A useful on-going educational myth is that of the "average" child based on some sort of nebulous ill-defined concept of "normality" which invites comparison between schools and an arbitrary judgment of performance.

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Professor of Inclusion and Diversity
A useful on-going educational myth is that of the “average” child based on some sort of nebulous ill-defined concept of “normality” which invites comparison between schools and an arbitrary judgment of performance. For example, The Department for Education (2016) categorises pupils at key stage 2 and 4 as low, middle or high attainers and it is against this criteria the child is measured and, to an extent, the quality of school provision. This is highly mechanistic, simplistic and misleading reducing educational outcomes to a level of measurement akin to how many miles per gallon a car attains. It ignores all the joy and wonder of discovery, the obvious fact that children are individual and learn in different ways at different speeds and in different contexts. Sadly, the higher education sector operates to a similar philosophy hence the hierarchical and bizarre league tables celebrated by The Guardian and Times Higher Education Supplement and berated by our Vice Chancellor (Thompson, 2015) Making sense of this artificial characterisation of humankind is difficult and puzzling. A good starting point might be the 1943 Norwood Report which confirmed the tripartite system as

- the academically-minded would be provided for in grammar schools;
- the scientifically-minded would go to technical schools;
- the rest would go to secondary modern schools

There is absolutely no evidence whatsoever that children could be so readily divided and the categories are based on the misjudged notion of differentiating by assessment and therefore selecting to a deliberately hierarchical model. Doing so usefully maintains the status quo and ensures privilege for a minority whilst creating a mass pool of workers for economic production as documented from many years ago, for example, Althusser,(1969) or Friere (1970). Beach (2010) sees the issues in terms of marketisation across Europe. More recently, Fitzner (2016) laments a common concern increasingly explored in educational research of the effects of neo-liberalism and marketisation whilst Harris and Little (2016) explore further Richard Hatcher’s ideas of a social movement against government policy. So, quite rightly and correctly, there continues to be a great deal of debate as to what constitutes quality. In higher education, for better or worse, the measure is often via research, The Russell Group attracting the biggest share of the sector’s research money and widely perceived as being the UK’s best universities. Which brings us to this edition of the journal. Here we have again a very wide selection of educational research, all written by students, but note the main theme, all are concerned with teaching and learning and it perhaps here that we ought to evaluate quality rather than via contrived and arbitrary national measures. Bolton is informed by a policy of “teaching led, research informed” and here are many examples. I hope you enjoy reading them.
References


Thomson, S. (2015), University of Bolton Vice Chancellor slams league tables. The Bolton News. 22.9.15
Applying curricula design principles to enhance students learning experience via in-class formative assessments

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Abstract

This research is focused on investigating the application of curricula design theories as means to improve the delivery of materials for Human Resource Management (HRM) subject in HND programmes. Analysis of HRM curricula set an emphasis on the relationship between the materials delivered in educational institutions and employability skills embraced by students required for further progression in academia or industry. The research has shown that students have the tendency to prioritise summative assessments by procrastinating, neglecting and lacking engagement and participation in class which will then negatively reflect upon students’ motivation and achievement levels. Therefore, this research seeks to explore the implications deriving from increasing the in-class formative assessments as part of curricula design in regards to enhancing students’ engagement, commitment and motivation. The author believes that strengthening the formative assessments together with summative assessments will contribute to a better learning experience, thus equip learners with adequate knowledge to assure smooth progression to more challenging academic programmes and/or industry related roles. The methodology of this research will rely on qualitative grounds, applying observations and focus groups as research techniques. Moreover, the data collected will be discussed and analysed embracing an interpretivism approach and elements of reliability and validity are also discussed.

Key Words: HRM Curricula Design; Formative Assessments; Student Engagement; Learning Experience; Transferable Skills; Employability Skills;
Introduction

This project consists of undertaking an action research approach to enhance aspects of the curricula design. It will be developed based on an assessment perspective and will investigate the implications of applying formative assessments in order to increase the students pass rate through increasing motivation and engagement of learners. The main concern relies on establishing an effective teaching and learning process where students would be embedding skills and knowledge that would aid their progression to further education or industry roles. Majority of students have the propensity to work on summative assignments when deadline approaches, thus not being systematic and consistent in skills development. Therefore, this research raises a hypothesis which intends to exploit the application of tests as a technique that would enhance students’ learning experience and improve employability opportunities.

The following section is constructed by providing a literature review which discusses the aspects of action research, formative assessments, curricula design and employability. Afterwards, a section dedicated to methodology with emphasis on data collection and methodology applied in this research are discussed.

Action Research within Educational Context

As many academic themes and concepts, action research has generated a variety of definitions where academics express certain disagreements in what it should be and include. According to Kemmis and McTaggart (1990) (see fig.1) action research is defined as “a form of collective self-reflective inquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of these practices and the situations in which these practices are carried out”.

Another definition was cited by McKernan (1991) stating that action research contributes to “practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework”. Even though, differences are noticed in defining and understanding action research, the common consensus relies on framing it as an inquiry applied by individuals within the organisation, institution or group where their work activities take place. The aim consists of proposing, justifying, applying and evaluating the changes deriving as a result of the action research undertaken.

The idea revolves that changes appear within the context of research, including researcher itself and participants or stakeholders involved within the project. This action research will aim to investigate the impact that an increase of formative assessment has in improving student engagement and as a result increase the overall pass rate.

![Figure 1: Action Research Framework](image-url)
2.2 Types of Assessments

Assessments are employed in order to support learning and evaluate students’ engagement and understanding with the knowledge delivered. Such evaluations are widely known as formative and summative. According to Black & Wiliam (2003) the term formative evaluation was initially introduced by Micheal Scrive in 1967 in regards to the curriculum and teaching aspects. However, Black & Wiliam (2003) added that Bloom (1971) utilised the term in referring to the evaluation aspects as it is used nowadays. Bloom (1971) defined the summative assessments as test or final work assigned at the end of the unit or module aiming to provide a final grade for the learner or assessing the curriculum’s efficacy. Authors differentiated the formative assessment as a technique that involves students, teachers and curriculum designers which takes place throughout the unit delivery and supports students’ learning process. Having said this, formative assessment is considered as a method that contributes continuously to the foundation of student knowledge and development. However, it is commonly known that motivation and engagement of student might lack during the term for several reasons such as student commitment, punctuality, curricula design, intensity of the programmes and for particular subjects complexity of the materials delivered (Burke, 2010). Therefore, emphasising the application of formative assessment is considered as an important teaching technique in enhancing the results of summative assessment (Tuttle, 2009). Consequently, this impacts the overall passing rate as the student learning process has been developed in progression with the materials delivered and guidance to overcome learners’ challenges is provided step by step. Having highlighted this from the literature review I intend to increase the number of in class formative assessments such as multiple choice tests in order to gain a better understanding of learners engagement and learning needs. This technique also helps to reflect on my own teaching practices and adjust where needed. Furthermore, this technique of formative assessment is introduced after a consideration of Par B, of UK Quality Code for Higher Education that focuses on Assuring and enhancing academic quality through programme monitoring and review and learning and teaching in Chapter B8 and Chapter B3 respectively.

2.2.1 Significance and Implications of Formative Assessment

The formative assessment aims to spot learning objectives and measure students progression towards the objectives stated. Consequently, such assessments are believed to enhance students’ performance and accomplishments. Additionally, formative assessments contribute in minimising or eliminating the gap between learners existing knowledge and the aimed objective. This will shape students abilities in becoming goal oriented rather than performance oriented. In other words, students will train the ability to learn continuously meet the goals independently and consistently rather than be assessed for performance purposes only. One of the advantages relies upon the ability of this method to enhance students learning without compromising their confidence. Studies have shown that this method allows students to notice the improvement of their intelligence over the time as a result of feedback (Vispoel and Austin, 1995). These intellectual improvements are reflected through a better self efficiency and an increase interest on learning as a result of being challenged continuously. Furthermore, students become more analytical, plan better and improve their learning skills (Black & William, 1998a). A considerable amount of the group of students in my class have the tendency to work on the assignments when the deadlines approaches thus not allowing enough time to conduct an appropriate research and consider a range of sources, different academic perspectives within the area or topic discussed. Also, the quality of work is not at the expected level and I feel majority of students have worked on the assignment only to meet an academic requirement. My concern consists of the students being able to embed an extensive knowledge from Human Resource Management (HRM) subject and through individual research that would equip them with the
adequate skills to improve their employability chances. Otherwise, the purpose of student frequenting an educational institution is vague and does not assure a constructive life decision which will also have negative consequences within societies or communities. Hence, wisely designing and implementing a curriculum is of a high significance when considering its implications within a social context in terms of skill acquisitions, society, industry, economy, nation progression and prosperity (Gardner & Gardner, 2012; Black & Wiliam, 1998). Curricula design is a considerable extensive area of study and has generated several issues, arguments, opinions and researches; however the main elements important for this action research will be discussed in the following section.

2.3 Curricula Design Theory

The curricula design has continuously gained prominence because it provides the foundation for investigating the link between academia and industry and judging the effectiveness of this bond. Such investigation is able to signal any changes occurring within the industry and that should be reflected in the curricula design. Stenhouse has provided an important insight regarding the curricula design which he argues that should make available a plan, study it empirically and provide the justification of selection. Stenhouse (1975) defined curriculum “an attempt to communicate the essential principles and features of an educational proposal in such a form that it is open to critical scrutiny and capable of effective translation into practice”.

From a planning standpoint Stenhouse highlights the importance of principles of the content selection in terms of what will be taught and learnt and the strategy how this will be achieved. Also, Stenhouse calls for the consideration of principles required to investigate the strengths and weaknesses of learners and be able to meet single cases within diverse groups.

In addition, Stenhouse advises the consideration of empirical study aspect where the curricula designers should reflect upon the principles that will be utilised to assess learners’ and teachers progression. Also, consider curricula implementation from different contexts such as school background, learner’s characteristics and group projects. Importantly, to take into account the outcomes deriving from different contexts and make sense of what causes the variations. In regards to justification, Stenhouse underlines the need to frame an aim of the curriculum that would allow access for critical investigation.

In addition to Stenhouse views and contribution another strategic issue highlighted within the literature of curriculum theory consists of centralisation and decentralisation. According to McKimm (2003) centralised curricula are well structured, easily to follow and achieve unification in terms of teaching and learning. Also, provides access to a wide range of expertise, however, appears to be less sensitive to local requirements and needs. On the other hand, decentralised curricula provide ownership to the teachers regarding the course and meet the local needs at a better level. Moreover, it allows for a combination of approaches in regards to design and delivery by creating opportunities to compare strengths and weaknesses of the applied techniques.

In a nutshell the main curriculum models are classified as product when the focus is on plans and intention and process when concentration is on activities and effects (Neary, 2003). O’Neill (2010) noted that product models that have been created as a result of Tyler (1949) work have received criticism for the over emphasis on the learning objectives. However, product model has been effective in communicating clearly the learning objectives to students. Literature suggests that when composing curricula under this philosophy designers should be cautious not to be very prescriptive when it comes to writing the learning outcomes (McKimm, 2003; O’Neill, 2010; Neary, M. 2003). On the contrary side, process models have intrinsic values and do not aim at only meeting the learning objectives as product models intend. Such models will consider more features than content, objectives methods and evaluation even though these elements are included within the process (O’Neill, 2010; Gosper & Ilenthaler, 2013). Therefore, under this philosophy curricula design is considered a continuous process which is updated in accordance to theories, philosophies, beliefs and experiences encountered.
2.4 Analysis of Human Resource Management Curricula

This section will focus on explaining several aspects of my own curricula in order to contextualise the research through a combination of aspects related with literature review and research methodology and forms. This curricula is aimed at students studying HNC/D who seek to progress to university programmes or industry. The programme aims at developing and equipping students with a set of transferable skills and knowledge within the area of Human Resource Management (HRM). This is achieved through coordination between several stakeholders such as staff, accrediting bodies (Pearson), Quality Assurance Agency (QQA), academic and industrial partnerships. One of the main stakeholders, the accrediting body, is very much learning objective oriented by providing several assessment criteria that built on this. On the other hand, as part of academic staff we are encouraged to promote and develop critical thinking and constructive discussions. There is a well aligned process between assignment briefs, learning materials and activities and expected outcomes. However, the delivery of learning materials in accordance with learning objectives and particularly assessment criteria guide learners to narrow their focus by concentrating on specific assessment criteria. This is seen to have a negative effect on student's levels of creativity, imagination and involvement. My concern consists of students not being motivated, confused and working on assignment when they are due only to meet the assessment criteria. This interferes between the approaches of a product model which is outcome oriented and a process model that fosters the critical thinking and students taking ownership while participate in academic activities. Additionally, a product oriented curricula is valuable in establishing a set of academics skills and introducing rigorous practices, in other words equipping learners with what they should embrace for a successful academic life. From several tutorial sessions or drafts that I have revised, learners had presented very good ideas and discussions, however, because they had not covered an assessment criterion they were advised to reconsider the answer. In my understanding this raises barriers for the student to be intellectually involved, engaged and challenged where instead s/he follows strictly a given guide. Consequently, principles of creativity and innovativeness are not much developed. Such principles are fostered in level 6 and particularly level 7 and level 8 where students are expected to be more critical, demonstrate deeper understanding and contribute to the development of the field through a process curricula approach though there is a product outcome at the end which consists of the degree. All this, takes place in compliance to academic regulations and standards but not on a much narrowed guide as opposed to level 4 and level 5. This might be as a result of the gaps between academic levels and experience; however, I believe that a process curricula design is more adaptable in teaching adult learners as it is in my case.
2.5 Employability Aspects

