90% have accessed YouTube to watch a video. Thirty nine percent (39%) have listened to a podcast but only 19% having downloaded one.

Sixty eight percent (68%) have an email account with 22% checking their emails four or more times a week. The use of social networking sites is mixed with 48% having a Facebook, Twitter, MySpace or BEBO account. Participation in online discussion forums is quite low at 35%. Regarding the perception of using computers in education 94% felt using computers was an important part of education today with 74% saying the enjoyed using computers to assist with their learning. Ninety seven percent (97%) would like to improve their general computer skills.

Seventy one percent (71%) indicated a preference for blended learning over 29% for classroom based learning alone in terms of receiving tuition. The preferred learning style among participants was very balanced - 32% Visual, 29% Auditory, 35% Kinaesthetic, while 4% were a mix of Visual & Kinaesthetic.

Levels of qualification among participants included Leaving Certificate 55%, Junior Certificate 42% and no qualification 3%.

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4.2 Experiment using Control Group Study

The objectives of this exercise are outlined on page 105. The following data was gathered during this process.

Between-Subjects Factors

		Value Label	N
topic	1	CA	31
	2	SA	31
condition	1	traditional	31
	2	blended	31

Figure 8 - Between-Subject Factors - Two-Way ANOVA

Descriptive Statistics

Dependent Variable: score

topic	condition	Mean	Std. Deviation	N
CA	traditional	59.8750	28.93412	16
	blended	84.4667	13.05410	15
	Total	71.7742	25.57696	31
SA	traditional	70.7333	17.87443	15
	blended	80.8125	12.10630	16
	Total	75.9355	15.76692	31
Total	traditional	65.1290	24.45641	31
	blended	82.5806	12.50006	31
	Total	73.8548	21.17518	62

Figure 9 Descriptive Statistics - Two-Way ANOVA

The output within the Descriptive Statistics from the two-way ANOVA (Fig. 9) displays the means and the standard deviation for each of the group. Within which it can be established how mean scores in two separate topics differ depending on the condition applied to each group.

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It also displays the mean scores when conditions applied to the two topics are combined for both groups. For example, the mean score was 84.4 when blended learning was utilised to deliver CA and 80.8 when utilised to deliver SA. When the scores of both groups who received blended learning were combined the mean was 82.5. This was better than the combined mean score for traditional learning which was calculated to be 65.

Tests of Between-Subjects Effects

Dependent Variable: score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5736.839[a]	3	1912.280	5.131	.003
Intercept	338900.952	1	338900.952	909.386	.000
topic	200.903	1	200.903	.539	.466
condition	4653.161	1	4653.161	12.486	.001
topic * condition	815.275	1	815.275	2.188	.145
Error	21614.854	58	372.670		
Total	365533.000	62			
Corrected Total	27351.694	61			

a. R Squared = .210 (Adjusted R Squared = .169)

Figure 10 Tests of Between-Subjects Effects - Two-Way ANOVA

The F - Value and their associated significance are displayed within "Tests of Between - Subjects Effects" (Fig. 10). Within which it demonstrates that there is significant difference between the conditions (F = 12.486, Sig = .001)

It can also be established from the output that regardless of the topic (CA or SA) there is no impact on the score (F = .539, Sig = .466).

No interaction between condition and topic was found (F = 2.19, Sig = .145) and is therefore insignificant.

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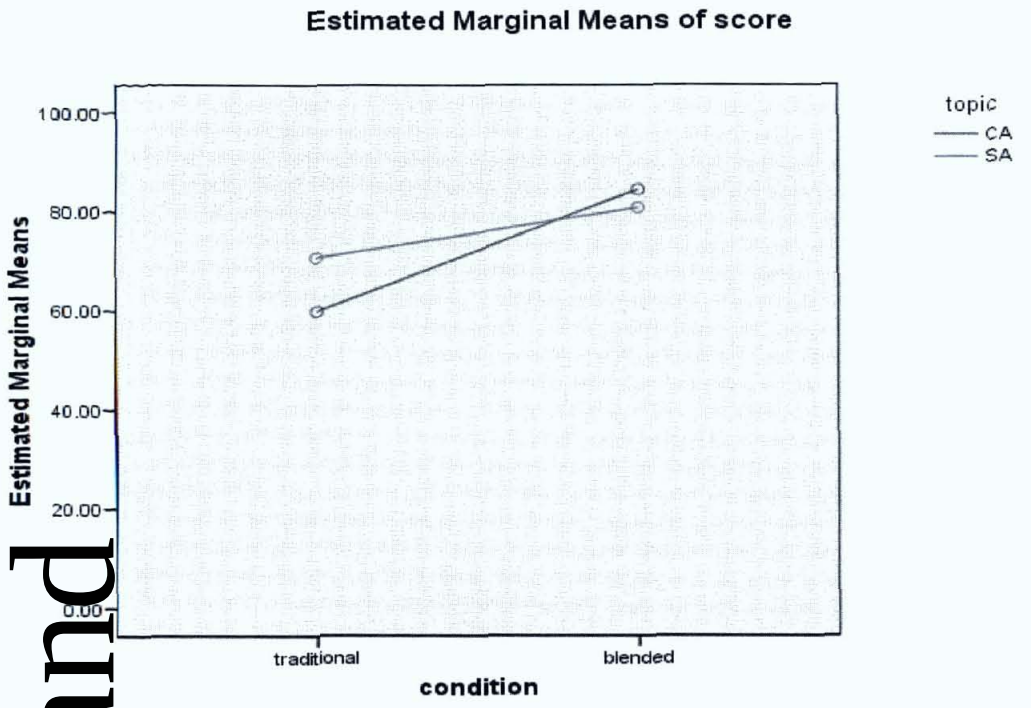

Figure 11 Estimated Marginal Means of Score - Two-Way ANOVA

The profile plot displays a graph which plots the condition along the horizontal axis and the mean values of scores on the vertical axis (Fig. 11). The lower line (blue) plots the mean value CA scores for those who received traditional learning to those who received blended learning. The upper line (green) connects the mean value SA scores for those who received traditional learning to those who received blended learning. In other words, there is no interaction between the two factors and the observed change between the two conditions can be explained by the different learning modes only.

Overall, the outputs from the two-way ANOVA demonstrate that the likelihood of the difference in scores being down to chance is extremely small.

There is therefore sufficient evidence to conclude that students who are exposed to blended learning achieve better exam scores than those who are exposed to traditional face to face learning only.

Consequently the null hypothesis (outlined on p. 105) may be rejected and the result considered significant.

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4.3 Observation

The objectives of this exercise are outlined on page 113. Because the observation ran over a period of two weeks there were occasional periods when some participants were absent. This however was rare and had an insignificant impact on the outcome. Data gathered from each apprentice (N=32) in the control (CN) and experimental (EX) group is correlated and presented within Table 9.The Table itself is a replication of the observation sheet used by the observer for each participant when collecting the data (see Appendix D). Sections one, two and three compared the control and experimental groups on three levels.

- ✓ Section one was used to observe any differences between both groups with regard to the construction procedures used to build the Camber Arch.
- ✓ Section two was used to assess whether there was an observable difference between the control and experimental group regarding the quality of workmanship and efficiency of methods used while physically constructing the Camber Arch (see Table 10 &11)
- ✓ Section three was used to observe how often participants sought clarification or assistance during the construction process from a lecturer, peer, notes or books (see Table 12).

Section 1

Table 9 Observation Results - Tasks carried Out (Section 1)

Practical Task	Occurrence	
	Control	Experimental
1. Set out the correct ope size using the timber centre provided.	75%	94%
2. Built both piers to the correct height.	100%	100%
3. Created the skewbacks to the correct angle.	88%	100%
4. Correctly set up the timber centre at the correct height.	63%	94%
5. Plumbed & levelled the timber centre.	88%	88%
6. Drawn out the Camber arch to scale.	63%	81%
7. Successfully located the striking point of the arch.	75%	81%
8. Correctly marked out the voussoirs on a setting out line.	69%	75%
9. Created a template for each voussoir on one side of the arch.	94%	100%
10. Correctly numbered each voussoir template.	81%	94%
11. Marked out each voussoir and numbered it.	94%	94%
12. Cut each voissoir to the correct markings.	50%	75%
13. Employed all safety requirements when using brick saw.	94%	94%
14. Set out the voussoirs dry on the ground.	88%	88%
15. Marked the intrados voussoir spacing's onto the timber centre.	63%	100%
16. Marked the extrados voussoir spacing's onto a timber batten.	63%	94%
17. Trim the voussoirs where appropriate at each joint.	100%	100%
18. Position a minimum of two string lines onto the wall.	81%	94%
19. Build and align each voussoir with marks on the timber centre and batten.	69%	88%
20. Position the key brick last & key joint the arch.	94%	94%
21. Remove timber centre & point soffit.	0%	0%
TOTAL AVERAGE	**76%**	**87%**

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Section 2

Table 10 Observation Results - Working Practice (Section 2A)

Description of Working Practice & Methodologies based on Observation	Control Group	Experimental Group
Very Good	44%	63%
Good	44%	31%
Poor	12%	6%
Very Poor	0%	0%

Table 11 Observation Results - Level of Competence (Section 2B)

Description of Level of Competence based on Observation	Control Group	Experimental Group
Very High	38%	56%
High	43%	38%
Average	13%	13%
Low	6%	0%

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Section 3

Table 12 Observation Results- Source & Frequency of Assistance (Section 3)

Source and Frequency of Assistance sought by Apprentices when Required	Number of Occasions	
	Control Group	Experimental Group
Lecturer	58	36
Peer	50	42
Notes/Books	6	10
Apprentices who required No Assistance	2	5

Within Section 1 the findings demonstrate in relation to carrying out the correct procedures when building the Camber Arch, the control group did this to a satisfaction level of 76% while the experimental group did it to a level of 87%. In Section 2 when those who scored in the "very good" or "good" category were taken into account, the working practices and methodologies were deemed to be at a level of 88% in the control group and 94% in the experimental group. Regarding level of competence those who were categorised as "very high" or "high" in the control group accounted for 81%, while in the experimental group it was 94%.

Section 3 demonstrates there were 202 occasions during the two week period when an apprentice required some level of assistance from a lecturer, peer or book/notes. This is approximately 8 queries per apprentice over the two week time frame (25 required assistance - 7 did not). Fifty six percent (56%) of these queries were made by the control group while 44% were made by the experimental group. Of the seven apprentices who did not require any assistance, 29% were from the control group, while 71% were from the experimental group.

These findings indicate when apprentices receive theoretical content via blended learning, the information and knowledge they accrue as a result of this delivery mode enhances their ability to perform practical tasks when compared to those who received the information using face to face tuition only. It also suggests blended learning increases levels of practical competence and promotes an element of self discovery when applying theoretical concepts during practical application.

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4.4 Post Course Questionnaire

There were two separate questionnaires used to gather data. One was administered to apprentices while the other was administered to lecturers of apprentices. The following data was gathered during this process.

4.4.1 Apprentice Questionnaire

The objectives of this exercise are outlined on pages 119 - 123. The following data was gathered from twenty five (N=25) participants. The questionnaire had a completion rate of 74% and took on average 21 minutes to complete (Fig. 12).

Survey Statistics	
Viewed	39
Started	34
Completed	25
Completion Rate	73.53%
Drop Outs (After Starting)	9
▸ Average time taken to complete survey : 21 minute(s)	

Figure 12 Completion Rate & Duration

Almost all participants (92%) accessed the blog which accompanied the course (Fig. 13). In doing so the majority found the process was either easy (20%) or very easy (8%) (Fig. 14).

Did you access the Blog that accompanied this course?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	22	91.67%	
2.	No	2	8.33%	
	Total	24	100%	

Key Analytics

Mean	1.083
Confidence Interval @ 95%	[0.970 - 1.196] n = 24
Standard Deviation	0.282
Standard Error	0.058

Figure 13 Level of Access to the Blog

How would you rate the level of difficulty accessing the Blog that accompanied this course?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Very Easy	17	68.00%	
2.	Easy	5	20.00%	
3.	Difficult	0	0.00%	
4.	Very Difficult	1	4.00%	
5.	Did not access the Blog	2	8.00%	
	Total	25	100%	

Key Analytics

Mean	1.640	Key Facts
Confidence Interval @ 95%	[1.162 - 2.118] n = 25	88% chose the following options :
Standard Deviation	1.221	Very Easy
Standard Error	0.244	Easy

Figure 14 Level of Difficulty Accessing the Blog

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There were no reasons given in a follow up question for the 4% who found it very difficult. This was however explored later during the focus group interview.