The employability aspect is of high importance as it assures the transition of the learners from college/university auditoriums to industries where there is a different reality accompanied by a demanding work environment, performance and competition. The design of HRM curricula has a clear intention in contributing to student employability skills and increasing the chances of students to enter within industry. According to Yorke (2004) employability is defined as “A set of achievements-skill practices and persona attributes—that make graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy”. In order to achieve a curriculum that would successfully address employability skills academics should consider an integration of four elements such as understanding, skilful practices in context, effective beliefs and metacognition (Yorke, 2004). Having said this, curricula emphasises transferable skills associated with composition of job descriptions, strategies for recruitment and selection, industrial relationships, types of contracts, appraisal and rewarding systems. Even though, the majority of these themes were part of the previous curricula they were expanded after the suggestions and recommendations provided in the report produced by QAA. Therefore, I believe that in terms of the content, curriculum is satisfactory, meeting and considering stakeholders needs continuously. The issue relies upon students’ ability to embrace the information delivered every session rather than demonstrate efforts only for achieving an assignment completion. This might compromise the quality of learners’ skills and as result the employability opportunities.

Consequently, I believe that monitoring students’ progression on weekly basis through multiple tests serves students as a technique to embrace transferable skills and knowledge. This has a positive effect as it contributes to students being more prepared because of the psychological test effect, better grades, higher pass rate and better employability skills.

3.0 Methodology

This action research intends to investigate that application of formative assessment such as in class short tests increases student pass rate and alongside improves motivation and student engagement, thus forming the main hypothesis of this investigation. The current work focuses on proposing a theme of interest for further investigation, as stated above, and provides theoretical justification in regards to theoretical background and methodology selected. Lichtman (2012) discusses that aim of research is to explain what we know and that derives as a result of the methodologies and approach we decide to apply. Any research can make a use of qualitative, quantitative or a combination of both and that applies in educational projects as well (Schostak, 2002). These methods are able to investigate and understand the phenomena, however, the qualitative method processes the information collected directly from the sample in an exploratory approach. This allows the researcher to gain a deep perspective and produce new theories, opinions and ideas associated with the phenomena studied. Having said this, qualitative method is applicable to my study as it will allow me to understand the effects of the new technique applied in class. I will also be collecting information that will be in numbers and quantified, however, that will be interpreted from a qualitative approach. For example, comparing the overall student passing rate between terms or compare the results of tests between first and last week for every individual to see if s/he demonstrates a higher performance as a result of the action undertaken. The justification behind this approach consists of embracing an interpretivist stance as it allows the research to plan, apply, collect and interpret the data collected within the social context that study takes place. The positivist approach, which focuses on the quantification of data collected and relationships amid variables would not provide opportunities to explore the dynamics of the social context.

Methodology is a crucial aspect in any research as it defines the technical approaches and forms the patterns of data collection methods and analysis, thus justify and make sense of the outcomes.
According to (Neary, 2003; Eddy et al. 2015) methodologies within an educational action research project might include one or a combination of the following:

- Observations
- Video and audio recording
- Photographs
- Focus groups
- Questionnaires
- Keeping field notes
- Apply structured or semi-structured interviews

For the purpose of this action research I will select to apply observations and focus groups. The observation method will allow me to see what the students’ reaction would be in terms of performance, engagement and motivation. While focus groups would provide the opportunity of finding out students’ perceptions on the new technique introduced and be able to receive any constructive feedback that could be incorporated for further improvement. A combination of these two methods will deepen the evaluation and analysis of data collected by investigating if the information and perceptions from observations and focus groups provide a unified understanding. Therefore, methodology of this research is expressed in the figure below.

I have created an observation form that includes several performance indicators to be used for evaluating each student’s performance on weekly basis (see appendix 1). These indicators were selected based on my own experience as the elements that show student involvement, participation and progression. The rational of selecting observation method is that allows the research to monitor samples’ reactions to new activities, communication, participation and behaviour (Schmuck, 1997). Importantly, it establishes new insights within the teaching and learning practices in relation to participation, interaction, communication and other student activities. Also, it provides opportunities to investigate issues noticed using other methods, which in my case will be focus groups. According to Cohen et al. (2000) and Eddy et al. (2015) observation aids the gathering of information on how an alternation or modification of teaching and learning practices has been applied separately from learners’ perception. This is another justification of selecting this method for my action research project since I will be introducing the application of weekly tests. Furthermore, is a method that allows the researcher to collect information that might be sensitive for learners and are not willing to share in other method such as focus groups (Cohen et al. 2000; Eddy et al. 2015).

According to Cohen et al. (2000) limitation of this method is the inability to observe what participants think, therefore, to overcome this challenge the focus groups will be utilised as an additional supportive method. Additionally, I have created a focus groups template that will be asking five questions in attempting to collect information from students and have a better understanding of their perception. These questions will be applied to five groups of students with four participants in each group. In order to eliminate any bias or interference from myself I would be sending a request letter to two of my colleagues to facilitate the focus group activity so students would not feel pressurised while expressing their opinions. The reason for two facilitators is justified with the attempt of having a variety of opinions at the end of the focus groups in case certain themes are not very clear or simply to assure that information was collected and considered.

**Philosophical Stance**
The ontological stance of the research, how will reality be seen?

**Methodology**

**Interpretivism**
The researcher will interpret the data based on his subjectivity.

**Techniques selected**

**Qualitative**

In class observations & Focus groups

*Figure 3- Methodological framework of this action research.*
4.0 Conclusions

This work has provided an academic justification for the action research proposal submitted at the beginning of the term. It aimed at producing a map guide of how the intended investigation will be applied and has justified the selection of literature, themes discussed and the selected research methods to be applied in order to generate reliable findings. This action research has raised the hypothesis that application of formative assessments such as in-class test increases student pass rate and also positively affect students’ motivation and engagement. Through data collection methods such as observation and focus groups and analysis I hope to attain final outcomes that would support the hypothesis of this research. In other words, that applying formative assessments such as weekly tests increases students’ pass rate and also enhances students’ engagement and motivation. The data regarding the student pass rate will be compared with final results of previous cohorts studying the same unit (Human Resource Management) to reflect upon the effectiveness of the formative assessments applied (weekly tests in class).

5.0 Future research

From a curricula design point of view, further research could investigate at what extent does the application of physical and moral rewards at the end of the unit impact the intrinsic and extrinsic motivation levels for higher performance. Also, explore any possible differences if the same formative assessment technique (multiple choice tests) would be applied to engineering students.
References


Changing a BTEC computing programme of study towards a more inclusive paradigm

John Roberts is currently employed as a Lecturer and Assessor in Computing and Games at an FE college and is working towards his Master in Education at the University of Bolton. John’s educationally related academic interests, which have developed through recent study at the University of Bolton and professional life, are mainly in the areas of inclusion, eLearning and curriculum.
The issue with a product curriculum is that it focuses on the ends and lends itself to an outdated and exclusionary mode of teaching: ‘educational banking’ teacher-led instruction, where educators deposit knowledge into educates, who are passives in this process. This report explains the contemporary meaning of inclusion within education and selects inclusive parameters, based on research findings, that are used, as a measure, to determine the inherent inclusiveness of three dominant curriculum models: (1) product, (2) process and (3) praxis and two learning theories: (1) constructivism and (2) connectivism, which are both innately student-led forms of learning theory.

Furthermore, a focus of this report is to determine whether technology, and which eTools, can be employed to develop and promote an increasingly inclusive, participative and collaborative classroom environment, in other words, a student-led inclusive contemporary classroom supported by technology. To inform, and justify, the selection, embedding and importance of eTools, desk research was conducted and a student survey was carried out to assess learners’ expectations and preferences in regards to collaboration and the embedding of technology in classroom activities.

Research findings regarding inclusion in education, curriculum models and learning theories accompanied by an analysis of the student survey results are used to propose a pedagogical approach based on Aristotle’s (modified) three disciplines of knowledge that places technology are the heart of student-led collaborative and engaging classroom: a hybrid process-praxis approach to curriculum based on a constructivist-connectivist approach to learning.

Keywords: Inclusive technology; inclusive education; inclusive learning; inclusive teaching; inclusive curriculum; inclusive curricula; inclusion in education; student-led learning; Freire; education banking; technology in education
Introduction

As a Lecturer and Assessor of Computing and Games I have a natural interest in technology and, to be more exact, how technology can be embedded in a traditional (product) curriculum to promote an increasingly inclusive learning environment. Furthermore, I teach BTEC courses, which have recently gone through an overhaul in regards to the rules set by the awarding body, which govern content delivery, assessment, assignment scripting, submission rules and permissible feedback (appendix 7.1); some changes of which, could be deemed exclusionary and present increasingly difficult challenges for both educators and learners.

Key changes include: (1) learners are only allowed one submission, but may be granted a resubmission if strict conditions are met (appendix 7.2); (2) learners are not allowed a draft or to receive feedback from the assessor—no guidance is allowed after the assignment is set and (3) assessors ‘must not provide feedback or guidance on how to improve the evidence to achieve higher grades’ or meet pass criteria for learners who are granted an opportunity to resubmit (Pearson, 2014, p.32). Therefore, due to the new rules, I seek a pedagogical approach that uses technology (eTools) to promote inclusion and overcome the barriers presented by the BTEC changes and a product curriculum.

The following section (2) will discuss the meaning and importance of inclusion and both a key theme and keywords are determined as indicative inclusive parameters. Additionally, three dominant curriculum models: (1) product, (2) process and (3) praxis and two student-led learning theories: (1) constructivism and (2) connectivism, will be explained, taking into account the research and writings of key educational theorists and commentators. Also, whether each model and theory is characteristically inclusive, in relation to the parameters later proposed in this report, is determined. Furthermore, a survey (appendix 7.3) was conducted among BTEC Computing learners, the results of which are analysed (section 3) to assess their expectations and preferences in regards to collaboration and the embedding of technology.

Section 4 presents a pedagogical approach based on inclusive curriculum models and learning theories and the survey analysis, backed by research findings, which is primarily focussed on the embedding of technology to enhance the learning environment, promote inclusion and collaboration, delivering a course that students both want and expect. This is followed by a conclusion (section 5).
2 Inclusion, Curriculum Models and Learning Theories

2.1 Inclusion

Inclusion is topic relevant to every educator; one that strives to give every person the best possible experience, throughout their education, and opportunities in life (LT Scotland, 2008). Most often, inclusion is associated with learners who have special educational needs (SEN), which is where its origins lie. The Education Act, 1981, abolished legal terms such as ‘educationally sub-normal’ (Tomlinson, cited in FEFC, 1996, p.2) and set the groundwork for learners with SEN to be integrated into mainstream classrooms (MacBeath et al., 2005). Additionally, SEN covers a wide range of disabilities and learning difficulties; the scope of which, has evolved, over time, in conjunction with medical advances and diagnostic technologies, encompassing more ‘contemporary disabilities, such as Autism, ADHD and Dyslexia’ (ibid, p.3).

However, inclusion is not only about supporting learners with SEN. Educators will be familiar with phrases such as, ‘increasing participation’, ‘widening participation’, ‘personalised learning’ and ‘equal access’: inclusion is inclusive of each and every individual learner and supporting them in attaining the best possible outcomes they can achieve, through equal and fair access, enabling them to ‘participate fully in… school [all educational institutes]’ (DfES, 2004, p.25). Furthermore, Tomlinson (cited in FEFC, 1996, p.4) writes that ‘inclusive education… [is] an approach [that] would benefit all’. The same report defined inclusion as ‘the greatest degree of match or fit between individual learning requirements and provision’ (CSIE, 1996).