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How often did you access the Blog during the course?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	More than once a day	0	0.00%	
2.	Once a day	3	12.00%	
3.	Between 4 & 6 times a week	3	12.00%	
4.	Between 2 and 3 times a week	7	28.00%	
5.	Once a week	10	40.00%	
6.	Never	2	8.00%	
	Total	25	100%	

Key Analytics

Mean	4.200
Confidence Interval @ 95%	[3.747 - 4.653] n = 25
Standard Deviation	1.155
Standard Error	0.231

Key Facts

- 68% chose the following options :
  - Once a week
  - Between 2 and 3 times a week

Figure 15 Regularity of Access to the Blog

In terms of how often participants accessed the blog, it was established 24% did so frequently, accessing the blog between once a day and 4-6 times a week. Twenty eight percent (28%) were regular users, accessing between 2-3 times a week, while 40% used the blog relatively infrequently, accessing it once a week. Eight percent (8%) never accessed the blog (Fig. 15).

The biggest barriers cited by the participants in accessing the blog more frequently was either no access to a computer (29%) or no internet access (19%) (Fig. 16).

Other reasons included... *"Had not got the time"*[54], *"Prefer face to face learning"*[55] and *"I forgot"* [56]

Did any of the following prevent you accessing the Blog more frequently? (select one)

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	No access to a computer	6	28.57%	
2.	No internet access	4	19.05%	
3.	Did not understand how to access the Blog	0	0.00%	
4.	No barrier existed	7	33.33%	
5.	Other (type reason into box below)	4	19.05%	
	Total	21	100%	

Key Analytics

Mean	2.952
Confidence Interval @ 95%	[2.270 - 3.635] n = 21
Standard Deviation	1.596
Standard Error	0.348

Key Facts

61.9% chose the following options :

- No barrier existed
- No access to a computer

Figure 16 Barriers to Accessing the Blog more frequently

54 Participant 12949432

55 Participant 12949418

56 Participant 12949409

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The rationale most commonly cited by participants for accessing the blog was to *revise material which was delivered in class* (26%). This was closely followed by a desire to *gain a deeper understanding of course material* (21%). The following three reasons were each selected by 15% of the participants, *to support classroom learning, to access material in different formats, and to review material which was delivered in class or workshop environments that wasn't fully understood* (Fig. 17).

Which of the following were your reasons for accessing the Blog during the course? (select as many as appropriate)

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	To support classroom or workshop learning	13	15.29%	
2.	To revise material delivered in the classroom or workshop	20	23.53%	
3.	To gain a deeper understanding of the course material	18	21.18%	
4.	To review material you did not fully understand in the classroom or workshop	13	15.29%	
5.	To access material in a different format such as video, podcast, discussion forum or blog posts	13	15.29%	
6.	To collaborate and share with others	5	5.88%	
7.	Did not access the Blog	1	1.18%	
8.	Other (type reason into box below)	2	2.35%	
	Total	85	100%	

Key Analytics

Mean	3.259
Confidence Interval @ 95%	[2.898 - 3.620] n = 85
Standard Deviation	1.698
Standard Error	0.184

Key Facts

- 44.71% chose the following options :
  - To revise material delivered in the classroom or workshop
  - To gain a deeper understanding of the course material
- Least chosen option 1.18% :
  - Did not access the Blog

Figure 17 Rationale for Accessing the Blog

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Ninety one percent (91%) of participants either agreed or strongly agreed the availability of the blog encouraged them to review or revise material delivered in the classroom of workshop (Fig. 18). In addition, 83% believed they would either be very unlikely or unlikely to go online to find further information on material delivered in class or in the workshop if the blog wasn't available (Fig. 19). Of those who accessed the learning material on the blog, 92% held the opinion accessing the blog enhanced their understanding of learning material (Fig. 20). In more general terms 92% of participants either agreed or strongly agreed by blending face to face and online learning, it encouraged them to develop problem solving skills that would assist them during their career (Fig. 21).

The Blog encouraged you to review or revise material that was delivered in the classroom or workshop by you....

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Strongly Agree	13	56.52%	
2.	Agree	8	34.78%	
3.	Disagree	1	4.35%	
4.	Strongly Disagree	1	4.35%	
	Total	23	100%	

Key Analytics

Mean	1.565	Key Facts
Confidence Interval @ 95%	[1.243 - 1.887] n = 23	91.3% chose the following options : Strongly Agree, Agree
Standard Deviation	0.788	Least chosen option 4.35% : Disagree
Standard Error	0.164	

Figure 18 Revising classroom or workshop material using the Blog

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If the blog was not available to you during this course, how likely would you be to go online to find out more about the material delivered in the classroom?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Very Likely	0	0.00%	
2.	Likely	4	16.67%	
3.	Unlikely	9	37.50%	
4.	Very Unlikely	11	45.83%	
	Total	24	100%	

Key Analytics

Mean	3.292	Key Facts
Confidence Interval @ 95%	[2.991 - 3.592] n = 24	83.33% chose the following options :
Standard Deviation	0.751	Very Unlikely
Standard Error	0.153	Unlikely

Figure 19 Likelihood of seeking additional information without access to the Blog

Accessing the learning material on the Blog encouraged you to think more about subjects discussed in the class/workshop and allowed you to form greater understandings and opinions about the subject. Do you...

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Strongly Agree	12	48.00%	
2.	Agree	11	44.00%	
3.	Disagree	1	4.00%	
4.	Strongly Disagree	1	4.00%	
	Total	25	100%	

Key Analytics

Mean	1.640	Key Facts
Confidence Interval @ 95%	[1.343 - 1.937] n = 25	92% chose the following options :
Standard Deviation	0.757	Strongly Agree
Standard Error	0.151	Agree
		Least chosen option 4% :
		Disagree

Figure 20 Promoting a greater understanding of learning material using the blog

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By combining classroom learning with online learning during this course, you developed problem solving skills that will assist you during your career. Do you...

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Strongly Agree	6	24.00%	
2.	Agree	17	68.00%	
3.	Disagree	1	4.00%	
4.	Strongly Disagree	1	4.00%	
	Total	25	100%	

Key Analytics

Mean	1.880
Confidence Interval @ 95%	[1.619 - 2.141] n = 25
Standard Deviation	0.666
Standard Error	0.133

Key Facts

- 92% chose the following options :
  - Agree
  - Strongly Agree
- Least chosen option 4% :
  - Disagree

Figure 21 Utilising Blended Learning to develop problem solving skills

Regarding finding information sought when accessing the blog, most of the participants (92%) said they found what they were looking for. This appears to support the theory of utilising a multifarious approach to facilitate learners in locating information which meets their learning needs (Fig. 22). On top of this 88% found having learning material available in multiple formats was either helpful or very helpful (Fig. 23). While 96% believed it was an advantage to have access to online instructional material in a variety of formats to support face to face learning (Fig. 24).

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Did the Blog provide you with the assistance/answers you were looking for when accessing it?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	23	92.00%	
2.	No	0	0.00%	
3.	I did not access the Blog	2	8.00%	
	Total	25	100%	

Key Analytics

Mean	1.160
Confidence Interval @ 95%	[0.943 - 1.377] n = 25
Standard Deviation	0.554
Standard Error	0.111

Key Facts

100% chose the following options :
- Yes
- I did not access the Blog

Figure 22 Usefulness of the Blog in terms of providing information

Was it helpful to be able to choose from a variety of technologies such as Podcasts, Videos, Presentations etc when looking for information on the Blog?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Very Helpful	12	48.00%	
2.	Helpful	10	40.00%	
3.	Unhelpful	1	4.00%	
4.	Did not access the Blog	2	8.00%	
	Total	25	100%	

Key Analytics

Mean	1.720
Confidence Interval @ 95%	[1.371 - 2.069] n = 25
Standard Deviation	0.891
Standard Error	0.178

Key Facts

88% chose the following options :
- Very Helpful
- Helpful

Least chosen option 4% :
- Unhelpful

Figure 23 Helpfulness of having learning material available in a variety of formats

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Based on your experience, is it an advantage or disadvantage having access to online material in various formats which supports classroom/workshop learning?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	It is an Advantage	24	96.00%	
2.	It is a Disadvantage	1	4.00%	
	Total	25	100%	

Key Analytics

Mean	1.040
Confidence Interval @ 95%	[0.962 - 1.118] n = 25
Standard Deviation	0.200
Standard Error	0.040

Figure 24 Accessing online learning material - Advantage or Disadvantage?

When participants were asked to identify which instructional mode on the blog they used most often, class notes, revision questions, videos and blog posts were most common (Fig. 25).

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If you accessed the Blog, Rank in order which of the following you availed of most (1 being most often, 8 being least often)

Rank Order Analysis															
Average Rank		1		2		3		4		5		6		7		8	
Online Class Notes	2.12	16	69.57%	1	4.35%	3	13.04%	0	0.00%	1	4.35%	2	8.70%	1	4.17%	0	0.00%
Podcasts	5.74	0	0.00%	2	8.70%	2	8.70%	3	13.04%	3	13.04%	3	13.04%	3	12.50%	7	30.43%
Videos	4.26	2	8.70%	5	21.74%	1	4.35%	3	13.04%	4	17.39%	6	26.09%	1	4.17%	1	4.35%
Blog Posts	4.61	2	8.70%	3	13.04%	2	8.70%	4	17.39%	4	17.39%	3	13.04%	2	8.33%	3	13.04%
Discussion Forum	5.87	1	4.35%	2	8.70%	2	8.70%	2	8.70%	0	0.00%	4	17.39%	4	16.67%	8	34.78%
Quizzes	4.61	1	4.35%	3	13.04%	4	17.39%	4	17.39%	3	13.04%	1	4.35%	6	25.00%	1	4.35%
Revision Question Pa ...	3.96	0	0.00%	4	17.39%	7	30.43%	5	21.74%	3	13.04%	2	8.70%	1	4.17%	1	4.35%
Image Slideshow	5.04	1	4.35%	3	13.04%	2	8.70%	2	8.70%	5	21.74%	2	8.70%	6	25.00%	2	8.70%

Figure 25 Instruction Modes used most frequently on the Blog

Some of the reasons for the participant choices in the previous question included,

- ✓ *"Reviewing class notes gave me a better understanding of what was covered in the class, which I found very helpful".* [57]
- ✓ "Accessing the material was convenient and I could understand the subject more *by reviewing the material at my own pace".* [58]
- ✓ *"Blog postings are a source of good information and helpful for taking quick notes".* [59]
- ✓ *"The discussion forum was useful as it promoted interaction amongst the class".* [60]

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57 Participant 12949394

58 Participant 12949385

59 Participant 12949453

60 Participant 12949400

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Participants were asked if they believed having information available in various formats allowed connections to be made on subjects, thus leading to a deeper understanding or better perspective of the subject - 92% either agreed or strongly agreed that, yes it did (Fig. 26).

By linking pieces of information presented in different formats on the Blog and in class, did it help you gain a deeper understanding and/or better perspective of the course material?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes - Strongly Agree	7	28.00%	
2.	Yes - Agree	16	64.00%	
3.	No - Disagree	1	4.00%	
4.	No - Strongly Disagree	1	4.00%	
	Total	25	100%	

Key Analytics

Mean	1.840
Confidence Interval @ 95%	[1.570 - 2.110] n = 25
Standard Deviation	0.688
Standard Error	0.138

Key Facts

- 92% chose the following options :
  - Yes - Agree
  - Yes - Strongly Agree
- Least chosen option 4% :
  - No - Disagree

Figure 26 Value of connecting information in different formats

Every participant (100%) held the belief that utilising online instructional tools such as Blogs, YouTube and podcasting etc. made their learning experience more interesting and engaging (Fig. 27). This included those 8% who held the opinion that making information available in various formats online did not lead them to achieving a deeper understanding or better perspective of the subject matter.

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Did the use of online technologies during this course such as Blogs, YouTube, Podcasting, Discussion Forums etc make your learning experience more interesting and engaging?

Frequency Analysis				
	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	24	100.00%	
2.	No	0	0.00%	
	Total	24	100%	

Key Analytics	
Mean	1.000
Confidence Interval @ 95%	[1.000 - 1.000] n = 24
Standard Deviation	0.000
Standard Error	0.000

Figure 27 Online Technologies - Do they make Learning interesting and engaging

With regard to making connections between the multi-formatted instructional information available, 67% of participants, through their own volition, explored additional or supplementary material to that they initially sought. In doing so the blog appeared to be facilitating participants in building a knowledge network through the connection of nodes while fostering a community of inquiry (Fig. 28).

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When you accessed the Blog, did you explore additional material to that which you were looking for?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes - I accessed additional material	16	66.67%	
2.	No - I only accessed the material I was looking for	6	25.00%	
3.	I did not access the Blog	2	8.33%	
	Total	24	100%	

Key Analytics

Mean	1.417
Confidence Interval @ 95%	[1.155 - 1.678] n = 24
Standard Deviation	0.654
Standard Error	0.133

Key Facts

- 91.67% chose the following options :
  - Yes - I accessed additional material
  - No - I only accessed the material I was looking for
- Least chosen option 8.33% :
  - I did not access the Blog

Figure 28 Accessing additional Information to that sought

For many, this knowledge network was enhanced by participating in an online discussion forum - an additional node in the network. Thirty six percent (36%) made a contribution to the forum by making a new post or responding to another post. Forty eight percent (48%) viewed the discussions taking place. Although the latter made no contribution, they were exposed to the information being shared amongst their peers (Fig. 29).

Fifty two percent (52%) of the participants found discussing learning material online with their peers either helpful or very helpful (Fig. 30). While 48% of those who participated in the forum indicated it encouraged them to review the material being discussed further either on the blog or elsewhere (Fig. 31).

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Did you contribute to the Blog Discussion Forum?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes - I created new posts	2	8.00%	
2.	Yes - I responded to posts	2	8.00%	
3.	Yes - I created new posts and responded to	5	20.00%	
4.	No - but I viewed the discussion and information	12	48.00%	
5.	No - I did not contribute	4	16.00%	
	Total	25	100%	

Key Analytics

Mean	3.560
Confidence Interval @ 95%	[3.121 - 3.999] n = 25
Standard Deviation	1.121
Standard Error	0.224

Key Facts

- 68% chose the following options :
  - No - but I viewed the discussion and information
  - Yes - I created new posts and responded to posts
- Least chosen option 8% :
  - Yes - I created new posts

Figure 29 Contributing to the Discussion Forum

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How helpful did you find discussing course material online with your fellow students?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Very Helpful	6	24.00%	
2.	Helpful	7	28.00%	
3.	Unhelpful	2	8.00%	
4.	Did not participate in the discussion	10	40.00%	
	Total	25	100%	

Key Analytics

Mean	2.640	Key Facts 68% chose the following options : Did not participate in the discussion Helpful
Confidence Interval @ 95%	[2.148 - 3.132] n = 25	
Standard Deviation	1.254	Least chosen option 8% : Unhelpful
Standard Error	0.251	

Figure 30 Helpfulness of the Discussion Forum

Did participating in the Discussion Forum encourage you to research or review the material being discussed either on the Blog or elswhere?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	12	48.00%	
2.	No	5	20.00%	
3.	Did not participate in the discussion	8	32.00%	
	Total	25	100%	

Key Analytics

Mean	1.840	Key Facts 80% chose the following options : Yes Did not participate in the discussion
Confidence Interval @ 95%	[1.488 - 2.192] n = 25	
Standard Deviation	0.898	Least chosen option 20% : No
Standard Error	0.180	

Figure 31 Discussion Forum - Did it encourage further research?

When information was sought from participants in relation to their preferred methods of learning, 92% identified blended learning as their first choice (Fig. 32). Seventy six percent (76%) regarded blended learning as the most effective way of learning when compared to online or classroom learning (Fig. 33). Of the participants 72% believed they would not have gained the same amount of knowledge from the course using classroom learning only (Fig. 34).

Which of the following is your preferred method of learning?

Frequency Analysis

Answer	Count	Percent	20% 40% 60% 80% 100%
1. Online Learning only	0	0.00%	
2. Classroom Learning only	2	8.00%	
3. Combination of Online and Classroom Learning	23	92.00%	
Total	25	100%	

Key Analytics

Mean	2.920
Confidence Interval @ 95%	[2.811 - 3.029] n = 25
Standard Deviation	0.277
Standard Error	0.055

Key Facts

100% chose the following options :

- Combination of Online and Classroom Learning
- Classroom Learning only

Figure 32 Preferred Method of Learning

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Which of the following do you believe is the most effective way of learning?

Frequency Analysis				
	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Online Learning	2	8.00%	
2.	Classroom Learning	4	16.00%	
3.	Combination of Online and Classroom Learning	19	76.00%	
	Total	25	100%	

Key Analytics		
Mean	2.680	Key Facts 92% chose the following options : Combination of Online and Classroom Learning Classroom Learning Least chosen option 8% : Online Learning
Confidence Interval @ 95%	[2.434 - 2.926] n = 25	
Standard Deviation	0.627	
Standard Error	0.125	

Figure 33 Most effective way of Learning – Apprentice Perspective

Do you think you would have gained the same amount of knowledge from this course through classroom learning only?

Frequency Analysis				
	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	7	28.00%	
2.	No	18	72.00%	
	Total	25	100%	

Key Analytics		
Mean	1.720	
Confidence Interval @ 95%	[1.540 - 1.900] n = 25	
Standard Deviation	0.458	
Standard Error	0.092	

Figure 34 Perception of acquiring knowledge using Blended Learning

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The following were cited for choosing blended learning as a preferred learning method,

- ✓ *Provides a wide variety of different learning techniques that we have not been able to access before.* [61]
- ✓ *It's a big advantage, because if you don't fully understand something delivered in class or the workshop you can go online and look back over lectures and other information in your own time and at your own pace.* [62]
- ✓ *Information coming at you from several sources gives you a better chance of some of it sticking.* [63]
- ✓ *Very useful as you don't have to spend time searching through notes in a folder.* [64]
- ✓ *I never used a computer before coming to ITB. I thought it was going to be really hard, but once I decided to give it a go I thought it was a very helpful way of learning. It was more interesting and in a way, fun to be able to do more than just read about a topic such as watching a video, viewing photos or listening to a podcast. I'm grateful to Dave Cooke for teaching me about computers and showing me how easy studying can be.* [65]

61 Participant 12949397

62 Participant 12949385

63 Participant 12949398

64 Participant 12949400

65 Participant 12963979

National College of Ireland

The following were cited as reasons for choosing blended, online or classroom as the most effective way of learning,

- ✓ *Blended Learning - because although email, discussion forums etc. are useful online options, actually having the lecturer present to field questions and provide instant responses, beats having to wait for a reply, which if online, might come when the information is less fresh in your mind.* [66]
- ✓ *Blended Learning - because classroom learning can become quite tedious, while having the online option give a lot more options regarding when and how we learn.* [67]
- ✓ *Online Learning - because you are one on one and therefore take in more.* [68]
- ✓ *Online Learning - because it's interesting and there are various ways to understand different topics.* [69]
- ✓ *Classroom Learning - because it makes you think more.* [70]
- ✓ *Classroom Learning - because you get better explanations in a classroom environment.* [71]

66 Participant 12949374

67 Participant 12949397

68 Participant 12949453

69 Participant 12949394

70 Participant 12949406

71 Participant 12949404

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Participants were asked to use one word which immediately came to mind when they thought of certain instructional methods. Words used by participants were then categorised as follows - Positive, Negative, Neutral or No comment (see Table 13). Apprentices thought most positively about blended learning (88%) and this was closely followed by instructional videos and online learning (84%). Twenty percent (20%) thought negatively towards classroom learning, online discussion forums and podcasting.

Table 13 Categorisation of Instructional Models (as a percentage)

Instructional Method	Category			
	Positive	Negative	Neutral	No Comment
Classroom Learning	72%	20%	8%	0%
Online Learning	84%	8%	4%	4%
Blended Learning	88%	4%	8%	0%
Online Discussion Forums	60%	20%	16%	4%
Podcasting	48%	20%	28%	4%
Instructional Videos	84%	4%	12%	0%

The majority of participants either agreed or strongly agreed (88%) using blended learning during the course encouraged them to manage their own learning (Fig. 35).

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Blending Classroom and Online learning encouraged you to manage your own learning, i.e where, when and how you decided to learn. Do you

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Strongly Agree	10	40.00%	
2.	Agree	12	48.00%	
3.	Disagree	2	8.00%	
4.	Strongly Disagree	1	4.00%	
	Total	25	100%	

Key Analytics

Mean	1.760
Confidence Interval @ 95%	[1.455 - 2.065] n = 25
Standard Deviation	0.779
Standard Error	0.156

Key Facts

- 88% chose the following options :
  - Agree
  - Strongly Agree
- Least chosen option 4% :
  - Strongly Disagree

Figure 35 Managing Learning

One of the secondary benefits associated with employing blended learning throughout the course was how participants described their knowledge of using online technologies after the course when compared to before the course (Fig. 36 & 37).

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Before undertaking this course, how would you describe your level of knowledge on using the following technologies? (tick the appropriate box for each of the technologies listed)

Overall Matrix Scorecard

	Question	Count	Score	Excellent	Above Average	Average	Below Average	No Knowledge
1.	Email	25	2.800					
2.	Blogs	25	3.440					
3.	Podcasts	25	3.640					
4.	Discussion Forums	25	3.640					
5.	Online Videos (YouTube)	25	2.120					
		Average	**3.128**					

Figure 36 Knowledge of Online Technologies before the Course

After undertaking this course, how would you describe your level of knowledge on using the following technologies? (tick the appropriate box for each of the technologies listed)

Overall Matrix Scorecard

	Question	Count	Score	Excellent	Above Average	Average	Below Average	No Knowledge
1.	Email	25	2.000					
2.	Blogs	25	2.280					
3.	Podcasts	24	2.500					
4.	Discussion Forums	25	2.600					
5.	Online Videos (YouTube)	25	1.520					
		Average	**2.180**					

Figure 37 Knowledge of Online Technologies after the Course

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On a scale which ranged between *excellent* and *no knowledge* the overall average for all of the technologies changed in the following direction (Table 14). Individual ratings for each of the technologies before and after can be seen in Table 15.

Table 14 Knowledge of Technologies - Overall Average Rating Before & After

Online Technology	Before Rating	After Rating
E-Mail	Average	Above Average
Blogs	Below Average	Average
Podcasts	Below Average	Average
Online Discussion Forum	Below Average	Average
Instructional Videos	Average	Above Average

Table 15 Knowledge of Technologies - Individual Rating for each Before & After (as a percentage)

Online Technology	Before Rating					After Rating				
	Excellent	Above Average	Average	Below Average	No Knowledge	Excellent	Above Average	Average	Below Average	No Knowledge
E-Mail	24%	20%	20%	24%	12%	36%	32%	28%	4%	0%
Blogs	8%	0%	44%	36%	12%	20%	44%	24%	12%	0%
Podcasts	8%	8%	24%	32%	28%	21%	25%	38%	16%	0%
Online Discussion Forum	8%	8%	28%	24%	32%	16%	28%	40%	12%	4%
Instructional Videos	48%	12%	24%	12%	4%	64%	24%	8%	4%	0%

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Fig. 38 demonstrates that further to enhancing their knowledge of online instructional tools a marked improvement occurred in the frequency participants checked their email accounts when compared to answers provided in the pre course questionnaire (see Table 16).

How often do you check your emails? (select one)

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Every Day	6	24.00%	
2.	4-6 Times a week	2	8.00%	
3.	2-3 Times a week	9	36.00%	
4.	Once a week	6	24.00%	
5.	Never	2	8.00%	
6.	Dont have an email account	0	0.00%	
	Total	25	100%	

Key Analytics

Mean	2.840	Key Facts
Confidence Interval @ 95%	[2.338 - 3.342] n = 25	60% chose the following options :
Standard Deviation	1.281	2-3 Times a week
Standard Error	0.256	Every Day

Figure 38 Frequency for checking email amongst Participants

Table 16 Frequency of email access Pre Course & Post Course (by percentage)

E-Mail Access	Pre Course						Post Course					
	Every Day	4-6 Times a Week	2-3 Times a Week	Once a Week	Never	No Email Address	Every Day	4-6 Times a Week	2-3 Times a Week	Once a Week	Never	No Email Address
Usage	16%	6%	13%	10%	55%	32%	24%	8%	36%	24%	8%	0%

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Participants were asked to rate a number of instructional tools (online and offline) sometimes used when delivering training. The objective was to establish if in their opinion these tools facilitated a deeper understanding of the subject being delivered during training. The findings indicated demonstrations, classroom lectures, instructional videos and handouts along with class activities enabled this (Fig. 39).

How benificial do you believe the following are, in terms of offering you an opportunity to gain a deeper understanding of subject material during training?