Researching inclusion in education will lead to numerous results; one theme that is consistent, which this report determines a fundamental parameter of inclusion, is that of involving the learner in the teaching and learning process, which is regarded as an essential element of an inclusive learning environment:

‘guided by the student’s wishes... the process should offer opportunities... to the individual... to make their views and wishes known’ (FEFC , 1996, p.15);
‘opportunities for students to discuss and manage their own learning’ (CSIE, 1996);
‘involving children in their own learning’ (DfES, 2004, p.52);
‘For learners it means being engaged not just with the content of what is being taught but being involved with the learning process’ (LLU, 2010, p.20);
‘Children and young people feel connected... contributing to their education, to the learning opportunities offered... feel that they contribute to decisions, that their voice is heard... that they can influence it [school], that they are valued within it [school]’ (LT Scotland, 2008, p.5).

Additionally, keywords, which also define the parameters when considering inclusive actions and strategies in this report, can also be deduced from research. Keywords include: ‘fair’, ‘accessible’, ‘transparent’ (FEFC , 1996), ‘involving’, ‘enabling’ (related to empowering) (DfES, 2004), ‘connected’, ‘contribute’ and ‘collaborative’ (LT Scotland, 2008).

Moreover, a Further Education Funding Council (FEFC) report, 1996, chaired by Professor John Tomlinson determined ‘that learning can only be fully effective if it is inclusive’ (CSIE, 1996, p.1). As such, promoting an inclusive classroom, where the learner has a voice, is a significant responsibility for educators.
2.2 Curriculum Models

Attempts to define ‘curriculum’ in a way that satisfies everyone is near impossible (Neary, 2002), partly because any definition is not ‘philosophically or politically neutral’ (Posner, 2004, p.5). Often, curriculum is defined as a product (Marsh, 1997a), specifying what should be learned and why and how learning will be facilitated (Posner & Rudnitsky, 2008).

2.2.1 Product

Alternatively, it is argued by some that curriculum is about the ends (outcomes)—specifying content and objectives—yet, for others it is about the means—instructions and strategies (Posner, 2004). However, taking any definition of the term curriculum, though it will not solve problems posed by curriculum, does provide a perspective of how to view curricular problems (Stenhouse, 1975), including through an inclusive lens. Such definitions have formed a basis from which models of curriculum have been developed.

A model intrinsically linked to Franklin Bobbitt (1918) and Ralph Tyler (1949), which focuses on behavioural objectives with a sole emphasis on the ends—product (Tummons, 2009). ‘Behavioural objectives’ first became a common term in the 1960s (Neary, 2002), used by Tyler who said ‘education is a process of changing the behaviour patterns of people’ (Tyler, 1971, p.5), where the objective is not to have the teacher perform activities but to produce ‘significant changes the students’ patterns of behaviour’ (Tyler, 1971, p.44).

Presently, product is the dominant curriculum model: objectives are set, followed by plans and then outcomes (Smith, 2000); such as the BTEC curricula. The model has advantages: little vagueness, precise assessment, preselected structure and content (Neary, 2002) and the ability to apply it to almost any level and subject (Marsh, 2009).

However, the model has come across much criticism (appendix 7.4): research shows that during initial planning few teachers use objectives; unintended learnings are not considered; no explicit reasoning exists when selecting one objective over another (ibid); lower levels may not require behavioural objectives; creativity is discouraged; and selecting behavioural objectives at high levels is difficult (Neary, 2002). Furthermore, behavioural engineering is one of the terms linked with social efficiency by Schiro (2008)—an ideology that places an emphasis on designing curriculum to meet needs of society—who likens students exiting schooling through a social efficiency ideology to steel rail production.

As such, I would argue that this is an exclusionary curriculum model; individual learners and the learning experience are not considered, instead learners are told how and what to learn, leaving them with ‘little or no voice’, whilst their success or failure is measured solely against predetermined outcomes (Smith, 2000). Therefore, it can be fairly surmised that the product model leans towards a behaviourist or cognitivist learning theory, which both promote a teacher-led learning environment—a system that Paulo Freire (1970) would describe as ‘education banking’; educators possess all of the power, becoming ‘depositors’ of knowledge into learners, who ‘receive, memorize, and repeat’ (Freire, 2000, p.36) deposited knowledge—a concept he argued was ‘an instrument of oppression’ (ibid, p.5). Furthermore, it is not a model which involves or empowers learners, nor does it promote learner contribution to the educational process or collaboration between all parties.
2.2.2 Process

Developed as an alternate model, by Lawrence Stenhouse, who believed it was pointless to criticise a model focussed on behavioural objectives if no alternate solution can be found (Stenhouse, 1975). Stenhouse disagreed with two points made by Tyler: (1) objectives should not be in the form of activities as they could not be judged and justified; (2) content should not be specified as it does not indicate what should be done with the content (ibid).

Fundamentally, a process approach is concerned with the means of education. Stenhouse (1975) wrote that curricula should not be too prescriptive; it should: focus on the journey and activities rather than outcomes; be student-centred and allow for interpretations of the teacher (Tummons, 2009), whilst emphasising activities important to individuals’ life skills and have active roles for learners and teachers. Additionally, Tummons (2009) highlights the emphasis on teachers having high expertise and professional qualities as a key advantage.

Naturally disadvantages exist, particularly with the neglect of considered appropriate content and the difficulty of applying this approach to some subject areas (Neary, 2002). Due to this, assessment is also difficult; Stenhouse, commented that the process approach was a ‘critical model’, not a ‘marking model’ (Smith, 2000). However, learners are clearly central in the process model, which, when focussed on promoting inclusion, sets the process model apart from the product approach: the educator becomes a facilitator; learners have a voice, interactions are encouraged and learning becomes more individualised (ibid). In turn, this results in a fair, transparent, connected and collaborative learning environment, where learners are empowered and encouraged to contribute.

2.2.3 Praxis

Paulo Freire was one educationalist concerned with praxis in a social and educational context. He believed that coming together to share knowledge (action) is not enough, it is essential that we critically reflect and make a difference (Freire Institute, 2014), writing ‘thought has meaning only when generated by action upon the world’ (Freire, 1970, p.64).

Tummons (2009) uses ‘critically-informed practice’ as a modern term for praxis. ‘Critically-informed’ is the reflection, the how and why, to improve and inform practice—future action; ‘practice’ is the doing, the practical, in other words the action.

Furthermore, Freire contended that we should not act on one another; but instead work with one another, moving away from ‘education banking’ (Smith, 2002), which ‘anesthetizes [sic] and inhibits creative power’ (Freire, 1970, p.68). His concern with praxis went beyond education, it was social and political, it was about ‘social justice’ and ‘making a [positive] difference in the world’ (Smith, 2002), advocating ‘reflection and action upon the world in order to transform it’ (Freire, 2000, p.25). He further argued that true knowledge was constructed through continued ‘critical inquiry’ with others, free, thoughtful and informed action supported by creative reflection: praxis (Birden, 2008).

Therefore, one would argue that praxis is inherently inclusive, naturally lending itself to student-led learning theories: constructivism and connectivism. It promotes social justice, individuals and groups and advocates collaboration to construct knowledge though a process of dialogue and engagement through critical reflection and action upon reflection. Educators are no longer the only one who teaches, instead educators and learners teach one another through open dialogue and experiences, each individual is ‘jointly responsible for the [educational] process’ (Freire, 1970, p.67). As with the process model, praxis too, empowers learners, involving them in the teaching and learning process; they become key contributors in the construction of knowledge.
2.3 Learning Theories

At this juncture it is worth noting that, as a contemporary theory, connectivism has yet to be wholly recognised as a learning theory. Such arguments are made by Kerr (2007), Kop and Hill (2008), Bell (2011) and, particularly, Verhagen (2006, p.1) who writes that it is a ‘pedagogical view, not a learning theory’, which belongs at the curriculum level because it is not concerned with how learning takes place; only the ‘what is learned and why’ (ibid). Siemens responded to Verhagen’s criticism; citing, and answering, Schunk’s five definitive questions to distinguish a learning theory (1991, cited in Ertmer & Newby, 2013). Summarising, Siemens (2006, p.36) produced the following table (1), which also serves as a general overview of the two learning models this report focuses on.

Behaviourism and cognitivism (appendix 7.5), which also appear in the table are teacher-led theories that have been eliminated from this report due to the inclusive student-led parameter previously determined.

<table>
<thead>
<tr>
<th>Property</th>
<th>Behaviourism</th>
<th>Cognitivism</th>
<th>Constructivism</th>
<th>Connectivism</th>
</tr>
</thead>
<tbody>
<tr>
<td>How does learning occur?</td>
<td>Black box—observable behaviour main focus</td>
<td>Structured, computational</td>
<td>Social, meaning created by each learner (personal)</td>
<td>Distributed within a network, social, technologically enhanced, recognizing and interpreting patterns</td>
</tr>
<tr>
<td>Influencing factors</td>
<td>Nature of reward, punishment, stimuli</td>
<td>Existing schema, previous experiences</td>
<td>Engagement, participation, social, cultural</td>
<td>Diversity of network</td>
</tr>
<tr>
<td>What is the role of memory?</td>
<td>Memory is the hardwiring of repeated experiences—where reward and punishment are most influential</td>
<td>Encoding, storage, retrieval</td>
<td>Prior knowledge remixed to current context</td>
<td>Adaptive patterns, representative of current state, existing in networks</td>
</tr>
<tr>
<td>How does transfer occur?</td>
<td>Stimulus, response</td>
<td>Duplicating knowledge constructs of “knower”</td>
<td>Socialization</td>
<td>Connecting to (adding) nodes</td>
</tr>
<tr>
<td>Types of learning best explained</td>
<td>Task-based learning</td>
<td>Reasoning, clear objectives, problem solving</td>
<td>Social, vague (“ill defined”)</td>
<td>Complex learning, rapid changing core, diverse knowledge sources</td>
</tr>
</tbody>
</table>

Table 1: Learning Theories
2.3.1 Student-led Theories: Constructivism and Connectivism

Constructivism is a theory that suggests humans develop meaning and construct knowledge from their own experiences (The University of Sydney, 2016) and self-reflection on those experiences—studies cited, by Dr. Tesia Marshik, evidence that most of what we learn and retain is ‘stored in terms of meaning’ (Marshik, 2015, 5:34). That is, as we encounter new experiences we use our past experiences, previous ideas and current knowledge to reconcile, and make decisions regarding, the new information, which may be to discard it, or, alternatively, it may change what we believe or how we perceive current knowledge (Educational Broadcasting Corporation, 2004). As a result, the classroom becomes a place where learners are encouraged to become active participants in a more dynamic and social environment where knowledge is constructed collaboratively through each learner’s own experiences (Educational Broadcasting Corporation, 2004, University College Dublin, n.d.).

George Siemens (2005a) and Stephen Downes (2005) are (separately) the key theorists contributing to the connectivism theory, since Siemens first ‘coined the term’, in 2004 (Downes, 2012, p.9). Siemens (2008) describes connectivism as a ‘learning theory for the digital age’, that is, it takes into consideration new technologies that impact learning and the way we communicate in the modern world, post behaviourism, cognitivism and constructivism (Siemens, 2005b). It is a theory where knowledge resides on networks that are made up of specialist nodes (information sources, including people) and it views learning as the process of connecting to, and traversing, those networks (Siemens, 2005b; Downes, 2012). That is to say, we store knowledge across a distributed network compromised of multi-format digital information (Kop & Hill, 2008) and that we can learn by plugging into this network, be it through reading blogs, communicating via email, sharing information through social networks, taking part in online communities or searching the web (Connectivism, n.d.).

As previously discussed, involving learners in the process of teaching and learning is key to fostering an inclusive learning environment. Each of the theories discussed in this section are innately student-led and cannot be construed as equivalent to the ‘education banking’ system so fervently opposed by Freire throughout his life. Freire’s conviction was that teaching is not a process of transferring knowledge ‘but to create the possibilities for the production or construction of knowledge’ (Freire, 2001, p.10); a process inherently enabled by constructivism and connectivism. Each explanation, above, resonates with the inclusive parameters—determined previously—associated with inclusive education. Therefore, it is fair to determine that each student-led theory is, from the perspective of research findings and measured against the set parameters, inclusive and thus provide a strong basis from which to propose an inclusive pedagogical approach.

3 Survey Results

Having informally discussed teaching methods and the use of technology with learners previously, the outcome of which has already informed my practice, I designed a short anonymous survey for the learners to complete in order to more formally document their expectations and preferences regarding the embedding of technology in the classroom. All learners who are enrolled on a BTEC Computing course took part in the survey. Therefore, the survey is fully representative of the targeted learner cohort. 90-percent of participants are male, whilst level 3 learners account for 76-percent of participants; level 2 learners represent the other 24-percent. Additionally, it is evident that all learners, 100-percent, feel that their tutors make appropriate use of the VLE (itslearning).

From experience, despite prompts, very few BTEC learners take notes on a regular basis; resulting in learners struggling with assignment work and questions being asked repeatedly that were answered during lesson activities. Therefore, questions 4-8 were designed with the process of note taking in mind. It was interesting to note that
although 45-percent of learners expect to need pen and paper when studying a computing course, only 28-percent brought pen and paper to lessons; consequently, 72-percent of learners do not have the means to take written notes during lessons. Moreover, 93-percent of learners would prefer to take notes electronically, whilst 100-percent of learners specified that they would find it beneficial if the class shared and collaborated when taking notes and conducting research.

Question 8 showed 76-percent of learners expect technology in every lesson, whilst 24-percent expect technology to be embedded in most lessons. No learner expected some, few or no lessons to have technology embedded. Furthermore, only 10-percent of learners felt that technology was embedded in all lessons, with 59-percent indicating that it was embedded in most and, worryingly, 31-percent feeling that it was only embedded in some lessons. These results highlight a clear discrepancy between the learners’ expectations and the current embedding of technology (Figure 1).

Furthermore, learners unanimously confirmed they would like to see more technology used during lessons. Likewise, there was a consensus among all learners confirming that they enjoyed watching videos as a means of learning. Question 12, ‘Do you find video recordings of presentations a useful revision/catch up resource?’ was asked to see if there was any corroboration between learners enjoying watching videos as a learning tool and whether videos created in Office Mix had the desired impact. If the percentage was lower than that of the learners who enjoyed watching videos as a learning tool, then it would probably be fair to surmise that the created videos did not follow a preferable format that engaged and aided learners. At first glance only 72% of learners found the videos useful, however, the other 28% of learners have not yet needed to watch the videos; no learners stated that the videos were not useful.

As an educator I have found the college’s VLE, itslearning, limited and dated in its user interface design. As a result, the VLE is non-linear, highly compartmentalised and very ‘clicky’, that is to say you spend a lot of time clicking back and forth between screens to access resources. For example, for a learner to open a PowerPoint, they must login and click through nine, or more, screens. Many staff and students have voiced their frustrations over this.

Therefore, I have searched for alternative means to deliver resources to learners in a more contemporary, linear and seamless fashion. However, alternate solutions had to be free, easily accessible and not conflict with college policies. As a result, I recently demonstrated to learners a proposal that was developed using Microsoft product, Sway. Learners were shown how course resources would be accessed, presented and shared, through one link, from any device with web access and without logging in. Question 13 asked learners whether they preferred Sway to itslearning. The response was emphatic, 100-percent of learners preferred Sway.
Finally, learners were asked the reasons why they preferred Sway. Their response is shown in Figure 2. All learners preferred the ability to both navigate and access resources faster whilst also being able to view files without the need to download them. Additionally, 83-percent preferred the linear layout, 76-percent like the idea that the format was easily accessible on mobile devices and 66-percent were impressed by the ability to view multiple resources at the same time on the same page.

4 Pedagogical Approach

BTEC is a product driven curriculum, which lends itself to a teacher-led transferring of knowledge; there is clearly defined criteria which form the basis of tasks to be carried out in order to achieve the ends. However, this does not have to shape our classrooms. As such, I propose to shape curriculum and resources around Aristotle’s (modified) three disciplines of knowledge (Figure 3), which places process and praxis between the syllabus (BTEC criteria) and the product (achieve criteria).
As previously established, process and praxis approaches to curriculum are inherently inclusive, but they only form a model of curriculum and should be supported by learning theory to further inform practice. Therefore, my focus is to foster a classroom environment that fuses constructivism and connectivism, that is to plan lesson activities that promote active participation, collaboration and student-led construction of knowledge with the aid of appropriately selected technology that meet the needs and expectations of my learners and do not treat learners as ‘empty vessels’ to be filled by a transfer of knowledge (Freire, 1970). In turn, this approach supports a hybrid process-praxis curriculum focussed on the means of education and critical action upon reflection.

The proposed approach could be considered a ‘transformational curriculum’, one in which technology influences what we know and how and when we know it, meaning that the planning of teaching and learning and the curriculum need to change also, to reflect the influence of technology (Attwell & Hughes, 2010). Therefore, at this point I will evidence the importance of technology in this inclusive pedagogical approach, from which it should be readily apparent how the embedding of technology syncs with a process-praxis curriculum model, can work alongside constructivism, echoes the inclusive parameters that were previously identified and reflects the preferences of learners.

Many studies: ‘Wang et al., 2012; Roblyer et al., 2010; Selwyn, 2009; Bosch, 2009; Barnes, Marateo and Ferrisare, 2007; Tsai, 2003; Garrison, 1999’ (Ratneswary & Rasiah, 2014, p.377), indicate that online (social) networks, in general, impact positively on learning; promoting student engagement; fostering collaboration; increasing motivation; and transforming students into active learners (Dron & Anderson, 2014; Ratneswary & Rasiah, 2014). Online networks also allow us to create vast networks with each connection providing the opportunity to learn, directly or indirectly (Dron & Anderson, 2014).

Moreover, many educationalists identify three types of learning: formal, non-formal and informal (non-formal and informal being features of process and praxis models) (García-Peñalvo et al., 2015). Technology, characteristically, allows all three, which is important in today’s educational environment where formal and non-formal learning no longer dominate; informal learning compromises a significant aspect of our learning through communities and personal networks (Siemens, 2005b).

Additionally, several papers and case studies have shown that there are benefits of using technology as part of a constructivist approach (The University of Sydney, 2016) and that technology can promote inclusion, enhance the experience of learners (Kop & Hill, 2008; Hobgood & Ormsby, 2011), promote benefits ‘such as cognitive processing, independent learning, critical thinking and teamwork and… enhances a student centred learning approach’ (European Agency, n.d.).

Furthermore, D’Alessio et al (2010, cited in European Agency, n.d., p.24) argues that technology can facilitate and enhance each key factor (appendix 7.6), proposed by Meijer (2003), in transforming classroom practice to support inclusion. Moreover, using technology allows educators to increase accessibility and extend learning time away from the classroom (Hobgood & Ormsby, 2011). Technology also enhances ‘access to information [which] is [viewed as] a fundamental right of every learner’ (European Agency, n.d., p.18) and we must also consider learners who ‘want and prefer to learn differently’ (Ertmer & Newby, 2013, p.66), as the survey results suggest— Figure 1 shows my learners expect technology to be embedded in lessons more that it currently is.

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Formal learning: explicit, organised and structure learning that usually leads to certification (García-Peñalvo et al., 2015).

Non-formal learning: non-explicit but embedded in organised learning activities (García-Peñalvo et al., 2015).

Informal learning: not explicit or organised and has no formal objectives. It is typically the result of everyday activities, which may be linked to leisure, work or family (García-Peñalvo et al., 2015).
Taking into account the survey results and the prominent role technology can have in enhancing inclusion and promoting active participation, I propose the newly embedding, or continued use, of four technologies (eTools): (1) Delicious and (2) Wikispaces in response to 45-percent of learners expecting to need pen and paper yet, only 28-percent actually bringing pen and paper to class; 93-percent of learners preferring to take notes electronically; and all learners agreeing that they would find it beneficial if the class shared and collaborated when taking notes and conducting research. (3) Office Mix because there was a consensus among all learners confirming that they enjoyed watching videos as a means of learning and all the learners who had viewed videos created in (4) Sway as learners were unanimous in their preference for the presented prototype over the VLE used by the college.

Additionally, each eTool is free and requires no specialist equipment and are therefore readily accessible to learners outside the classroom.

### 4.1 Delicious and Wikispaces

**Delicious** is a social bookmarking tool and its potential as a learning, research and collaboration tool is immediately apparent. It allows users to bookmark websites and assign multiple tags to each bookmark, which can be searched by anyone in the world. From a classroom perspective, a network can be created that each learner joins; subsequently any bookmark or tag any learner adds will be viewable to network members (Queen’s University, 2009). Therefore, social bookmarking allows for easier, and encourages greater, collaboration between learners, enhancing the scope of research and resources available to the learning network (Ruffini, 2011). Furthermore, studies have shown that social bookmarking has a positive impact on the learner experience, with many learners preferring social bookmarks over VLEs and printed material (Farwell & Waters, 2010). Also, Delicious allows for private or public bookmarking, allowing learners to have control over what they do and do not share with others.

In many ways Wikispaces is similar to using a blog, in regards to the content learners can create, such as embedding images, videos and rich-text information. However, Wikispaces has a feature named ‘Wikispaces Classroom’ that provides a secure social network environment where learners can communicate and where educators can measure student engagement and contribution, all in real-time (WikiSpaces, n.d.). Additionally, whilst learners can work in private spaces for individual work, educators have the ability to create learner groups, allowing simultaneous collaboration on a project, whilst also providing an excellent platform for peer assessment and feedback. Furthermore, these groups are not fixed, a tutor can simply drag and drop learners between groups, allowing for dynamic and engaging group activities. Moreover, because Wikispaces is online, students have the opportunity to interact in a social environment as much or as little as they choose, whilst participating in topics and tasks that they are most interested in and at a time of their own choosing, since synchronous and asynchronous communication options exist. Finally, online participation often encourages learners who are normally shy, quiet or that prefer not to speak out or have attention thrust upon them, to actively participate, and perhaps gain confidence.
Office Mix is a free plugin, from Microsoft, for PowerPoint, which adds valuable teaching and learning tools to the PowerPoint toolbar (appendix 7.7). Office Mix will allow learners to write and annotate, or speak and discuss orally, or record video using a webcam. Therefore, it allows learners to participate in multi-format ways, meaning that learners can choose their preferred method. It also means that where a learner cannot physically participate in one method, they can choose another to present their information. Within my own practice there is a learner who demonstrates comfort when discussing and presenting information orally, but due to Dyslexia and Dyspraxia, often struggles and can become demotivated during written tasks. However, Office Mix provides this learner with alternate ways to present their information depending on how they feel at a particular moment in time.

Additionally, the opportunity to present information in different ways has also benefitted learners whose first language is not English. Furthermore, I use Office Mix to record presentations so that learners can review them when they wish, which certainly helps learners when I am unable to give them guidance due to the new BTEC rules (appendix 7.7).

Sway has a very simple design interface that has many built-in design and layout features, making it very simple to use (Thorp, 2014; PCMag, 2015). Some will view Sway as a PowerPoint replacement, but Sway is not designed to replace PowerPoint; Dave Paradi (2015) writes an excellent in-depth comparison of the two applications. PowerPoint provides users with more control over individual elements, design and layout, whereas Sway is simple, providing fewer options, yet, creating a potentially more powerful and dynamic interactive document in less time (Thorp, 2014; PCMag, 2015; Paridi, 2015). For example, a simple remix button will automatically change the design of the whole Sway in one click (Microsoft, 2016). Sway currently has three navigation options: (1) a click through presentation style format, (2) horizontal scrolling (imagine an eBook) or (3) vertical scrolling (similar to a website) and is focussed on providing a user with a quick way to produce interactive newsletters, presentations, reports, stories, photo albums and more (ibid). Examples can be viewed here (If this document is not electronic see appendix 7.8).

The potential I see in Sway resides in its linear navigation features and the ability to easily embed content. My learners enjoy watching videos as a learning tool and whether they are videos that exist online, such as YouTube, or are created by me, I can embed them into a Sway with ease. Furthermore, I, and I encourage the learners to, use cloud storage; Sway can link and embed files directly from a OneDrive account, meaning that they are live files; if I edit a file the learner will see this when they next view the Sway. The survey evidences that learners want and prefer information to be presented in this way. The prototype presented to learners can be viewed here (appendix 7.8).

Additionally, a Sway can be set as view-only or editable, meaning that multiple users can collaborate on a Sway at any the same time, a good tool for promoting group work, sharing ideas, note taking and generating evidence for tasks. Moreover, Sway will automatically adjust content for the device that a person is using to access to content, be that a mobile phone, tablet or desktop; hugely important as all of my learners have smartphones and, globally, more people are using mobile phones and tablets to access information online. Lastly, moving forward, I view Sway as a tool that learners can use to generate and present content in a way they are most conformable; a multi-format mode of assessment where the learner chooses how they generate and present information.
5 Conclusion

The issue with a product curriculum (BTEC) is that it focuses on the ends and lends itself to an outdated and exclusionary mode of teaching: ‘educational banking’ teach-led instruction. As educators, we have a duty to help learners reach the ends (criteria), but we can determine how those ends are achieved. As such, we must be progressive and focus our curriculum and lesson design on inclusive student-led classrooms, concentrating on the means of education and higher order critical thinking skills: student-led construction of knowledge and action and reflection upon that knowledge to develop new knowledge. The hallmark of a process-praxis curriculum supported by constructivist learning theory.