Overall Matrix Scorecard

	Question	Count	Score	Very Benificial	Benificial	Dont Know	Of little benifit	Of no benifit
1.	Classroom Lecture	25	1.440					
2.	Demonstrations	24	1.333					
3.	Handouts	25	1.720					
4.	Videos (e.g YouTube)	25	1.720					
5.	Lecture Recordings	25	2.440					
6.	Class Activities	25	1.440					
7.	Websites	25	1.840					
8.	Virtual Learning Environments (e.g Moodle)	25	2.040					
9.	Blogs	25	1.800					
10.	Wikis	25	2.440					
11.	Podcasts	25	2.240					
		Average	1.859					

Figure 39 Rating online and offline Instructional Tools

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Participants were asked to express their overall levels of satisfaction with the blended approach used during the course. This was done using Kirkpatrick's four levels of evaluation.

Reaction - 88% liked the blended approach used to deliver the course (Fig. 40).

Learning - 84% said it assisted with enhancing knowledge of the subject matter delivered (Fig. 41).

Behaviour - 92% said it either enriched their learning experience, improved the way in which they view learning, or both (Fig. 42).

Return on Investment - 92% said it will assist them during exams, in their future learning experiences, or both (Fig. 43).

Overall did you like the blended approach used to deliver this course?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	22	88.00%	
2.	No	3	12.00%	
	Total	25	100%	

Key Analytics

Mean	1.120
Confidence Interval @ 95%	[0.990 - 1.250] n = 25
Standard Deviation	0.332
Standard Error	0.066

Figure 40 Reaction to Blended Learning

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Overall did the blended approach used to deliver this course assist you with enhancing your knowledge of the subject material?

Frequency Analysis				
	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	21	84.00%	
2.	No	4	16.00%	
	Total	25	100%	

Key Analytics	
Mean	1.160
Confidence Interval @ 95%	[1.013 - 1.307] n = 25
Standard Deviation	0.374
Standard Error	0.075

Figure 41 Enhancing Learning as a result of Blended Learning

Overall did the blended approach used to deliver this course enrich your learning experience or improve the way you view learning?

Frequency Analysis				
	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	It enriched my learning experience	5	20.00%	
2.	It improved the way I view learning	13	52.00%	
3.	It did both	5	20.00%	
4.	It did neither	2	8.00%	
	Total	25	100%	

Key Analytics		
Mean	2.160	Key Facts
Confidence Interval @ 95%	[1.827 - 2.493] n = 25	72% chose the following options :
Standard Deviation	0.850	Least chosen option 8% :
Standard Error	0.170	

- It improved the way I view learning
- It enriched my learning experience
- It did neither

Figure 42 Behaviour Change as a result of Blended Learning

National College of Ireland

Overall do you believe the blended approach used to deliver this course will assist you in your exams and future learning?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	It will assist me in my exams	14	56.00%	
2.	It will assist me in my future learning	4	16.00%	
3.	It will do both	5	20.00%	
4.	It will do neither	2	8.00%	
	Total	25	100%	

Key Analytics

Mean	1.800	Key Facts 76% chose the following options : • It will assist me in my exams • It will do both Least chosen option 8% : • It will do neither
Confidence Interval @ 95%	[1.392 - 2.208] n = 25	
Standard Deviation	1.041	
Standard Error	0.208	

Figure 4.3 Return on Investment as a result of Blended Learning

National College of Ireland

4.4.2 Lecturer Questionnaire

The objectives of this exercise are outlined on pages 125 - 129. The following data was gathered from twenty two (N=22) participants. The questionnaire had a completion rate of 63% and took on average 16 minutes to complete (Fig. 44).

Survey Statistics	
Viewed	46
Started	35
Completed	22
Completion Rate	62.86%
Drop Outs (After Starting)	13
Average time taken to complete survey : 16 minute(s)	

Figure 44 Completion Rate & Duration

Eighty six percent (86%) of the participants are responsible for delivering phase 4 and 6 of the apprenticeship programme (Fig. 45). In terms of duration, 82% of participants have been delivering the apprentice programme for between 6 and 15 years with 64% of these doing so between 6 and 10 years (Fig. 46).

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Which Phase of the Apprentice training programme are you responsible for delivering?

(Select one of the following options)

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Phase 4	2	9.09%	
2.	Phase 6	1	4.55%	
3.	Both	19	86.36%	
	Total	22	100%	

Key Analytics

Mean	2.773	Key Facts 95.45% chose the following options : Both Phase 4
Confidence Interval @ 95%	[2.517 - 3.028] n = 22	
Standard Deviation	0.612	Least chosen option 4.55% : Phase 6
Standard Error	0.130	

Figure 45 Lecturer distribution across Phases

How many years have you been delivering the Apprentice training programme to Apprentices?

(Select one of the following options)

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Less than 1 year	1	4.55%	
2.	1 - 5 years	1	4.55%	
3.	6 - 10 years	14	63.64%	
4.	11 - 15 years	4	18.18%	
5.	16 - 20 years	0	0.00%	
6.	21 - 25 years	0	0.00%	
7.	More than 26 years	2	9.09%	
	Total	22	100%	

Key Analytics

Mean	3.409	Key Facts 81.82% chose the following options : 6 - 10 years 11 - 15 years
Confidence Interval @ 95%	[2.852 - 3.966] n = 22	
Standard Deviation	1.333	
Standard Error	0.284	

Figure 46 Lecturer duration delivering Apprenticeship

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There was a high level of satisfaction amongst participants regarding the methods they used to deliver theory to apprentices. Fifty nine percent (59%) indicated they were satisfied while 32% said they were very satisfied (Fig. 47).

Are you satisfied with the method(s) you currently use to deliver the theory component of the Apprentice training programme to Apprentices?

(Select one of the following options)

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Very Satisfied	7	31.82%	
2.	Satisfied	13	59.09%	
3.	Unsatisfied	2	9.09%	
4.	Very Unsatisfied	0	0.00%	
	Total	22	100%	

Key Statistics

Mean	1.773
Confidence Interval @ 95%	[1.517 - 2.028] n = 22
Standard Deviation	0.612
Standard Error	0.130

Key Facts

90.91% chose the following options :

- Satisfied
- Very Satisfied

Figure 47 Satisfaction with Delivery Methods

When participants were asked what could be done to change a "satisfied" rating to "very satisfied" the following were typical comments.

- ✓ *More time required to develop course material to fit new delivery methods.* [72]
- ✓ *More work on my part preparing lectures for online application.* [73]
- ✓ *By learning about new technologies that will help my learners more.* [74]
- ✓ *Updating our delivery system.* [75]
- ✓ *More support in relation to timetables to enable the creation of learning resources and more collaboration with peers.* [76]

Participants were asked what, if any, tools they used to support classroom learning. The findings here were similar to those cited earlier by apprentices as facilitating a deeper understanding of subject matter during training (see Fig. 39). Lecturers indicated a preference for supporting classroom learning with demonstrations (21%), handouts (21%), class activities (18%) and instructional videos (12%). Only 8% utilised an online learning environment such as Moodle (Fig. 48).

72 Participant 12949326

73 Participant 12949718

74 Participant 12997429

75 Participant 12955376

76 Participant 12970109

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Do you supplement your Lectures with any of the following?

(Select as many of the following options that are applicable. If you choose "other" please elaborate within the text box provided)

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Demonstrations	21	21.21%	
2.	Handouts	21	21.21%	
3.	Videos	12	12.12%	
4.	Voice Recordings	1	1.01%	
5.	Class Activities	18	18.18%	
6.	Websites	11	11.11%	
7.	Moodle (or similar)	8	8.08%	
8.	Blog	2	2.02%	
9.	Wiki	0	0.00%	
10.	Podcast	2	2.02%	
11.	None	0	0.00%	
12.	Other	3	3.03%	
	Total	99	100%	

Key Analytics

Mean	3.909
Confidence Interval @ 95%	[3.377 - 4.441] n = 99
Standard Deviation	2.700
Standard Error	0.271

Key Facts

- 42.42% chose the following options :
  - Demonstrations
  - Handouts

Figure 48 Tools used to support Lectures

The frequency of use of each of these tools can be seen in Table 17. It is worth noting the relative infrequent use of instructional videos by lecturers in this Table. This is in spite of the apprentice sample rating instructional videos highly in their ability to facilitate a deeper understanding of subject material.

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Table 17 Frequency of use of support tools (rounded to nearest percentage)

Support Tool	Frequency					
	Every Day	2-4 Times P/W	Once P/W	Once P/M	Never	N/A
Demonstrations	14%	41%	36%	9%	0%	-
Handouts	29%	29%	29%	10%	5%	-
Instructional Videos	0%	7%	21%	57%	14%	-
Lecture Recordings	0%	0%	11%	11%	67%	11%
Class Activities	26%	37%	32%	5%	0%	-
Websites	6%	6%	44%	31%	6%	6%
VLE (Moodle)	31%	8%	15%	8%	23%	15%
Blog	14%	0%	0%	14%	57%	14%
Wiki	0%	0%	0%	0%	83%	17%
Podcast	0%	0%	25%	0%	63%	12%

When asked if online technologies has changed the way participants share information and deliver theory to apprentices over the last five years 68% said it had (Fig. 49). In addition, 82% believe online technologies will change this over the next five years (Fig. 50).

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Have online technologies changed the way in which you share information and deliver theory to Apprentices over the last 5 years?

Frequency Analysis				
	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	15	68.18%	
2.	No	7	31.82%	
	Total	22	100%	

Key Analytics	
Mean	1.318
Confidence Interval @ 95%	[1.119 - 1.517] n = 22
Standard Deviation	0.477
Standard Error	0.102

Figure 49 Technology effects over last 5 years

Do you believe online technologies will change the way in which you share information and deliver theory to Apprentices over the next 5 years?

Frequency Analysis				
	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	18	81.82%	
2.	No	4	18.18%	
	Total	22	100%	

Key Analytics	
Mean	1.182
Confidence Interval @ 95%	[1.017 - 1.347] n = 22
Standard Deviation	0.395
Standard Error	0.084

Figure 50 Technology effects over next 5 years

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The following explanations are offered in relation to how online technologies have changed delivery methods over the last 5 years,

- ✓ *More use of Video, imagery and online discussion.* [77]
- ✓ Access to up to date information allows quality material to be sourced easily and passed on to students. [78]
- ✓ *Online resources allow apprentices access learning material - class time can then focus on key points, discussion and questions.* [79]
- ✓ *Use of technology opens up the possibility of less structured learning.* [80]

The following explanations are offered in relation to how participants believe online technologies will change delivery methods over the next 5 years,

- ✓ *Increased use of technology.* [81]
- ✓ *More interactive tools for students.* [82]
- ✓ Less face to face interaction. [83]

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77 Participant 12948745

78 Participant 12949004

79 Participant 12949437

80 Participant 12997429

81 Participant 12948745

82 Participant 12948812

83 Participant 12949185

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- ✓ *It will allow larger numbers of students to share information without having to attend college.* [84]
- ✓ *I believe I will move the ownership of learning material from myself to the student using online tools.* [85]

Participants were asked to rate their knowledge of a number of online technologies. Table 18 displays the findings.

Table 18 Lecturer Knowledge of online technologies (as a percentage)

Online Technology	Rating				
	Excellent	Above Average	Average	Below Average	No Knowledge
E-Mail	45%	23%	32%	0%	0%
VLE (Moodle)	5%	36%	32%	9%	18%
Blogs	10%	10%	24%	24%	33%
Wikis	5%	19%	24%	10%	43%
Podcasts	5%	10%	29%	14%	43%
Discussion Forums	14%	10%	24%	38%	14%
Instructional Videos	9%	41%	18%	23%	9%

84 Participant 12949326

85 Participant 12970109

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When a comparison is made between how participant lecturers and apprentices rate their own knowledge of online instructional technologies, it can be seen within Table 19 that with the exception of email, apprentices rate their own knowledge higher than lecturers rate their own knowledge.

Table 19 Comparison of how participant lecturers and apprentices rate their own knowledge of online instructional technologies (as a percentage)

Online Technology	Lecturer Knowledge					Apprentice Knowledge				
	Excellent	Above Average	Average	Below Average	No Knowledge	Excellent	Above Average	Average	Below Average	No Knowledge
E-Mail	45%	23%	32%	0%	0%	36%	32%	28%	4%	0%
Blogs	10%	10%	24%	24%	33%	20%	44%	24%	12%	0%
Podcasts	5%	10%	29%	14%	43%	21%	25%	38%	16%	0%
Online Discussion Forum	14%	10%	24%	38%	14%	16%	28%	40%	12%	4%
Instructional Videos	9%	41%	18%	23%	9%	64%	24%	8%	4%	0%

Seventy six percent (76%) of participants believe that online technologies such as those listed above will play a key role in the way apprentice training is delivered to apprentices over the next five years (Fig. 51).