Moreover, technology is an ever increasing part of our lives, we live in a ‘digital age’ and there is an expectation among learners to be engaged, learn, research, communicate and collaborate via technological means; we, educators, are duty-bound to meet their needs. Furthermore, technology, used correctly, can further promote inclusive practice, increasing active participation, accessibility, collaboration and engagement. Connectivism, irrelevant as to whether it is a learning or curriculum theory, provides the pedagogical framework from which to view and plan the embedding of technology into curriculum to reap its inclusive (and other) benefits.

That said, all eTools will not be suitable for all learners, curricula or classroom environments and should not be forced into planning without the learners having a voice. We must engage our learners to determine their needs and select appropriate inclusive eTools for them, as was done with the student survey. This approach provides the grounds from which to develop a student-led inclusive contemporary classroom supported by technology that matches our learners’ needs and preferences.

‘When I enter a classroom I should be someone who is open to new ideas, open to questions, and open to the curiosities of the students as well as their inhibitions. In other words, I ought to be aware of being a critical and inquiring subject in regard to the task entrusted to me, the task of teaching and not that of transferring knowledge’ (Freire, 2001, p.28).

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8 Bibliography


Stimulating student note-taking and review: the effect of active learning with rapid feedback

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Abstract

As part of a study skills workshop, first year undergraduate students participated in an active learning exercise on remembering; this involved watching a video and later being tested on how much they could recall. The students watching the video were divided into three groups with different approaches to note-taking and subsequent review; afterwards the test results were fed back to the class. Subsequently, a survey was carried out of the students' approach to note-taking and review, both before and after the workshop. The results during the classes clearly demonstrated to the students the learning benefits both of taking notes and of subsequently reviewing them and the questionnaire results confirm that students' behaviours in this area were positively impacted by the workshop. Additionally, a number of barriers to effective note taking were identified which can be addressed in the future.

Keywords: active learning, note-taking, notetaking, remembering, study skills.
Introduction

It has long been known that learning from lectures is made more effective when students take notes and subsequently review those notes (see, for instance, Fisher & Harris, 1973; Einstein et al, 1985). In developing “Learning Skills” workshops for first year undergraduates, the taking and use of notes was therefore an important element. This paper describes the approach taken to encouraging students to take and review notes and then discusses the subsequent effect on their note-taking behaviour. It must however be pointed out that this was not planned as a research study but rather the study was developed during the course of six workshops, which were delivered over two weeks.

Background

Learning Skills Workshop Live Events Management is a two-year Foundation Degree (FdA) course offered by Backstage Academy, a partner institution of the University of Bolton which is the degree awarding body. Foundation Degrees are described by the UK higher education regulator, the QAA (The Quality Assurance Agency for Higher Education) as follows: “Foundation Degrees integrate academic and work-based learning through close collaboration between employers and programme providers. They build upon a long history of design and delivery of vocational qualifications in higher education, and are intended to equip learners with the skills and knowledge relevant to their employment, so satisfying the needs of employees and employers.” (QAA, 2010:4). The same QAA document goes on to stress the importance of balancing intellectual and practical skills.

The Live Events Management course very much embodies these principles; it is a hands-on, two-year, practical course for people who wish to work on technical, creative and organisational aspects of live events such as concerts, festivals, product launches and other corporate events. Aspects covered include sound, lighting, staging, live visuals, design and planning. Alongside the FdA qualification, students also obtain technical certificates needed for employment in the industry in areas such as safety, rigging, first aid, working at heights and working with electricity (Backstage Academy, 2014).

A one day “Learning Skills” workshop was developed for delivery to all first year FdA students; it formed part of an intensive introduction to the course and took place during the initial ten days of the students’ first term. Topics related to note-taking and remembering in the workshop included benefits of note-taking, techniques, organising information, remembering and forgetting together with several exercises.

The FdA course is very practically orientated and the workshop was designed to fit in with that approach by showing the students, through their own results, the benefits of note-taking and review. An exercise was therefore developed involving students watching a video in the morning and then being tested on their recall at the end of the day. A range of modes of note-taking and review was incorporated by dividing the students into three groups each of which would adopt a different approach to taking notes and subsequent review of them.

There were 96 students in the cohort, divided into study groups of 16, each group participating in the workshop on a specific day; approximately 90% of eligible students attended a workshop. The initial intention was simply that the efficacy of both note-taking and subsequent review would be made apparent because the students who did more note-taking and review would perform better in the test and, on the first day, the results were collected in orally. However, on reflection this was not optimally effective so, for subsequent days, students marked their own work and handed it in and the lecturer was then able briefly to summarise the day’s results. Whilst self-marking can introduce inaccuracy due to self-interest, there does not seem to be any systemic reason why this should operate differentially in the three groups as the participants had no interest in the validity or otherwise of the hypotheses. A further refinement was added on day three in that the
previous results were analysed and presented to students graphically (see Findings section below) after their own results. Each subsequent day’s results were added to the presentation so that, by the final workshop, students had not only their own results but also those of the majority of the cohort.

The results obtained during the workshop, as discussed below, strongly indicated the positive effects, both of taking notes and of subsequently reviewing them, on recall. The pedagogical aim of the workshop though was to impact positively on students’ study behaviour and it was therefore also decided to investigate whether a positive classroom demonstration had led to changes in their approach to note-taking. This meant that there were two research objectives:

- To test whether note-taking and review affected subsequent recall.
- To assess whether students’ approach to note-taking and review were changed by the workshop and this particular exercise.

Remembering and forgetting
In one of the earliest studies in the field of experimental psychology, Ebbinghaus (1885) investigated memory and forgetting. He observed that the ability to recall learned information (groups of syllables) decreased over time in a consistent manner and his results can be clearly seen in what is now called the Ebbinghaus Forgetting Curve. This showed that, of information that can be recalled immediately, over half is forgotten in less than an hour and by two days 75% can no longer be recalled:

Ebbinghaus also studied the effect of repeating the learning over time and found that it did assist recall considerably if the material was studied again and that the amount of time needed to consolidate learning fell with each successive repetition.

These two findings form the basis of the view (University of Waterloo, ND; trainingindustry, ND) that revisiting learned material is a very effective way of overcoming Ebbinghaus’s curve. The following graph is one of many illustrating this point that can be found in study skills books and on university and other internet study sites:
Active Learning
The value of the learner actually “doing” rather than passively absorbing is one of the oldest concepts in pedagogy, having been identified at least two and a half thousand years ago:

“One must learn by doing the thing, for though you think you know it - you have no certainty until you try.” (Sophocles, 5th c BCE)
“I hear and I forget. I see and I remember. I do and I understand.” (Confucius, 5th/6th c BCE)

More recently, Adler (1982:50) expressed the same sentiment: “All genuine learning is active, not passive. It is a process of discovery in which the student is the main agent, not the teacher.” And in 1987 (3) Chickering and Gamson, in their manifesto “Seven Principles For Good Practice in Undergraduate Education” identified encouraging active learning as one of those key principles and went on to say: “Learning is not a spectator sport. Students do not learn much just by sitting in classes listening to teachers, memorizing prepackaged assignments, and spitting out answers.” However, the concept was really popularised and the term ‘active learning’ introduced with the creation of the Association for the Study of Higher Education (ASHE) and the publication in 1991 of the first ASHE report by Bonwell & Eison where it was defined with great simplicity as: “anything that involves students in doing things and thinking about the things they are doing” (2). The aim is also summarised in the subtitle of their paper (a phrase they have repeatedly used since): Creating Excitement in the Classroom.

In the following years, active learning became an increasingly important component of Higher Education teaching and, in their 2002 investigation of how time was spent in classes in a US public university, Lammers & Murphy found that approximately 15% of class time was engaged in active learning. This approach is very much that adopted by Backstage Academy (nd: online) as expressed in its prospectus: “We place great emphasis on practical learning”.

The issues both of remembering and active learning can be seen to affect the way in which student classroom learning is mediated by the way students record and review what they have been taught.

Note-taking and remembering
It has been experimentally demonstrated many times that note-taking enhances learning. Fisher & Harris (1973) compared recall of lecture content after three weeks depending on both note-taking and subsequent review. They found that taking notes and reviewing them produced the highest level of recall, whereas not taking any notes and reviewing the lecture “mentally” was the least effective. Subsequently it has been shown that note-taking has a benefit not only on the quantity of recall but on its quality as well: Einstein et al (1985) compared the recall of note takers and non-note takers and found that note takers recalled more of the high-importance propositions whereas non-note takers recalled high- and low-importance propositions equally. In other words, taking notes assists information processing leading particularly to recall of important information.

The efficacy of note-taking and review can now be considered settled and it is notable that there is little if any contemporary research on this. By 1979, in their review of research on the subject, Carrier & Titus concluded that there were two principal active areas of research: the first considered the various methods of note-taking and their relative benefits and the second was more concerned with the mechanisms by which note-taking has its impact on learning which they express as “investigators disagree as to which property of notetaking best accounts for its utility” (1979:299).

In a subsequent meta-analysis (Henk & Stahl, 1984), the theoretical basis for the efficacy of note-taking is summarised into two hypotheses: the first is the encoding hypothesis which credits the actual process of note-taking (in terms of attention, transformation and the consequently deeper level of processing) with leading to better recall. The alternative hypothesis argues that the existence of notes as a record of the lecture permits the subsequent analysis and restructuring of the lecture material which also facilitates learning; this is called the external storage hypothesis. These two explanations are not mutually exclusive and encoding can be seen as the primary reason for note-taking, in and of itself, being beneficial whilst the external storage view explains the additional benefit of subsequent review. This view was demonstrated experimentally by Rickards & Friedman (1978: P136) “Most importantly, note-taking seemed to serve as both an encoding device and as an external storage mechanism, with the latter being the more important function”. It could, however be argued that the importance of students’ own lecture notes as external storage is greater in the experimental setting where the notes are the only
medium for review than in the real
world where, even in the absence
of their own notes, students will
still have other sources for revision
such as lecture handouts, slide
packs, other VLE material, text
books, revision guides, internet sites
and so on.

As a result of all the above work,
the subject is addressed in many
publications aimed at students;
for instance, Kesselman-Turkel &
Peterson (2003:3) say that “the
very act of note-taking helps you
remember ideas you're taking
down” and many universities
have learning skills sites which
also promote the taking of notes
(the University of Bolton and, in
addition, Leeds, St Andrews &
Cornell to name only three out of
many). In fact, universities invest
heavily in a wide range of learning
skills support; whilst it is difficult
to find financial information on
the amounts invested, the level of
commitment can be illustrated by
the staffing of such centres; for
instance, the University of Essex
Skills Centre has 17 academic staff
as well as administrators (University
of Essex, ND).

Research on the subject has very
much moved on in the last 30 years
to special cases (such as those
with learning needs – outwith the
scope of this paper) and to the
methods employed in note-taking,
especially in the light of electronic
means that are now available. In
particular, there is a strong body
of work suggesting that the use of
laptops (and, by inference, more
recent technology such as tablets
and smartphones) during lectures
impacts negatively on learning. An
early, and still influential, paper on
this subject reported on research
done at Cornell, a university well
known for its widely-used ‘Cornell
Notes’ approach to note-taking, by
Hembrook & Gay (2003). Groups
attended the same lecture, one
using laptops (the ‘open’ group)
and the other not (the ‘closed’
group). They were subsequently
tested using both multiple choice
(recognition) and free form (recall)
questions. The closed group
performed significantly better on
both recall and recognition. The
result is explained by the level of
distraction available with a laptop
(now, with the rise of social media,
much greater than it was in 2003)
even if the distraction related to
lecture content (looking up specific
points mentioned by the speaker
for example). Although Hembrook
and Gay did not specifically record
whether the laptops were being
used for note taking it is possible
that the lower degree of encoding
required in transcribing material
through a keyboard may also have
adversely affected learning.

Sana, Weston and Cepeda (2012)
took this further and looked at
the impact of laptop use not only
on the student’s own learning but
also on that of their neighbours
and found that students who were
in view of peers who were using
laptops performed less well than
those who did not have a view of a
screen. Concentrating again in the
impact on note takers themselves,
Mueller & Oppenheimer (2014),
echoing both the findings
of Einstein et al (1985) and
Hembrook & Gay (2003), found
that students who took notes
on paper performed better on
conceptual questions than those
who used laptops, and concluded
that “laptop note takers’ tendency
to transcribe lectures verbatim
rather than processing information
and reframing it in their own words
is detrimental to learning.” (1)

All of this weight of evidence has
led to a move by many academics
to ban laptops in class. As
Dartmouth computing Professor
Dan Rockmore (2014) puts it:
“The act of typing effectively turns
the note-taker into a transcription
zombie, while the imperfect
recordings of the pencil-pusher
reflect and excite a process of
integration, creating more textured
and effective modes of recall.” If
this is so, it would accord with the
encoding thesis as the scope for
encoding when typing is rather less
than that available to the paper
note taker who can more readily
annotate, link and illustrate during
the process of taking down what is
heard.

All this supports the importance
of active learning processes, such
as taking down and organising
information, and also subsequently
reviewing that captured information
to optimise learning. It therefore
makes note-taking and review
both an important element of the
skill-set required by students (and
hence rightly a major component
of a study skills workshop) and a
suitable subject for research in a
real classroom context.
Methodology

Remembering test
Students were shown a video that was brief, lasting just over 4 minutes, but interesting and informative in a relevant subject area which was intended to engage their interest. In the video Todd Ricci (EventElevator, 2013), the lighting director for Bruce Springsteen's touring show, discusses some of the equipment he uses and the reasons for choices he made.

There were 96 students in the cohort, divided into study groups of 16, each group participating in the workshop on a specific day; numbers actually attending on any given day varied between 12 and 16.

Each day's class was divided into three groups of approximately equal size, based on which of the three sides of the room (the seating being an open rectangle) they were sitting on; two of the groups were told to take notes (on paper) while the video was played and the other was told not to make any notes. After the video had been viewed, the notes from one group were collected in and the group which had retained their notes were asked to review those notes.

The groups were identified as A (no notes), B (notes but no further review) and C (notes and review). To avoid any bias from where students chose to sit (for example it was observed that the first students to arrive tended to select the seats facing the lecturer), the group allocations were changed from day to day so that each position had an approximately equal chance of being in A, B or C.

Those in Group C were prompted to review their notes again several times during the rest of the day.

At the start the design was purely a pedagogical one and it was only intended that the data collected should be shown to the students to demonstrate the point being made. During the course of the workshops it became apparent that there might be something interesting in that data and therefore more effort was taken both on eliminating bias and on the feedback of the results (both of that group and of previous groups) at the end of the exercise.

At the end of the day a 10 question recall test was administered and self-marked by the students.

The differences between the three groups were analysed using a 1-tailed t-test. A 1-tailed test was deemed appropriate due to the very low possibility (both from previous evidence and inductively) that taking no notes (or not reviewing notes) would result in better recall.

Survey of note-taking behaviour

Approximately one month after the last workshop all 96 students in the cohort were emailed and asked to complete an online questionnaire if they had attended a workshop. In addition to background and demographic information, the questionnaire asked respondents to describe their note-taking behaviour both before and after the workshop, on 4 or 5 point Likert scales, in terms of:

- The frequency with which they normally took notes - questions 1 (before) & 4 (after)
- The extent / level of detail in their notes- questions 2 & 5
- The degree to which they subsequently reviewed their notes - questions 3 & 6

In addition, a diagnostic question was asked to those who took few notes, seeking to understand their reasons for this and students were also asked their preferred medium for note-taking.

Points were allocated to questionnaire answers relative to the desirability of the approach (from 1, least, to 4 or 5, most, depending on the number of options presented) across all three dimensions (frequency of note-taking, extent of notes taken and level of subsequent review).

Descriptive statistics of numbers of students who had improved on each aspect were produced and the differences between ‘before’ and ‘after’ scores were tested for significance using 1-tailed t-tests (1-tailed being deemed appropriate as there was no reason to expect that the workshops would have had a negative effect on behaviour).

Limitations of the methodology
It must be recognised that there are several limitations in the methodology, in particular:

- It was developed during the course of the workshops so there were no a priori objectives and each day was not absolutely identical to the previous ones;
- There was no control group making it impossible to
Findings and discussion of results

In addition to announcing the day's results, those for the previous groups were shown to the students after the test, in graphical form (for ease of understanding); the examples below show the results for all five days.

It can be seen that the results are very much in line with the expectations based both on theory and on previous research.

The use of the high-low scores graph was intended to bring the findings home more dramatically as it shows that whereas well over half (56%) of those who took and reviewed notes achieved an above average score, barely a quarter (26%) of those who took no notes did so. It is another way to view it: members of the 'note and review' group were more than twice as likely to obtain a high score (at least half marks) as those in the 'no notes' group.

Statistical analysis
The analysis, using a 1-tailed t-test, showed that taking and reviewing notes was better than simply taking notes at the 95% confidence level. However, just taking notes alone did not improve performance over the no notes group by a statistically significant degree (the difference fell just above the 90% confidence level).

This demonstrates that the significance to recall of taking notes lies to a great extent in its being an essential enabler to subsequent review and that simply taking notes, whilst beneficial, is not sufficient on its own to ensure improved performance.

It should however be noted that (a) as commented above this applies more in the experimental setting where students' notes are the only means of revision available and (b) the findings do not support the null hypothesis (that note taking alone has no effect).

Discussion
It is worth remembering that the students were assigned to groups randomly and that the scores should therefore reflect purely their actions during the exercise and not any inherent differences between or preferences of the members of each group.

It is the experimenter's observation that those students who did not, as their preferred approach, take notes during the rest of the workshop tended to be those who appeared least interested or engaged in the process. (This is, of course, a generalisation and there were students who, while very engaged, did not take notes; in at least one case, the student concerned was dyslexic.)

It could therefore be inferred from this that if the experiment were to be repeated with participants choosing their own approach, the
gap would be greater and that this would represent the 'real-life' situation. The material recalled was purely factual and required little analysis, therefore the impact of note-taking and review is really only being measured in terms of simple recall rather than understanding. The period after which recall was tested is also fairly short – about 4 hours - so says little about longer term learning.

Survey of note-taking behaviour

Overall note-taking approach
Points were allocated to questionnaire answers relative to the desirability of the note-taking approach (from 1, least, to 4 or 5, most, depending on the number of options presented) across all three dimensions (frequency of note-taking, extent of notes taken and level of subsequent review). On this basis, 7 of the 9 respondents increased their score and the mean increase was 25%. Of the 7, 2 improved on all 3 dimensions and 4 on 2 dimensions. The results of each dimension are considered below.

Frequency of note-taking
Participants were asked which of the following statements best described the frequency with which they took notes:

1. I rarely or never took/take notes
2. I occasionally took/take notes
3. I usually took/take notes
4. I always took/take notes

A majority of students (6/9) reported that, before the workshop, they usually took notes whilst one said notes were taken occasionally and the remaining two rarely if ever took notes. Afterwards, 5 students reported that they took notes more often than before, including 3 who said they now always took notes (none having previously done so). Two students also commented that some lecturers discouraged students from taking notes during classes (as it was seen as a distraction from learning) with one going on to add: "my recall is less in these lectures". The mean points score increased by 0.7 (from 2.4 to 3.1) after the workshop which is significant at the 95% confidence level using both 1- and 2-tailed t-tests.

Extent of note-taking
Participants were next asked which of the statements below best described the extent of the notes they took:

1. I hardly wrote/write anything down
2. I just noted occasional things that were/are interesting
3. My notes were/are quite brief
4. My notes were/are focussed on the most important points
5. My notes were/are usually very comprehensive

Before the workshop only 3/9 students claimed to take notes which were comprehensive or focussed on the important points; but afterwards the number doubled, with 2 taking comprehensive notes and 4 at least capturing the most important points. Overall 6 students improved the extent of their note-taking (and one was already on the maximum level so did not have scope to improve within the terms of the questionnaire – so 75% of students who were able to improve did so). However, surprisingly, one student actually reported that they were taking less comprehensive notes after the workshop. It is difficult to interpret a single score and it may well be that this anomaly is due to nothing more than careless completion of the questionnaire; nevertheless, it is possible that other factors not directly connected to the workshop (such as the change in the type of learning they were now experiencing compared to school or college) may have negatively affected this student's note-taking behaviour.

Overall the mean points score for respondents increased by 0.6 (from 3.0 to 3.6) and the improvement is significant at the 95% confidence level using both 1- and 2-tailed t-tests.

Review of notes
Finally, respondents were asked about whether they subsequently reviewed notes they had taken:

1. I rarely or never reviewed/ review my notes and/or I didn't take notes
2. I reviewed/review my notes when I needed to look something up or for a test
3. I reviewed/review my notes after class
4. I reviewed/review my notes after class and several times after that

Prior to the workshop students either never reviewed their notes (4/9 including the 2 who made no
notes) or only used their notes to study for a test (5/9). Afterwards 4/9 had increased their review frequency; 3/9 said they reviewed their notes after the class and one, who had previously not taken notes, now used those notes prior to tests. Overall, mean scores increased by 0.6 (from 1.6 to 2.2); this is significant at the 95% confidence level using 1- or 2-tailed t-test.

Reasons for not taking notes
Students were also given the opportunity to select from a list of reasons why they did not take notes. Although the question was explicitly aimed at those who took few if any notes, it was in fact answered by a majority of students (5/9) indicating that many of those who do take notes still have issues.

The two who initially took few if any notes both answered that they were unable to write fast enough and it is interesting to note that both of these (but only one of the other 6 who stated their preferred method) used laptops for note-taking. Although ‘writing’ was not intended in the question to mean specifically using pen and paper, it is possible that respondents interpreted it this way so it may be that they used laptops because they found the physical process of writing on paper difficult. Even if this is so, it does not appear that using a laptop has solved the problem for them.

In addition to the comments above on some lecturers discouraging note-taking, other issues identified were: missing things while writing (4/5), the view that handouts / slides are sufficient (2/5) and not knowing what to write (1/5). Two students also reported that they suffered from a diagnosed learning need.

Discussion and Conclusions
Efficacy of note-taking and review in supporting learning
Although this has long been established (Fisher & Harris, 1973) it is nevertheless a positive outcome that the results of the remembering test did, in fact, conform to both theory and previous experimentation.

Impact on note-taking behaviour
Participants’ approaches to both the taking and the subsequent review of lecture notes improved significantly following and, by inference, as a consequence of the workshop. Universities and other institutions invest substantially in teaching skills - as opposed to specific academic subjects – (University of Essex, ND), including not only study skills, as in this case, but also specific technical skills (e.g. use of Microsoft Office products or SPSS) and other skills needed for their particular area of study (such as Research Skills) and these results do indicate that such investment can be worthwhile in terms of positively affecting behaviour.

Active learning and feedback
The exercise contained both active learning (participation in an experiment on note-taking) and prompt feedback (of the results within the current class and, from day 3, of those of previous classes). Unfortunately, the number of respondents on each day precludes any attempt to identify the impact of different factors (e.g. the potential impact of more data being fed back with each subsequent workshop.)

The video exercise addressed taking notes and reviewing them but did not address the actual nature, quality or comprehensiveness of the notes taken. If active learning is more effective (Bonwell & Eison, 1991), it would be reasonable to expect that the aspects addressed by the activity (propensity to take notes and to review them) would be impacted more than would the extent of those notes, as this was not addressed in the activity. In fact, there was a somewhat greater impact on the frequency of note-taking but no difference between the impact on comprehensiveness of notes taken and that on subsequent review. This, though, does not necessarily imply that the exercise played no part in the improved overall approach to taking and reviewing notes. The three aspects were all explained to participants as being inextricably linked in supporting effective learning and it is therefore a tenable hypothesis that the effect of the active learning exercise was on the whole of note-taking.

Given that the impact of the exercise on behaviour appears to have been positive, there are several possible explanations. Firstly, it may be that taking part in the video exercise was itself convincing or secondly it was the feedback of previous results (but of an exercise the participant understood from having themselves taken part in it.) Alternatively, that the effect of the exercise lay not so much in its ability to convince but rather, being memorable, that it placed the subject at the forefront of participants’ minds and therefore was more likely to remind them to adopt the desired behaviours. Finally, it is possible that the exercise, in and of itself, did not have a significant impact on behaviour and the observed effects were due to other parts
of the workshop that addressed note-taking and remembering. The limitations of this brief study do not permit any of these to be determined but they will be referred to below under ‘future directions’.

Nevertheless, the effectiveness of the active learning approach can be a useful guide to the design of course delivery. There may well, of course, be other reasons for including such activities: they serve to, in Bonwell & Eison’s phrase (1991), Create Excitement in the Classroom (by breaking up the day, adding variety, stimulating active engagement and so generally increasing student interest). But this study reinforces the view that, in a real world classroom environment, they can also directly contribute to positive learning outcomes.