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Do you believe the use of online technologies (similar to those listed in the previous question) will play a key role in the way Apprenticeship training is delivered to Apprentices in the next five years?

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Yes	16	76.19%	
2.	No	5	23.81%	
	Total	21	100%	

Key Analytics

Mean	1.238
Confidence Interval @ 95%	[1.051 - 1.425] n = 21
Standard Deviation	0.436
Standard Error	0.095

Figure 51 Importance of Online Instructional tools over next 5 years

Participants were asked to rate a number of instructional tools (online and offline) sometimes used when delivering training. The objective was to establish if in their opinion these tools facilitated a deeper understanding of the subject being delivered during training (Fig. 52).

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How benificial do you believe the following are, in terms of offering Apprentices an opportunity to gain a deeper understanding of subject material during training?

Overall Matrix Scorecard

	Question	Count	Score	Very Benificial	Benificial	Dont Know	Of little benifit	Of no benifit
1.	Demonstrations	22	1.182					
2.	Handouts	21	2.143					
3.	Videos (e.g YouTube)	21	2.048					
4.	Lecture Recordings	21	2.810					
5.	Class Activities	20	1.300					
6.	Websites	20	2.000					
7.	Virtual Learning Environments (e.g Moodle)	21	2.000					
8.	Blogs	20	2.700					
9.	Wikis	20	2.600					
10.	Podcasts	20	2.750					
		Average	2.153					

Figure 52 Rating online and offline Instructional Tools

When the views of lecturers are compared with apprentices, the findings indicate demonstrations are most highly regarded by both sets of participants. Instructional videos are next although apprentices show a higher regard for this mode of learning than lecturers. Handouts are thought of quite highly by apprentices and reasonably highly by lecturers. An interesting observation is apprentices regard online instructional tools far higher than lecturers, but perhaps more telling is the fact that lecturers largely "don't know" if these tools generate a deeper understanding of learning material for apprentices (see Table 20).

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Table 20 Participant lecturers and apprentice's views on which tools generate a deeper understanding of learning material for apprentices (as a percentage)

Instructional Tools	Lecturer Perception					Apprentice Perception				
	Very Beneficial	Beneficial	Don't Know	Of Little Benefit	Of No Benefit	Very Beneficial	Beneficial	Don't Know	Of Little Benefit	Of No Benefit
Demonstrations	82%	18%	0%	0%	0%	71%	25%	4%	0%	0%
Handouts	14%	71%	5%	5%	5%	44%	48%	0%	8%	0%
Instructional Videos	14%	67%	19%	0%	0%	44%	48%	4%	0%	4%
Lecture Recordings	0%	29%	61%	10%	0%	16%	52%	12%	12%	8%
Class Activities	70%	30%	0%	0%	0%	60%	36%	4%	0%	0%
Websites	5%	90%	5%	0%	0%	40%	52%	0%	0%	8%
VLE (Moodle)	29%	43%	28%	0%	0%	36%	36%	20%	4%	4%
Blogs	10%	15%	70%	0%	0%	40%	52%	0%	4%	4%
Wikis	10%	25%	60%	5%	0%	16%	44%	28%	4%	8%
Podcasts	10%	15%	65%	10%	0%	24%	52%	8%	8%	8%

With regard to participants incorporating an element of online instruction into their teaching while delivering theory training, 88% said there was some form of barrier to them doing this – primarily the time associated with it (Fig. 53).

Six percent (6%) gave the following specific reasons for not incorporating online instruction,

- ✓ *The ability (lack) of apprentices to use the technology.* [86]
- ✓ *Real support from management is required.* [87]
- ✓ *Enabling access for every apprentice is a challenge.* [88]

Do you regard any of the following as a barrier to you incorporating online learning tools into Apprenticeship training?

(Select as many of the following options that are applicable. If you choose "other" please elaborate within the text box provided)

Frequency Analysis

	Answer	Count	Percent	20% 40% 60% 80% 100%
1.	Cost of Software	6	11.54%	
2.	Time associated in developing material	15	28.85%	
3.	Lack of technical knowledge	7	13.46%	
4.	Unavailability of training	7	13.46%	
5.	Little or no technical support	6	11.54%	
6.	Lack of evidence to say it works	5	9.62%	
7.	No barriers exist	3	5.77%	
8.	Other	3	5.77%	
	Total	52	100%	

Key Analytics

Mean	3.654
Confidence Interval @ 95%	[3.095 - 4.213] n = 52
Standard Deviation	2.057
Standard Error	0.285

Key Facts

- 42.31% chose the following options :
  - Time associated in developing material
  - Lack of technical knowledge
- Least chosen option 5.77% :
  - No barriers exist

Figure 53 Barriers tot incorporationg online instruction into theory training

86 Participant 12948867

87 Participant 12970109

88 Participant 12995625

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When information was sought from participants in relation to which method of instruction they thought was the most effective way of apprentices learning, 71% identified blended learning as their first choice with the remainder choosing classroom learning (Fig. 54). This compares with 92% of apprentices identifying blended learning as their first choice (see Fig. 33).

Which of the following do you believe is the most effective way for Apprentices to learn while attending college during Phase 4 & 6?

Frequency Analysis

Answer	Count	Percent	20% 40% 60% 80% 100%
1. Online Learning	0	0.00%	
2. Classroom Learning	6	28.57%	
3. Combination of Online and Classroom Learning	15	71.43%	
Total	21	100%	

Key Analytics

Mean	2.714
Confidence Interval @ 95%	[2.516 - 2.912] n = 21
Standard Deviation	0.463
Standard Error	0.101

Key Facts

100% chose the following options :

- Combination of Online and Classroom Learning
- Classroom Learning

Figure 54 Most effective way of Learning – Lecturer Perspective

The following were cited by lecturers as reasons for choosing either classroom or blended as the most effective way of learning,

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- ✓ *Blended Learning – The literature suggests mixed methods and self directed learning has been proven to be successful.* [89]
- ✓ *Blended Learning – Accommodates flexibility.* [90]
- ✓ *We are more aware students have preferred learning styles – therefore we must do our best to accommodate that.* [91]
- ✓ *Blended Learning – Online resources provide a helpful supplement to classroom learning during training.* [92]
- ✓ *Blended Learning – Direct teaching is required to help learners make connection to their own community of practice, however online can help cover large parts of the syllabus where direct instruction is not required.* [93]
- ✓ *Classroom Learning – Provides greater contact with students – I am able to identify weaker students early on and assist where necessary.* [94]
- ✓ *Classroom Learning – Apprentices are practical learners and benefit most from interaction with lecturers through discussion, demonstrations and questions.* [95]

89 Participant 12949185
90 Participant 12948745
91 Participant 12949019
92 Participant 12949437
93 Participant 12970109
94 Participant 12948898
95 Participant 12949437

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✓ *Classroom Learning – Many students don't have access to a computer at home.* [96]

Participants were asked to use one word which immediately came to mind when they thought of certain instructional methods. Words used by participants were then categorised as follows - Positive, Negative, Neutral or No comment. Comparison between the perception of lecturers and apprentices are presented in Table 21.

Table 21 Categorisation of Instructional Models (as a percentage)

Instructional Method	Lecturer Perception				Apprentice Perception			
	Positive	Negative	Neutral	No Comment	Positive	Negative	Neutral	No Comment
Classroom Learning	45%	18%	36%	0%	72%	20%	8%	0%
Online Learning	45%	18%	33%	5%	84%	8%	4%	4%
Blended Learning	64%	10%	18%	9%	88%	4%	8%	0%
Online Discussion Forums	64%	14%	18%	5%	60%	20%	16%	4%
Podcasting	27%	9%	50%	14%	48%	20%	28%	4%
Instructional Videos	55%	5%	27%	14%	84%	4%	12%	0%

96 Participant 12952218

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To complete the survey participants were asked to offer additional comments in relation to the methodology used to deliver apprenticeship training. The following were offered,

- ✓ *We all need to incorporate different teaching and learning styles. In my trade area (and perhaps in all apprenticeship training within my IT) I'm the only one who makes use of Moodle. Colleagues are either afraid or lazy when it comes to utilising new technologies, yet the experience reflected back by apprentices is excellent.* [97]
- ✓ *Many apprentices just want to get through their course and are not really interested in studying more than they have to. Ask how many apprentices purchase books relating to their craft and the answers are depressing.* [98]
- ✓ *I think new on-line learning technologies are exciting and will only improve and should be embraced. However, some of the traditional methods of learning will still have a role for some time into the future.* [99]
- ✓ *I feel that apprentices benefit from a mixture of learning methods as there is generally a broad range of academic ability within a class. What works for one does not always work for others.* [100]

97 Participant 12949019

98 Participant 12949303

99 Participant 12949004

100 Participant 12949437

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4.5 Focus Group Interview

The primary objective in undertaking this form of enquiry was to check the validity of the data collected during surveys, observation and discussions with apprentices; however it also provided an opportunity to test the hypothesis presented earlier.

The three areas to be addressed during the informal conversation included,

- ✓ Motives or barriers to accessing the online support blog.
- ✓ Opinions on building knowledge networks through connecting information presented using multiple formats.
- ✓ Perceptions of blended learning and online instructional technologies.

Because listening is regarded as *the most important skill in interviewing*, a *three level listening strategy* was employed (Seidman 2006, p.78-79). This involved,

1. Listening carefully to what participants were saying to ensure clarity.
2. Listening to the participants' *true inner voice* rather than the *guarded outer voice* (Steiner 1978 in Seidman 2006, p.78).
3. Listening while being aware of the process, environment and participant emotions.

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While this was an important element of the research, the data gathered during the conversation did not elicit information that was significantly different from that already collected. It did however provide validity to data already collected. A transcript of the discussion is presented within Appendix E.

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4.6 Summary of Results

Convenient access to computers exists for most apprentices. Although many report accessing the internet relatively infrequently prior to the delivery of the course, this changed throughout the course. This was largely as a result of demonstrating to apprentices how this process worked and by providing relevant information online that would assist them during the course and with their exams. A surprisingly high number of apprentices did not have an email address at the beginning of the course and only a minority reported checking their email accounts on a regular basis. Once again however this changed during the course when those without email addresses were supplied with one and instructed how to utilise it. Email was used regularly by the lecturer as a supplementary form of communication with apprentices. Most apprentices make use of instructional videos such as those found on YouTube, and half of those surveyed have a social networking account. A large majority of apprentices report they enjoy using computers and online instructional tools to learn, and wish to improve their general computer skills. This is generally because they believe computers play an important role both during their education and beyond. Although apprentices expressed only a slight preference for blended learning over classroom learning prior to undertaking the course which utilised blended learning, this changed significantly after the course was delivered. Almost all expressed a preference for the blended approach over the classroom only approach.

This preference can be academically justified too, as the quantitative findings demonstrate, when a comparison is made to identify if there is significant improvement in the exam scores of students who are exposed to blended learning when compared to those exposed to traditional face to face learning only - those exposed to blended learning score higher.

Supporting classroom learning with relevant online material in a variety of formats offers apprentices' convenience. It also encourages access to the internet, participation, collaboration, self direction, further exploration and an opportunity to revise material delivered in class.

By making this information available to apprentices at one online location (e.g. blog), using multiple formats and instructional tools, apprentices report they are able to build knowledge by connecting information gleaned from one format/method to another. This in turn offers apprentices an opportunity to gain a deeper understanding of learning material (*know why*) by linking together information (*know what*) using techniques which meet their personal needs (*know how*).

Utilising online learning technologies during training to support classroom learning has an added benefit of making the learning experience of apprentices more interesting and engaging. The perception of blended learning is very positive among apprentices and is regarded more highly than either classroom learning or online learning alone.

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Apprentices rated their ability to use all of the online instructional tools made available on the blog during the course higher on completion than they did at the beginning. It would appear once material is relevant and of value to the apprentice, there is a strong willingness for them to use these tools and in doing so, skill levels and perceptions of same are enhanced.

On evaluation, the blended learning model of instruction used during the course was successful on a number of levels. Apprentices liked it, it enhanced their knowledge, it enriched their learning experience and it improved they way in which they viewed learning. It also had very positive impact on their exam scores.

With regard to participant lecturers, almost all were happy with the methodology they employ when delivering training to apprentices. However, very few utilised an online environment to share or make classroom information available outside of the classroom. The main barrier to doing this was the time it would take to develop the material followed by a lack of technical knowledge and the unavailability of training. In the last five years, almost two thirds of lecturers have changed the way they deliver training material to apprentices. They have done this largely by supplementing classroom lectures with demonstrations, handouts and class activities. There is recognition amongst the majority of lecturers that online technologies will play a key role and change how they currently deliver training to apprentices over the next five years and that face to face interaction will be less than it is currently.

In comparing how apprentices (after completing the course) and lecturers rated their own knowledge of a number of online instructional tools, apprentices rated their knowledge far higher than lecturers. The only exception was for email - both groups rated their knowledge equally. In general terms online instructional tools are not as highly regarded by lecturers as they are by apprentices. Once again a barrier for some lecturers incorporating such tools into their teaching is the perception that it requires a large amount of time.

While almost all apprentices recognised blended learning as the most effective method of learning, just less than three quarters of lecturers believe this to be the case. This imbalance may be as a result of some lecturers not having the opportunity (due to reasons outlined earlier) or knowledge to implement this pedagogical approach.

When lecturer perceptions of a number of learning modes and instructional tools are compared to apprentice perceptions, apprentices display a higher regard for those modes and tools which include an online or technological element. Interestingly they also show a higher regard for classroom learning than lecturers do. Although appearing unusual, it may be a secondary benefit to utilising blended learning in apprenticeship training - i.e. apprentice perception of classroom learning may actually be enhanced when supported with online material.

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5. Discussion

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5.1 Assessing the impact of change on Apprentices

At the outset of this paper positive and negative implications of change were highlighted. Some of the negative elements mentioned and often associated with change included fear, worry, anxiety, and resistance. It's likely that some apprentices experienced some or all of these at the beginning of this study, particularly in relation to the blended learning methodology used to deliver the course as none had experienced it before. However there was an intense willingness on their part to engage and participate in this process. At no stage was there ever any indication of resistance. Not once did any apprentice say they were unwilling to modify or change how they build upon their trade related knowledge or indeed to explore new opportunities to learn.

For apprentices and qualified trades people, particularly in the construction industry, change is just another part of their job. Moving from one project to the next is normal. Using different methods and techniques along the way to accomplish a task is simply part of the process. The findings in this paper indicate apprentices within this sector have a very flexible disposition towards change.

By embracing change and engaging fully in this research apprentices demonstrated this characteristic can also be attributed to them during the delivery of theoretical content while attending IOTs. Initial fears, worries or anxieties dissipated during the course and were replaced by hope, opportunity, freedom and ultimately satisfaction.

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Apprentices don't just acknowledge change as being an intrinsic component of their job, they appreciate change can bring about educational benefits which will ultimately enhance their knowledge and performance.

5.2 Justification for Change

Architect Frank Lloyd Wright used the phrase "form follows function" - suggesting that the way a structure is to be used should determine the way it gets shaped. Educators and educational institutions in today's world must remain conscious of this principle when designing and delivering educational material. Learners and their associated educational needs must shape the structure of training and not the other way round.

The face to face only methodology employed by FAS to deliver the theory element of the Standards Based Apprenticeship has remained largely unchanged over the last sixteen years. This means apprentices are being shaped by a structure that has not factored in the educational needs or demands of the modern learner. This is in spite of...

(a) Copious amounts of evidence within the literature and research findings to suggest it is not the optimum way for learners to build knowledge.

(b) Significant advances in online instructional technologies.

(c) Substantial growth in the use of technology in other areas of education.

(d) Apprentices expressing a preference to use a blended approach while learning.

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Bell (1997) argues that educators who provide training with the aid of technology promote meaningful, engaging learning amongst learners which affords them the opportunity to work with a wealth of resources. By failing to adapt the methodology used to deliver theory training during this time FAS have demonstrated an inflexible and unresponsive characteristic - the complete opposite to apprentices.

5.3 Future Proofing Apprentices and Apprenticeship

The rigid approach by FAS lends credence to the view outlined earlier by Roger Schank who suggested one of the reasons the education system has remained largely unchanged over such a long period of time is because *our school system hates innovation*. Callan & Fergusson (2009, p. 1) offer support to this view contending *major barriers exist in regard to changing the mindset of traditionalists who are locked into traditional methods of delivery.* There appears to be no other good or valid reason to explain the unresponsive nature of FAS in this regard.

For example, within the FAS mission statement it clams its objectives include,

(a) Promoting a more competitive economy.

(b) Enhancing the skills and capabilities of individuals.

(c) Collaborating with all stakeholders.

However the research finds FAS may in some cases be failing to meet their objectives. In terms of promoting a more competitive economy, FAS themselves must first apply an element of competitiveness within its own organisation.

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Using the IBM example outlined earlier, if FAS were to deliver theoretical training to apprentices using blended learning instead of face to face only, there is potential for a substantial reduction in their €130 million expenditure each year on apprentice training. Amongst the core values listed by FAS within their Statement of Strategy (2006 - 2009, p. 8) it states they will "*Always conduct FAS business in a prudent manner and in accordance with best practice compliance, governance and risk management. Protecting FAS resources and seeking out value for money in the work we do by achieving the greatest efficiency and effectiveness for the minimal cost*". The research finds current practices employed by FAS in relation to the delivery of apprentice training do not support this. Given the objectives and values of FAS, there is no identifiable reason why blended learning should not be strongly considered by FAS to deliver the theoretical content of apprentice training.

With regard to enhancing the skills and capabilities of learners, the quantitative and qualitative research finds the face to face methodology employed by FAS to deliver the theory element of apprentice training is not the optimum solution. By continuing to employ it, it diminishes the possibility of apprentices attaining highest possible levels of skill and competence. Furthermore it lessens the opportunity for apprentices to meet the government's vision for 2020. It does this by being *static* and minimising the opportunity for apprentices to *demonstrate transferable skills, IT skills, people skills and flexibility*.

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As a result, the current practice employed by FAS misaligns with the government's vision for 2020 and therefore must change. Given the governments rationale for their 2020 vision and the potential repercussions in the absence of policy change, modification of how the theoretical element of apprentice training is delivered to apprentices must occur.

In terms of stakeholder collaboration, while some level of collaboration does exist between some of the apprenticeship stakeholders, almost no formal feedback is obtained by FAS from apprentices regarding their levels of satisfaction with their training. This is a critical flaw in the design of apprentice training. Kirkpatrick (1998) suggests evaluation is essential for successful training to occur. Without regular feedback from apprentices or monitoring of satisfaction levels, effective, meaningful training is impossible. Once again, given the mission statement and objectives of FAS, there is no identifiable reason why this should not occur at the end of every phase during apprentice training.

5.4 Implications for IOT's

As a result of FAS not employing the optimum solution for apprentices to *enhance their skills and capabilities* it has a significant secondary effect for another major stakeholder, the Institutes of Technology.

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As outlined earlier the Institutes of Technology Ireland (IOTI) declare IOT's "*provide programmes which reflect current and emerging knowledge and practices and promote self-management, critical analysis and decision making*". The findings however indicate delivering the theory element of the apprenticeship programme in IOT's using a face to face only methodology fails to embrace emerging knowledge and practices. Face to face tuition also achieves less when compared to blended learning in terms of promoting self-management, critical thinking and decision making. Subsequently by IOT's delivering theoretical content to apprentices, using the face to face only methodology chosen by FAS, a significant conflict occurs and the relationship between FAS and IOT's is compromised.

The methodology utilised by FAS to deliver theoretical content to apprentices needs to be convenient, accessible, multi modal and multifarious. With the exception of some personal initiatives undertaken by some lecturers in IOT's which accommodate this, it's simply not the case at present and there is a justifiable need for change.

5.5 Optimising Learning Opportunities for Apprentices

The primary objective for an apprentice is "to learn" (*Apprendere*). The literature tells us learning occurs as a result an adjustment or change in the learner's schema, behaviour, perceptions, practical application and or their environment or network.

For instruction to aid this in the most efficient manner it needs to occur in a supportive learning environment wherein learners receive appropriate guidance while engaging in activities that are aided by tools (Vygotsky 1978).

While the Master/Apprentice paradigm works well when providing instruction during the practical component of training, it is no longer considered best practice when providing instruction during theoretical component of training.

When learning theories most commonly used by educators to facilitate learning (behaviourism, cognitivism, constructivism and connectivism) were individually examined during this study, each had something beneficial to offer apprenticeship. By designing apprentice training that accommodates the blending of learning theories it has the potential to enhance learning among apprentices. This is because it would enable the most appropriate theory to be utilised at the most appropriate time. In doing so it creates a balanced approach to learning, which the literature informs us, is best suited to the modern day learner. Robert Gange's *Conditions of Learning* referred to earlier revolve around the premise that instruction should be tailored specifically within the context of the learners needs and be designed to include multiple instructional methods to meet the diverse needs of learners. In order to do this however the method of delivery needs to be flexible, convenient and utilise technology. It must promote dialogue and collaboration between educator and apprentice.

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It must also provide apprentices with the opportunity for improved performance, increased access to knowledge, self discovery and optimum prospects for building knowledge which enables learning - enter blended learning. Not only does the literature point towards blended learning as the most effective and empowering mode of instruction - apprentices, lecturers and educational organisations report it meets more of their needs than any other modality.

5.6 Technology use in Apprentice Training

The use, accessibility, and convenience of technology in the world today lend themselves well to blended learning. The research suggests when instructional technologies are used to support face to face learning, performance among apprentices improves, a more effective learning environment is created and learning opportunities are enhanced. In outlining the implications of using computers and multimedia in education, Allessi & Trollip (2001, p. 40) contend *educators should use a variety of multimedia, materials and approaches, and thus provide flexible learning environments meeting the needs of the greatest number of their learners.* The use of technology during this study enabled apprentices to access specific information which allowed them to further research concepts and ideas presented in the classroom.

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Although the benefits of using technology during apprentice training are self evident the findings also indicate a considerable number of participating apprentices did not possess the levels of skill required to comfortably utilise such technology during initial stages of instruction. In order to up skill these individuals to a level which would enable comfortable use of technology, supplementary training and support was required. It appears the modern apprentice is no different to learners in other sectors of education when their educational needs are considered. Technology has given rise to a new generation of learner who sees the world in a different way to those learners belonging to previous generations.

Accessing information using this technology has changed how learners belonging to the Net Generation approach education. It is important to note however some apprentices have low levels of ability when using some on-line technologies. To ensure these and indeed all apprentices keep pace with their more technology minded and academic counterparts, it is critical apprentices are taught about and exposed to technology which facilitates knowledge building and learning.

A further outcome of the research indicated apprentices have a slightly higher regard for utilising blended learning and its associated instructional technologies than their lecturers do. This may be in part associated with generational differences referred to earlier by Mark Prensky, thus creating different perceptions. Lecturers who participated in the survey for this paper had an average age of 43.

This means they had an average birth date of 1967, placing them firmly into the category of "Generation X". Apprentices who participated in the study however had an average age of 23. This means they had an average birth date of 1987, placing them firmly into the category of "Net Generation". Lecturers recognise online technologies will play a key role and change how they currently deliver training to apprentices over the next five years. However, they cite the large amount of time it would take for them to develop material suitable for delivery in this fashion followed by a lack of technical knowledge and the unavailability of training as a barrier.

5.7 Conclusion

When all factors of this study are considered the following assertion is made.

The instructional design and methodology employed by FAS to deliver theoretical content to apprentices during their apprenticeship is ripe for change.

There is an abundance of data which substantiates this hypothesis and provides significant credibility to the claim that...

Employing a blend of learning modes and theories during apprentice training provides the greatest opportunity to enhance the performance of apprentices while providing the optimum environment and conditions for learning to occur.

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5.8 Limitations

While every effort was made to minimise the limitations of this study, it is important to acknowledge they do exist. These need to be factored into account when considering the papers contributions and findings before any generalisations can be made. The following limitations have been identified.

Apprentice and lecturer sample sizes were quite small. A total of 25 apprentices and 22 lecturers participated in the study. There was also some imbalance in the research insofar as all participating apprentices belonged to one trade only (bricklaying) and all were male. Although no information was available to suggest there are female apprentice bricklayers anywhere in the country, female apprentices are registered in other trade areas. In addition to participant apprentices only belonging to one trade, the research was only carried out with those who were in phase 6 of their apprenticeship and were attending only one IOT. A further limitation of the research was participating lecturers were only responsible for delivering four of the twelve construction related trades offered by FAS.

A positive factor however is that the mixed research methodology used during the research reduces the possibility of invalidity.

Nevertheless, by identifying these limitations it provides opportunities to discover new areas of research that could lead to the performance of apprentices being further enhanced.