Future directions
A study planned and designed in advance, ideally using control groups and with a larger population, could give a better insight into the impact of the factors identified. However, it must be noted that there are ethical issues in giving some students a sub-optimal learning experience purely to facilitate research. Even simply repeating this study on subsequent cohorts would give a larger dataset that could potentially identify a statistically significant difference in recall between the ‘no notes’ and ‘notes but no revision’ groups.

Remembering is a simple subject to be studied in this way because it can readily be tested in a short period of time which means both that it can fit in with the limited time available and that more or less immediate feedback can be provided. Ways of applying this approach to other aspects (such as comprehension or planning and to technical skills) could be investigated.

Finally, turning to the enhancement of future workshops, the main area of focus arising from the study would be in investigating and offering more solutions to enable students to overcome the barriers to note-taking that were identified.

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References

Backstage Academy (ND) http://www.backstage-academy.co.uk/ [accessed 1/10/2014]


EventElevator (2013), Lighting Director Todd Ricci about his work for Bruce Springsteen and the E Street Band, https://www.youtube.com/watch?v=UZep8AKhJFQ [accessed 6/10/2014]


Rickards & Freidman (1978) The encoding versus the external storage hypothesis in note taking Contemporary Educational Psychology Volume 3, Issue 2, April 1978, Pages 136–143


University of Essex (ND) University Skills Centre – People http://www.essex.ac.uk/skillscentre/staff/default.aspx [accessed 19/3/2015]

University of Leeds (ND) Skills Library http://library.leeds.ac.uk/skills-students [accessed 3/10/2014]
University of St Andrews (ND) Taking and making notes https://www.st-andrews.ac.uk/students/academic/advice/academicstudyskillsupport/mathssupport/notes/ [accessed 3/10/2014]

The Historical Development of Engineering Higher Education and Implications on Future Teaching and Learning - Bridging the Skills Gap’

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Abstract

The introduction of science, technology, engineering and mathematics (STEM) education in the UK was protracted, initially driven by scientific developments but ultimately shaped and enhanced by industrial demand. The current focus of widening participation, engaging students from less conventional academic backgrounds is further compounded by the need to satisfy the STEM, (particularly engineering) shortfall in the UK, hence alternative approaches to encourage young people into such areas is being supported via more expansive routes into higher education. This has opened some particularly educationally profound avenues such as University Technical Colleges, and also via HE in FE: supporting Higher Apprenticeship Schemes and delivering Foundation Degrees.

The teaching and learning styles employed in undergraduate engineering, although highly researched still display some evidence of historical methods and traditional didactic teaching styles. These approaches have the potential to both impose additional pressure on and de-motivate students from less traditional vocationally orientated backgrounds.

Keywords: HE in FE, engineering education, engineering history, teaching / learning methods, vocational engineering, widening participation.
As part of a doctoral research programme of study into the investigation of the transition from further into higher education for engineering students, it was deemed pertinent to initially evaluate how historical trends and legacy teaching approaches have shaped current pedagogical practice and access to Higher Education (HE) engineering. This background will allow informed exploration of the key challenges that students face whilst transitioning into higher education in an engineering discipline, henceforth providing opportunities to enhance their learning experiences and ultimately expand employment prospects. This investigation initially explores the policies, trends and legacies that have shaped the development of engineering education, defining how it was delivered historically and whom it was accessible to. Further examination of existing research available around the changing methods of teaching, learning and assessment of engineering students directs consideration to the impact on students from less traditional academic backgrounds, which will lead to the focus of the doctoral research investigation.

There is evidence of teaching in Oxford as early as 1096, albeit the University of Oxford was not actually officially founded until 1167. Subjects taught were predominantly focused around the Church and areas such as Law, the Arts and Medicine. According to University of Cambridge archives, the earliest records of study date back to 1209, when, due to hostility from the Oxford locals many scholars moved to Cambridge. Again Arts and associated subjects prevailed, later followed by a broader spectrum of arithmetic, music, geometry and astronomy, hence there is no evidence that engineering, technology, science or even core mathematics (beyond arithmetic) were part of the initial higher education (HE) agenda. Typifying the educational style of the era, particularly at Cambridge: ‘Teaching was conducted by masters who had themselves passed through the course and who had been approved or licensed by the whole body of their colleagues (the Universitas or University). The teaching took the form of reading and explaining texts; the examinations were oral disputations in which the candidates advanced a series of questions or theses which they disputed or argued with opponents a little senior to themselves, and finally with the masters who had taught them.’ (University of Cambridge, 2014 online). Further evidence typifying the learning and teaching styles of the Middle-Ages identified that ‘writers like Aristotle were regarded as the final authority, lecturing was a matter of explaining what they meant’. Until the introduction of the printing press in 1476, students tended to learn via tutors and lectures only as ‘books were rare luxuries’. (Local Histories, 2014 online). Mathematical and scientific developments in education were not overtly evident until the seventeenth century, through which, ensued a rapid development of professorships in mathematics,
chemistry and astronomy, resulting in mathematics dominating studies towards the end of the century. This period known as the ‘Scientific Revolution’ was transforming the views of nature and society, with further innovations such as Galileo’s observational astronomy and physics feeding the dialogues: ‘Two New Sciences’ (Galileo, 1638) and Hooke’s principles of science, including the pertinent ‘Hooke’s Law’ (1660). During this period, Isaac Newton was a Professor at Cambridge University. In 1687, Newton composed the prominent ‘Principia Mathematica’ - establishing fundamental principles of physics that still informs teaching in contemporary classrooms today. Newton himself argued that during his studies he was ‘self-taught’, learning from books and supplementing his stifled ‘Aristotle oriented education’ by reading works written by the (then) modern philosophers such as Galileo and Kepler. (For contextualisation, Einstein’s theory of relativity followed in 1905 and many further significant scientific developments, albeit these were only introduced in limited form to university education at the time). A series of ‘Dissenting’ Academies emerged in the latter end of the Seventeenth Century, in existence between 1662 to 1820, they were eventually ‘open to all comers’ and during fourteen hour days, delivered a wide range of subjects preparing students for life in general (Parker, 1990, p125). There is some evidence of science and mathematical topic areas such as algebra, metaphysics, trigonometry and celestial mechanics (astronomy), being embedded within the curriculum. (Parker, 1990, p.127). Albeit a wide and varied experience in terms of quality and consistency, a new definition of the content of a general education was worked out and put into practice’ (Williams, 1961, p.134). This inevitably had an impact upon the development in educational topics during the Industrial Revolution as the State began to implement a form of nationalised education programme. Hence, the Industrial Revolution and an increasing population (not less influenced with significant developments such as James Watt’s steam engine in 1769), resulted in a migration from an agriculturally focused country to mass production factories and new industrial development. Guilds were still embedded within medieval towns during this period which increasingly forced the economic propulsion for specific, high, consistent standards to be met, particularly in craft trades. (Guild 2016 online). The required skills to support these changes incorporated the need for ‘mechanics’ (the non-contemporary definition of which represents those who were actually undertaking technical roles such as operating and maintaining machinery) to support the growth in local industry. Universities of this period were not configured to teach the relevant subject areas to accommodate such a technical education, or the working classes. Hence the technical education for working professionals was undertaken by the introduction of ‘Mechanics’ Institutes’ initially established as libraries and facilities to provide access to education in science and technology for the working class – (the first of which was set up in Edinburgh in 1821 founded by George Birkbeck). Further Mechanics’ Institutes evolved in rapid succession - there were believed to be over seven hundred by the mid nineteenth century across the UK and overseas. The Mechanics Institute motion, ‘matured within an environment of attention by a considerable dimension of the populace in methodical interests disclosed in the common speeches of well-known experts in science such like Faraday’. (Jefferson, 1969, p.21). Education within the Mechanics’ Institutes drew
upon existing intellectual traditions (demonstrating didactic teaching approaches similar to that of most universities of the time), yet training a specific class of society and initiating the onset of technical vocational training. The initial teaching methodology applied was via a series of lectures in physical mechanics, which (due to the alleged inquisitive nature of the students in such topics) further developed to include ‘mechanics’ classes’, laboratories and reading libraries. The Mechanics’ Institutes could be categorised as inherently providing training of a specific class, where ‘the new sciences were radical elements in the society as a whole.’ (Williams, 1961, p.143, cited by Gillard, 2011).

Although many of the Mechanics Institutes were ultimately disbanded when industrial demand waned, some migrated into colleges and universities or were further developed into public libraries during the latter end of the twentieth century, evidence that their influence is still significant to the educational development of Engineering, Science and Technology today. The importance of the Mechanics’ Institute movement has been much understated, arguably, ‘it laid the foundations of our modern technical education and in no small degree of our public library system.’ (Kelly, 1952, p.17).

Further developments in university engineering and mathematics education were slow until after the Royal Commission of 1850 (with the establishment of the first World Trade Fair) they subsequently advanced considerably, a result of the aforementioned acting as a catalyst for expansion and development of Britain’s industrial image and also as a result of the increasing strength of university education in mathematics in England particularly, (gradually introducing natural and mechanical science studies and ensuing experimental physics and engineering).

A provocative opinion of universities during this era was that of Newman who highlighted in his ‘Discourses to the Church’ that the focus of a university was as a ‘place of teaching universal knowledge’, with the implications that ‘…its object is intellectual rather than moral and the diffusion and extension of knowledge rather than the advancement’. Most controversial in the context of this study is the further statement that he did not appreciate ‘how it can be the seat of literature and science’. Newman (1852). Hence claiming that universities were not advancing research and development nor were they encouraging forward thinking or engaging students in new ideas or concepts. Subsequently, contradicting Newman’s arguments, education in experimental physics moved forward rapidly at universities such as Cambridge, particularly towards the late 1800’s resulting in major scientific breakthroughs such as the discovery of the electron, later leading to the (initial) splitting of the atom in 1932. Further significant engineering and scientific progress: significantly jet engine development, digital computer technology and the identification of the structure of DNA all ensued over the following two decades, predominantly as a result of research expansion within the more prominent universities of the time.

The opening of new colleges and particularly the six initial ‘Redbrick’ Universities (in major UK industrial driven Victorian and Edwardian cities: Birmingham, Bristol, Leeds, Liverpool, Manchester, Sheffield) in the late nineteenth and early twentieth century, initiated changes at Oxford and Cambridge as their restricted curriculum and limited intake invited fierce competition. These original six Redbrick Institutions, with origins back to engineering or medical colleges, gained university status before World War I and ‘arose in the great industrial cities of the North
and Midlands in response to rising population … and the need for scientific and technical manpower for the industries of those areas’ (Sanderson, 2002, p3).

The new organizations admitted male learners without prejudice against religion or class to study, (until the ‘University Statute’ of 1920 admitting women to full university membership, women were not allowed to matriculate or graduate at some universities), - the focus being predominantly civic science and/or engineering related skills, to serve their industrial locations. (Egiins, 2010, p12). Hence local demand from the developing manufacturing industry was again driving the development of technical education at a higher academic level within universities. Statistics from this period show a significant increase in the number of students gaining first or second degrees (aligned with the increase in available institutions within the UK), this remained relatively steady until the significant downturn during World War II.

The Second World War had a momentous effect upon the financial status of HEI’s and also on the development of teaching in that it ‘influenced certain academic concepts, the aims of education, the introduction of new programmes and curricula …. the nature of teaching’. (Cardozier, 1993, p212). As demonstrated in Figure 1, the number of students studying and gaining first degrees in the late 1940’s rose as ‘numbers were boosted by government schemes to support those who had served in the armed forces’ (Bolton, 2012, p13). Growth remained a prevalent theme into the early 1990’s, where the 1992 Act expanded opportunities for polytechnics and institutes to be raised to university status: ‘if the educational institution is within the HE sector… so as to include the word ‘university’ in the name of the institution’. (Further and Higher Education Act, 1992).

This allowed them to validate their own undergraduate and post graduate programmes, hence a significant development for HE, reflecting recommendations made within the ‘Robbins Report’ (1963) almost thirty years earlier.

![Number of Students Gaining First Degrees between 1920-2010](source data: Bolton, 2012)
The traditional polytechnics predominantly focused on engineering, applied sciences and technology with more emphasis on teaching than research. Although often deemed lower in status than traditional universities they provided opportunities to those who may not have otherwise accessed higher education: with often lower admission criteria and a more informal approach to teaching in contrast to the lecturing style utilised by most university professors of the day. Prior to the 1992 act, academic degrees in polytechnics and institutes were validated by the Council for National Academic Awards (CNAA) and many undergraduate courses by the Business and Technology Education Council (BTEC). It was argued by many of these transitioning organisations that ‘a CNAA degree was superior to many university degrees especially in engineering, due to the external independent validation process employed by the CNAA, the engineering institutions, and innovations such as sandwich degrees.’ Brosan (1972). Subtle intimation of forthcoming vocationalism) that a polytechnic education is more adaptable for professional roles within industry.