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6. Future Perspectives

The willingness of apprentices to engage and participate in training which utilises technology and a blended methodology is most encouraging. It offers the potential for apprentices to conveniently widen their scope of knowledge and become more diverse in terms of their qualifications. The ability for learners and employees to be able to diversify in the modern world is crucial. However, the possibility for diversification among some apprentices and trades people within the construction industry is limited. This is often as a result of them possessing either few or no additional qualifications beyond their National Craft Certificate.

It would therefore be interesting to design a future study to establish if...

Blended learning is an effective mode for delivering generic, transferable skills to apprentices and trades people within the construction industry which enhances their opportunity to up skill and ability to diversify.

An additional area of interest which could be explored in a future study is examining the costs associated with delivering theory training to apprentices. In these challenging economic times efficiency is central to the success of many organisations. Over the coming years the educational sector faces monumental financial challenges. It must meet these challenges in a professional yet frugal manner.

With this in mind, a financial analysis could be designed to establish...

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Comparative return on investment figures for when apprentice theory training is delivered using face to face only learning and when it is delivered using blended learning.

Finally, there is little doubt on-line instruction and technology will play a central role in the way apprentices of the future build knowledge and learn. It will be hugely important therefore educators are in a position to facilitate this. As a lack of technological skills and/or training is often cited by educators as a barrier in this regard, it would be interesting to establish...

If those educators who are responsible for delivering theoretical content to apprentices received appropriate training in utilising on-line technologies in education, how much more likely are they to incorporate such tools when delivering material to apprentices when compared to those who have received no training?

All of the areas identified for further exploration could produce findings within the next two to three years. They are those which offer the greatest benefits to apprentices, educators, FAS, employers, apprenticeship and society in general. In addition to these goals being specific, they are measurable, attainable, results oriented and time bound.

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Appendices

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Appendix A: Pre Course Apprentice Readiness Survey.

1. Do you have convenient access to a computer?

○ Yes ○ No

2. How often do you access the internet?

○ Every Day ○ 4-6 Times a week ○ 2-3 Times a week ○ Once a week ○ Never

3. Have you ever logged onto You Tube and watched a video?

○ Yes ○ No

4. Have you ever listened to a Podcast?

○ Yes ○ No

5. Have you ever downloaded a Podcast?

○ Yes ○ No

6. Do you have an email address?

○ Yes ○ No

7. How often do you check your emails?

○ Every Day ○ 4-6 Times a week ○ 2-3 Times a week ○ Once a week ○ Never

8. Do you have any of the following.... Facebook / Twitter / Blog / YouTube account?

○ Yes ○ No

9. Have you ever participated in an online discussion board or web forum?

○ Yes ○ No

10. How easy or difficult do you find using computers in general?

○ Very Easy ○ Easy ○ Difficult ○ Very Difficult

11. Would you like to improve your computer skills in general?

○ Yes ○ No

12. Do you think computer skills are important in education today?

○ Yes ○ No

13. Do you like using computers to learn?

○ Yes ○ No

14. Which of the following would you prefer?

○ Classroom based Learning ○ Computer based Learning ○ Combination

15. Have you successfully passed any of the following exams?

○ Leaving Cert ○ Junior Cert ○ Both ○ None

16. Which of the following is you learning style?

○ Visual ○ Auditory ○ Kinaesthetic ○ Mix

17. What age are you?

[ ]

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Appendix B: Apprentice Post Course Questionnaire.

Online Version available at; http://MScApprentice.questionpro.com

APPRENTICE SURVEY

Dear Apprentice

As you know, I am currently undertaking some research as part of an MSc in Learning Technology.

I am looking to establish Apprentices attitudes, perception, experiences and reaction to using a blended learning approach when deliverng Phase 6 of the Apprentice training programme.

I would very much appreciate your contribution and would therefore like to invite you to participate in my survey.

Approximately thirty Apprentices, will be asked to complete this survey which asks questions about...

1. Accessing Online Material
2. Experiences with Online Technologies
3. Participating in blended learning courses
4. Managing your own learning
5. Personal preferences regarding learning modes
6. The effects of blended learning

It will take approximately 10 minutes to complete the questionnaire.

Your participation in this study is completely voluntary.

Your survey responses will be strictly confidential and data from this research will be reported only in the aggregate. Your information will be coded and will remain confidential.

As this is an online survey, to answer each of the questions simply follow the prompts. To begin the survey click the "Click here to begin" tab at the botttom of this page and to submit the survey on completion, click the "Submit" tab after the final question and you are done!

ALL SURVEYS MUST BE COMPLETED BEFORE *26 FEBRUARY 2010*

If you have questions at any time about the survey or the procedures, you may contact me (David Cooke)at +353 1 8851325 or by email at davidfcooke@gmail.com

Thank you very much for your time and support.

Please start with the survey now by clicking on the button below.

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Accessing Online Course Material

Did you access the Blog that accompanied this course?

- Yes
- No

How would you rate the level of difficulty accessing the Blog that accompanied this course?

- Very Easy
- Easy
- Difficult
- Very Difficult
- Did not access the Blog

If you answered "Difficult" or "Very Difficult" in the previous question - what were the reasons for this? (type your text into the box below)

How often did you access the Blog during the course?

- More than once a day
- Once a day
- Between 4 & 6 times a week
- Between 2 and 3 times a week
- Once a week
- Never

Did any of the following prevent you accessing the Blog more frequently? (select one)

- ○ No access to a computer
- ○ No internet access
- ○ Did not understand how to access the Blog
- ○ No barrier existed
- ○ Other (type reason into box below)

Which of the following were your reasons for accessing the Blog during the course? (select as many as appropriate)

- ☐ To support classroom or workshop learning
- ☐ To revise material delivered in the classroom or workshop
- ☐ To gain a deeper understanding of the course material
- ☐ To review material you did not fully understand in the classroom or workshop
- ☐ To access material in a different format such as video, podcast, discussion forum or blog posts
- ☐ To collaborate and share with others
- ☐ Did not access the Blog
- ☐ Other (type reason into box below)

Did the Blog provide you with the assistance/answers you were looking for when accessing it?

- ○ Yes
- ○ No
- ○ I did not access the Blog

When you accessed the Blog, did you explore additional material to that which you were looking for?

- ○ Yes - I accessed additional material
- ○ No - I only accessed the material I was looking for
- ○ I did not access the Blog

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The Blog encouraged you to review or revise material that was delivered in the classroom or workshop. Do you....

- ○ Strongly Agree
- ○ Agree
- ○ Disagree
- ○ Strongly Disagree

Learning Materials & Preferences

Was it helpful to be able to choose from a variety of technologies such as Podcasts, Videos, Presentations etc when looking for information on the Blog?

- ○ Very Helpful
- ○ Helpful
- ○ Unhelpful
- ○ Did not access the Blog

If you accessed the Blog, Rank in order which of the following you availed of most (1 being most often, 8 being least often)

Online Class Notes	
Podcasts	
Videos	
Blog Posts	
Discussion Forum	
Quizzes	
Revision Question Page	
Image Slideshow	

Briefly explain the reason for your first choice in the previous question (type your text into the box below)

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If you accessed the Blog, Rank in order which of the following assisted you most with learning during the course (1 being most assistance, 9 being least assistance)

Image Slideshow _____
Revision Question Page _____
Podcasts _____
Blog Posts _____
Discussion Forum _____
Quizzes _____
Videos _____
Online Class Notes _____
Classroom Learning

Briefly explain the reason for your first choice in the previous question (type your text into the box below)

Did you contribute to the Blog Discussion Forum?

- Yes - I created new posts
- Yes - I responded to posts
- Yes - I created new posts and responded to posts
- No - but I viewed the discussion and information
- No - I did not contribute

How helpful did you find discussing course material online with your fellow students?

- Very Helpful
- Helpful
- Unhelpful
- Did not participate in the discussion

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Did participating in the Discussion Forum encourage you to research or review the material being discussed either on the Blog or elswhere?

- Yes
- No
- Did not participate in the discussion

By linking pieces of information presented in different formats on the Blog and in class, did it help you gain a deeper understanding and/or better perspective of the course material?

- Yes - Strongly Agree
- Yes - Agree
- No - Disagree
- No - Strongly Disagree

Based on your experience, is it an advantage or disadvantage having access to online material in various formats which supports classroom/workshop learning?

- It is an Advantage
- It is a Disadvantage

Briefly explain the reason for your choice in the previous question (type your text into the box below)

Did the use of online technologies during this course such as Blogs, YouTube, Podcasting, Discussion Forums etc make your learning experience more interesting and engaging?

- Yes
- No

Do you think you would have gained the same amount of knowledge from this course through classroom learning only?

- Yes
- No

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Which of the following is your preferred method of learning?

- Online Learning only
- Classroom Learning only
- Combination of Online and Classroom Learning

Which of the following do you believe is the most effective way of learning?

- Online Learning
- Classroom Learning
- Combination of Online and Classroom Learning

Give a brief reason for your answer in the previous question. (type your text into the box below)

Self Directed Learning

Blending Classroom and Online learning encouraged you to manage your own learning, i.e where, when and how you decided to learn. Do you

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

If the blog was not available to you during this course, how likely would you be to go online to find out more about the material delivered in the classroom?

- Very Likely
- Likely
- Unlikely
- Very Unlikely

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Accessing the learning material on the Blog encouraged you to think more about subjects discussed in the class/workshop and allowed you to form greater understandings and opinions about the subject. Do you...

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

By combining classroom learning with online learning during this course, you developed problem solving skills that will assist you during your career. Do you...

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

General Experiences with Technology

Before undertaking this course, how would you describe your level of knowledge on using the following technologies? (tick the appropriate box for each of the technologies listed)

	Excellent	Above Average	Average	Below Average	No Knowledge
Email					
Blogs					
Podcasts					
Discussion Forums					
Online Videos (YouTube)					

After undertaking this course, how would you describe your level of knowledge on using the following technologies? (tick the appropriate box for each of the technologies listed)

	Excellent	Above Average	Average	Below Average	No Knowledge
Email					
Blogs					
Podcasts					
Discussion Forums					
Online Videos (YouTube)					

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How benificial do you believe the following are, in terms of offering you an opportunity to gain a deeper understanding of subject material during training?

	Very Benificial	Benificial	Dont Know	Of little benifit	Of no benifit
Classroom Lecture	○	○	○	○	○
Demonstrations	○	○	○	○	○
Handouts	○	○	○	○	○
Videos (e.g YouTube)	○	○	○	○	○
Lecture Recordings	○	○	○	○	○
Class Activities	○	○	○	○	○
Websites	○	○	○	○	○
Virtual Learning Environments (e.g Moodle)	○	○	○	○	○
Blogs	○	○	○	○	○
Wikis	○	○	○	○	○
Podcasts	○	○	○	○	○

How often do you check your emails? (select one)

- ○ Every Day
- ○ 4-6 Times a week
- ○ 2-3 Times a week
- ○ Once a week
- ○ Never
- ○ Dont have an email account

Overall did you like the blended approach used to deliver this course?

- ○ Yes
- ○ No

Overall did the blended approach used to deliver this course assist you with enhancing your knowledge of the subject material?

- ○ Yes
- ○ No

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Overall did the blended approach used to deliver this course enrich your learning experience or improve the way you view learning?

-- Select --

Overall do you believe the blended approach used to deliver this course will assist you in your exams and future learning?

-- Select --

Based on your experiences during this course, use one word that comes to your mind when you see the following methods used for learning....

(Enter your response into the text box below each word)

Classroom Based Learning

Online Learning

Blending Classroom & Online Learning

Use of Discussion Forums

Use of Podcasting

Use of Video (e.g YouTube)

Appendix C: Lecturer Questionnaire.

Online Version available at; http://MScLecturer.questionpro.com

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LECTURER SURVEY

Dear Colleague

I am presently undertaking some research as part of an MSc in Learning Technology.

I am seeking to establish the most common methods and technologies currently used by Lecturers to deliver Apprenticeship training to Apprentices. I would very much appreciate your contribution and would therefore like to invite you to participate in my survey.

Only lecturers responsible for delivering Apprenticeship training, will be asked to complete this survey which asks questions about.....

1. Lecturers most frequently used method for delivering their course material

2. What(if any)computer technology Lecturers utilise to deliver their course material

3. Lecturers knowledge/perception/opinion of online technologies and modes of learning.

It will take less than 5 minutes to complete the questionnaire.

Your participation in this study is completely voluntary.

Your survey responses will be strictly confidential and data from this research will be reported only in the aggregate. Your information will be coded and will remain confidential.

As this is an online survey, to answer each of the questions simply follow the prompts. To begin the survey click the "Continue" tab at the botttom of this page and to submit the survey on completion, click the "Submit" tab after the final question and you are done!

ALL SURVEYS MUST BE COMPLETED BEFORE 26 FEBRUARY 2010

If you have questions at any time about the survey or the procedures, you may contact me (David Cooke)at +353 1 8851325 or by email at davidfcooke@gmail.com

Thank you very much for your time and support.

Please start with the survey now by clicking on the Continue button below.

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LECTURER SURVEY

AREA OF EXPERTISE

In what trade do you Lecture to Apprentices?

(Select one of the following options)

- ○ Brick & Stone laying
- ○ Carpentry & Joinery
- ○ Electrical
- ○ Plumbing

Which Phase of the Apprentice training programme are you responsible for delivering?

(Select one of the following options)

- ○ Phase 4
- ○ Phase 6
- ○ Both

How many years have you been delivering the Apprentice training programme to Apprentices?

(Select one of the following options)

- ○ Less than 1 year
- ○ 1 - 5 years
- ○ 6 - 10 years
- ○ 11 - 15 years
- ○ 16 - 20 years
- ○ 21 - 25 years
- ○ More than 26 years

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METHOD OF DELIVERY & TECHNOLOGICAL KNOWLEDGE

Do you supplement your Lectures with any of the following?

(Select as many of the following options that are applicable. If you choose "other" please elaborate within the text box provided)

- ☐ Demonstrations
- ☐ Handouts
- ☐ Videos
- ☐ Voice Recordings
- ☐ Class Activities
- ☐ Websites
- ☐ Moodle (or similar)
- ☐ Blog
- ☐ Wiki
- ☐ Podcast
- ☐ None
- ☐ Other _____

How frequently do you supplement your Lectures with the following? *(Select a frequency for each option)*

	Every Day	2-4 times a week	Once a week	Once a month	Never	N/A
Demonstrations	○	○	○	○	○	○
Handouts	○	○	○	○	○	○
Videos (e.g YouTube)	○	○	○	○	○	○
Lecture Recordings	○	○	○	○	○	○
Class Activities	○	○	○	○	○	○
Websites	○	○	○	○	○	○
Virtual Learning Environment (e.g Moodle)	○	○	○	○	○	○
Blog	○	○	○	○	○	○
Wiki	○	○	○	○	○	○
Podcast	○	○	○	○	○	○

Have online technologies changed the way in which you share information and deliver theory to Apprentices over the last 5 years?

- ○ Yes
- ○ No

If you answered "Yes" to the previous question in what way have your delivery methods changed?

Do you believe online technologies will change the way in which you share information and deliver theory to Apprentices over the next 5 years?

- Yes
- No

If you answered "Yes" to the previous question in what way do you believe your delivery methods will change?

Are you satisfied with the method(s) you currently use to deliver the theory component of the Apprentice training programme to Apprentices?

(Select one of the following options)

- Very Satisfied
- Satisfied
- Unsatisfied
- Very Unsatisfied

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If you answered "Satisfied" to the previous question what can be done to change your satisfaction level to "Very Satisfied"

If you answered "Unsatisfied" or "Very Unsatisfied" to the previous question briefly outline your reasons . ***(Enter your response into the text box below)***

How would you describe your level of knowledge on using the following technologies? ***(tick the appropriate box for each of the technologies listed)***

	Excellent	Above Average	Average	Below Average	No Knowledge
Email	○	○	○	○	○
Virtual Learning Environment (e.g Moodle)	○	○	○	○	○
Blogs	○	○	○	○	○
Wikis	○	○	○	○	○
Podcasts	○	○	○	○	○
Discussion Forums	○	○	○	○	○
Online Videos (e.g YouTube)	○	○	○	○	○

PERCEPTION OF MODES OF DELIVERY

Do you believe the use of online technologies (similar to those listed in the previous question) will play a key role in the way Apprenticeship training is delivered to Apprentices in the next five years?

○ Yes
○ No

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How benificial do you believe the following are, in terms of offering Apprentices an opportunity to gain a deeper understanding of subject material during training?

	Very Benificial	Benificial	Dont Know	Of little benifit	Of no benifit
Demonstrations	○	○	○	○	○
Handouts	○	○	○	○	○
Videos (e.g YouTube)	○	○	○	○	○
Lecture Recordings	○	○	○	○	○
Class Activities	○	○	○	○	○
Websites	○	○	○	○	○
Virtual Learning Environments (e.g Moodle)	○	○	○	○	○
Blogs	○	○	○	○	○
Wikis	○	○	○	○	○
Podcasts	○	○	○	○	○

Do you regard any of the following as a barrier to you incorporating online learning tools into Apprenticeship training?

(Select as many of the following options that are applicable. If you choose "other" please elaborate within the text box provided)

- ☐ Cost of Software
- ☐ Time associated in developing material
- ☐ Lack of technical knowledge
- ☐ Unavailability of training
- ☐ Little or no technical support
- ☐ Lack of evidence to say its works
- ☐ No barriers exist
- ☐ Other

Which of the following do you believe is the most effective way for Apprentices to learn while attending college during Phase 4 & 6?

- ○ Online Learning
- ○ Classroom Learning
- ○ Combination of Online and Classroom Learning

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Give a brief reason for your answer in the previous Question

Use one or two words that come to your mind when you see the following methods used for learning....

(Enter your response into the text box below each word)

Classroom Based Learning

Online Learning

Blending Classroom & Online Learning

Use of Discussion Forums

Use of Podcasting

Use of Video (e.g YouTube)

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ADDITIONAL INFORMATION

Which of the following age brackets do you fit into?

(Select one of the following options)

- ○ 20 - 25
- ○ 26 - 30
- ○ 31 - 35
- ○ 36 - 40
- ○ 41 - 45
- ○ 46 - 50
- ○ 51 - 55
- ○ 56 - 60
- ○ 61 - 65

If you would like to offer any additional comments or suggestions, in relation to the methodology used to deliver apprenticeship training, please do so within the text box below.

(If you have no comments or suggestions to make skip this question and click on "Submit" to complete the survey)

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Appendix D: Observation Instrument.

Instructions

This exercise seeks to establish if apprentices have gained sufficient theoretical knowledge on Camber arch construction that will enable them to physically construct the arch within a practical workshop environment. Please make your unbiased observations over the following workshop.

There are 3 sections to the observation sheet.

Section 1 – is to determine if the apprentice has carried out the correct sequence of operations in order to construct the Camber arch.

It requires input into the checkbox provided. If the apprentice has carried out the listed task - place a "✓" into the box. If they have not carried out the listed task - place an "**x**" into the box

Section 2 – is to establish how well the apprentice appears to be carrying out the procedures under the headings of knowledge and competence.

It requires the input of a "✓" into the most appropriate checkbox using a scale which ranges between very good and very poor.

Section 3 – is to discover if the apprentice carried out the listed tasks with or without assistance from a lecturer, peer, notes or books. It also seeks to establish how regularly (if at all) the apprentice sought assistance.

It requires input into the checkbox provided. If the apprentice required the assistance of a lecturer, peer notes or books - place a "✓" into the appropriate box. If they did not require any assistance - place an "**x**" into the box.

To indicate how regularly the apprentice sought assistance (if at all) input a "✓" into the most appropriate checkbox on the scale of four numerical options.

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Section 1

Has the apprentice carried out the following tasks?

TASK	INSERT "✓" OR "X"
1. Set out the correct ope size using the timber centre provided	
2. Built both piers to the correct height	
3. Create d the skewbacks to the correct angle	
4. Correctly set up the timber centre at the correct height	
5. Plumbed & Levelled the timber centre	
6. Drawn out the Camber arch to scale	
7. Successfully located the striking point of the arch	
8. Correctly marked out the voussoirs on a setting out line	
9. Created a template for each voussoir on one side of the arch	
10. Correctly numbered each voussoir template	
11. Marked out each voussoir and numbered it	
12. Cut each voissoir to the correct markings	
13. Employed all safety requirements when using brick saw	
14. Set out the voussoirs dry on the ground	
15. Marked the intrados voussoir spacing's onto the timber centre	
16. Marked the extrados voussoir spacing's onto a timber batten	
17. Trim the voussoirs where appropriate at each joint	
18. Position a minimum of two string lines onto the wall	
19. Build and align each voussoir with marks on the timber centre and batten	
20. Position the key brick last & key joint the arch.	
21. Remove timber centre & point soffit.	

Section 2

Based on your observation of the apprentices working practice/methodologies, how would you describe their knowledge of Camber Arches?

Place a "✓" into the most appropriate checkbox.

VERY GOOD	GOOD	POOR	VERY POOR

Based on your observation of the work the apprentice is producing, how would you describe their level of competence in relation to building Camber Arches?

Place a "✓" into the most appropriate checkbox.

VERY HIGH	HIGH	AVERAGE	LOW

Section 3

Has the apprentice required any assistance from any of the following during the process of construction the Camber Arch?

Place a "✓" into the most appropriate checkbox. (More than one option may be ticked if required)

LECTURER	PEER	NOTES/BOOKS	NO ASSISTANCE

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If the apprentice availed of assistance from a lecturer, peers, notes or books – how often did they require this?

Place a "✓" into the most appropriate checkbox.

TEN TIMES OR MORE	BETWEEN 6 & 9 TIMES	BETWEEN 3 & 5 TIMES	BETWEEN 1 & 3 TIMES	NO ASSISTANCE

The observation is now complete

Thank - You

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Appendix E: Focus Group Interview Transcript.

The following questions were asked of the group and a synthesis of answers is included below each question.

Question 1

D.C *"Can we briefly discuss your reasons for accessing or not accessing the blog which supported classroom learning during the course?"*

Confirming what was established in the post course questionnaire, participants confirmed they mainly accessed the blog to revise work being done on a face to face level and to get a deeper understanding of the subject matter.

Participant 12949385 (Reason for accessing)"To look at the videos of the projects we would be doing in the workshop and to see lecture notes in advance of the class"

Participant 12949410 (Reason for not accessing)"I have no computer at home so I could only access it in college"

The general consensus among the group was once they knew how to access the blog and where to find particular information, it was easy. The only barriers identified were internet access and convenient access to a computer.

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Question 2

D.C *"During the post course questionnaire 92% of apprentices believed connecting pieces of information gathered from different sources on the blog gave them a deeper understanding and better perspective of a subject.... Can we discuss the possible reasons for this?"*

Participant 12949394 *"I was able to take small pieces of information at a time and add them together. I did this by using different techniques. Sometimes I used the blog posts or notes and sometimes I used the videos or podcasting. This meant I got a better idea in my head about the subject, rather than only having one option such as notes taken in class"*

Participant 12949397 *"By joining the information from different sources it allowed me to put the information together. This helped me to understand the subject better. Having all of the information in one place allowed me to do this".*

D.C. *"Would it be fair to say you enjoyed being able to connect pieces of information to build your own picture and understanding of a subject?"*

The entire group answered *"Yes"* to this however participant 12949410 added *"I like the idea, but I don't really like using computers to learn, I prefer being in the classroom"*

D.C (to participant 12949410) *"Would you like computers to play some role in your learning experience"*

Participant 12949410 *"Yes"*

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D.C (to participant 12949410 and group) *"Would it be a good idea if apprenticeship training included a recognised module on using computers and computer applications?"*

Participant 12949410 *"Definitely"*

All Participants strongly supported the views of Participant 12949410 - emphasising the importance of computers in today's world.

D.C *"So coming back to connecting pieces of information - is it fair to say generating your own personal knowledge network or databank from the information provided on the Blog helped you to gain a deeper understanding of subjects during the course?"*

The entire group answered *"Yes"*

Participant 12949399 added *"Yes because you can filter out any information you don't need and add in information you do need".*

Question 5

D.C *"Can we discuss your thoughts on the blended learning method used to deliver the course? - For example how did it compare to other courses you were involved in?"*

Participant 12949410 *"I was a bit worried at first because I never used a computer as part of a course, but once I was shown how to access the blog I did not have to do that much only click onto the information that was on it."*

Participant 12949397 *"It worked out really well; the best thing was having access to the stuff afterwards"*

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D.C *"Having now completed the course, which would you say is the most effective in terms of you being able to enhance your knowledge of your trade while assisting in preparing for exams - Combination of online and classroom learning or Classroom only."*

Participant 12949385 *"Combination"*

Participant 12949394 *"Combination"*

Participant 12949399 *"Combination"*

Participant 12949397 *"Combination"*

Participant 12949410 *"Combination"*

Participant 12949462 *"Combination"*