Vocational education became a topic of particular interest towards the new century. National Vocational Qualifications (NVQ’s) had already been in existence for almost a decade, however they only hinted of the later more focused integration of academia and industry. These early NVQ’s were subject to much controversy due to the considerable paperwork required to apply the criteria for assessing skills and competence. The NVQ has progressed and developed over a period of time, still today allowing many individuals to gain formal qualifications within their vocational trades and professions. It also introduced a new style of education that provided an alternative approach to learning and assessment and also satisfied the needs of many employers as their staff could study on a part time / more flexible basis. Contrastingly, the NVQ framework was also likened to a ‘prescriptive straightjacket’ and it was realised by the government that ‘employer ownership needed to be strengthened’ (Raggatt & Williams (2004, p100). Interestingly employer ownership and collaboration is the cornerstone of the new Degree Apprenticeship schemes initiated in 2015. During the early part of the millennium, the focus of attention was shifted from compulsory education to the educational welfare of 16-19 year olds. Following the publication of the ‘Learning and Skills Act (2000)’ and the establishment of the Learning and Skills Council, concentration on the ‘14-19 agenda’ became of prevailing Government interest, and the drive for acquisition of skills led to a dramatic change in traditional approaches to teaching and learning, particularly in practically oriented subject areas. Noteworthy consultation papers were written by Estelle Morris in 2002 and a year later by Charles Clarke, both identifying proposals for the 14-19 curriculum, these were entitled: ‘14-19 extending opportunities, raising standards’ and ‘14-19: opportunity and excellence’ respectively, ultimately resulting in the ‘Increased Flexibility Programme’ (IFP). This programme was structured to provide alternative routes for students with a more practical, vocationally orientated educational bias. Statistical evidence from the initial cohorts demonstrated that practically based teaching was effective and worked well for students who did not benefit from pure classroom-based study and wanted applied practical experience in an area of interest. (NFER 2010). It also arguably provided opportunities to enhance industrial links with potential future employers of vocational students, resulting in ‘positive outcomes where schools and
colleges and providers work in partnership to offer greater flexibility to students…’ (Golden 2004). Contrasting arguments however can be found aligning with the highly debated - ‘free schools’, being disputed to be ‘largely ideologically informed’ and to ‘increase segregation’ (Kitchener, 2013, p.411), identifying patterns of class and educational selectivity resulting in limitations to career direction.

Influenced by the Tomlinson Report (2004), five new diplomas were introduced in 2008, from foundation through to higher levels, with the aim of broadening vocational opportunity for those students, where again, the current curriculum did not suit. Two of these being ‘construction’ and ‘engineering’ focussed, with a bias towards acquisition of practical skills. The 14-19 engineering diplomas in particular received ‘exceptional employer and professional engineering community engagement and was recognised as providing an authentic engineering experience for pupils taught in real world settings, stimulating their motivation to learn’. (Kirby, 2013, p.19). Despite significant investment and focus, the diploma was disbanded by the Department for Education in 2013 although such was the commitment to the programme (at the time of writing), a committee of key participants still convene to promote engineering education.

EngineeringUK launched a report in 2014 highlighting the necessity to double the number of annual recruits into engineering to meet expected demand (Kumar, 2014, p.xi). Engineering companies are projected to have over two million job openings from 2010 – 2020, almost 70% of these will need essential engineering skills and knowledge via degree (including foundation, undergraduate and postgraduate) qualifications. Currently the UK produces only 46,000 engineering graduates each year. There will also be demand for around 69,000 people qualified at advanced apprenticeship or equivalent level each year: Despite the demand, only around 27,000 UK apprentices a year are currently qualifying at the required level. (Kumar, 2014, p.xiii).

The growing concern about the limited availability of people studying STEM subjects into further and higher education requires a less traditional, more radical approach, by widening participation and attracting students from different backgrounds, providing more varied and flexible routes into engineering. Identifying that those from disadvantaged areas and/or backgrounds are ‘ten times more likely to take a vocational pathway and study less academically challenging subjects that their more affluent counterparts’, (Kirby, 2014, p.19), there is an increasing recognition that the image of vocational routes need to be uplifted to eliminate negative perceptions and make access routes into HE more achievable yet desirable. University Technical Colleges (UTCs) are one example of a new initiative offering an alternative route from school into engineering or technical education with progression routes into apprenticeships or higher education. Another alternative mechanism is via further education (FE) providers. Studies show that in 2011, FE colleges provided 38% of higher education entrants (Summers, 2011, online). Interestingly two thirds of HE students studying in a FE college are doing so on a part time basis and are generally more likely to be older than their university counterparts, hence the FE setting provides an alternative and debatably more flexible route into HE. In 2011, two FE colleges were the first to be given Foundation Degree Awarding Powers (FDAP), (Summers, 2011, online), this has increased to five (at the time of writing), hence bridging the gap between further and higher education.
Summary

It is evident that science, engineering, technology and to a lesser extend mathematics were not deemed essential subject areas in their own right during historical development of university education. Key drivers for introducing such topics being via scientific developments, but even then the teaching was reported to be unidirectional and based upon individual professors’ research interests. Ultimately industrial demand shaped the need to enhance the curriculum, with the introduction of Mechanic’s Institutes, wider range of additional universities and more frequently polytechnics and university technical colleges. Official figures from 2013 identified that almost half of young people in the UK experienced a university education of some form, in contrast to 4% of the young population fifty years previous. Such a significant increase in figures since the 1960s could be partially attributed to the wider variety of post compulsory educational opportunities that have become increasingly more readily available yet there is a significant and real shortfall in those embarking on a STEM career. The current need to satisfy the identified STEM (and particularly engineering) shortfall has resulted in the need to reconsider the curriculum provision and identify creative approaches, widening opportunities and encouraging students from non-traditional, less academic educational backgrounds. This however has implications on the teaching, learning and assessment in contemporary classrooms, in order to retain the interest of vocationally orientated students, whilst also retaining the academic rigour. This poses significant challenges to engineering students during and beyond their transition into higher education whilst also providing a different set of challenges to the tutors in engage students from various educational starting points and with differing levels of drive and determination. Nevertheless, widening participation opportunities via entry into HE Engineering via UTC and FE Colleges, combined with traditional degree routes, the newly defined Degree Apprenticeship agenda, and the increasingly popular offering of the more practically orientated Foundation Degree can only assist in driving the reduction in the UK engineering skills gap anticipated in the forthcoming decade.

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Motivating Computer Games Programming students using gamification

Andrew completed a BSc (Hons) in Computer Games Technology and worked for seven years as a programmer in some of the most critically acclaimed games studios across the UK. He is now a lecturer in games programming at The University of Bolton, studying for a Post Graduate Certificate in Teaching and Learning in Higher and Professional Education.
This paper discusses an action research project that used gamification to enhance the HE level 4 Object Oriented Game Programming (OOGP) module at The University of Bolton. The games industry has recently been facing skills shortages in graduates, with around 95% of games degree courses being branded as ‘not fit for purpose’ (Cellan-Jones, 2008). In OOGP, a core first year module of Computer Games Programming, there is a pass rate of just 50%. ‘There has been recent research focused on the use of games for reasons other than pure entertainment. This research study was conducted first into the usefulness of gamification and secondly into the more specific concept of games in the learning process’ (Subrahmanyam & Greenfield, 1994 cited in Jones et al, 2014, p.2). I undertook an action research project in order to apply gamification to OOGP. If any group of students would be more receptive to the idea of using game concepts in a non-game context, it would be Computer Games Programming students. By using Kahoot quizzes to gamify OOGP, I was able to track student progress with the module each week. The results were positive, 73% of students taking the gamified version of OOGP obtained a passing grade, up from 50% the previous year. Student engagement with the module increased almost immediately. Based on the results from this cohort, I will definitely be running my gamified class again next year, with improvements from my observations and from the feedback that I have received.

Keywords
Gamification, Programming, Technology Enhanced Learning, Engagement, Kahoot
With the computer games industry making $60 billion a year, it is now bigger than Hollywood and dwarfs the music industry (Stuart, 2014). It is no surprise that games related degrees are soaring in popularity (Owen, 2013). Computer games programming is a relatively new degree subject which aims to prepare students for a career as a software engineer, with a particular emphasis on computer games. The course is aimed at people who have little or no previous programming experience, but who aspire to become programmers in the games industry. It is for this reason that the biggest influence on curriculum for the computer games programming degree course is the skill requirements of the games industry itself. ‘Game development is a serious and hugely enjoyable career, but it’s competitive and demanding’ (Blitz Games Studios, No Date). The competition for vacancies is fierce. (Brightman, 2014) As a result, the entry requirements to get a job as a programmer in the games industry are set very high and graduates are expected to hit the ground running. Another influence on the curriculum is accreditation. It is now possible to obtain Creative Skillset accreditation for games programming degree courses (Creative Skillset, No Date). This is something that our course currently does not meet but aspires towards obtaining. As with every university degree course in the UK, Computer Games Programming must also conform to the standards set out by the QAA. Computer Games Programming falls under the QAA Subject Benchmark Statement for Computing, which defines benchmark standards for threshold, typical and excellent levels for bachelor’s degrees (QAA, 2016). The curriculum in practice is therefore shaped to meet the skills requirements of the games industry, culminating in a mixture of curriculum theories. The computer games programming curriculum can be seen as a body of knowledge to be transmitted (programming theory), a final product (portfolio of work) and as a praxis (guided lab sessions in applied programming) (Smith, 1996, 2000). The current curriculum has been developed with help from the games industry and feedback from former graduates; Sony Liverpool and Electronic Arts, who were at one time the largest games industry employers in the north west of England, were heavily involved in developing the curriculum for Computer Games Programming. To get a job as a programmer in the games industry a degree in computer science or equivalent is usually required, however a degree, whether from a game school or a university, is not nearly as important as what is in a student’s portfolio (Sinclair, 2014) (Stuart, 2014). As a graduate’s portfolio is more important than their degree classification, it is a product, showcasing their competencies, which must be produced over the course of their degree.

If a programmer makes it to an interview in the games industry, they will have to complete a programming test, usually in C++ (Simpson, 2008). To pass such a test a graduate must have a solid theoretical and practical understanding of C++. Programming theory is a body of knowledge that must be transmitted.

The industry has recently been facing skills shortages in graduates, with around 95% of games degree courses being branded as ‘not fit for purpose’ (Cellan-Jones, 2008). The industry is moving more and more toward specialists (Brightman, 2014) and is looking for skilled graduates that are focused on a specific area of games development (Blitz Games Studios, No Date). However it struggles to find graduates with the right mathematical and computer science skills required to build increasingly sophisticated products (Cellan-Jones, 2008).

This skills shortage is something that is present in our own Computer Games Programming degree course. In Object Orientated Games Programming, a core first year module, there is a pass rate of just 50%. This is not something that is exclusive to The University of Bolton, (Anderson et al, 2008; Jenkins, 2002 cited in Neve et al, 2014, p.1) suggests that ‘Many students dislike programming’ and ‘the tutors’ traditional perception is that students struggle with programming’ (Proulx, 2000 cited in Neve et al, 2014, p.1). As part of my Post Graduate Certificate in Teaching and Learning in Higher and Professional Education, I will undertake an action research project in order to help assess the issue and develop a solution, with the aim of reducing the programming skills shortage. Action research is an iterative process in which pragmatic solutions can be developed for pressing issues by combining action, reflection, theory and practice, in participation with others (Reason and Bradbury, 2007).
To ensure an ethical approach to my action research project, I have completed the university’s research ethics form (RE1). Participants will be BSc (hons) Computer Game Programming students who will remain anonymous. All participants have signed a research ethics consent form (RE5), advising that anonymised data collected could be used in publications. Participants are aware of the study that they are participating in and have been made aware that they may withdraw their consent at any time, without giving reason.

Gamification

Games are invading our everyday lives. (Schell, 2010). ‘The gamer generation is part of a society used to collecting airline miles, and reward points in the same way they collected gold stars in kindergarten. It is something that people have come to expect, even if they aren’t hard-core gamers’ (Sheldon, 2012, p.xvii). ‘There has been recent research focused on the use of games for reasons other than pure entertainment. This research study was conducted first into the usefulness of gamification and secondly into the more specific concept of games in the learning process’ (Subrahmanyn & Greenfield, 1994 cited in Jones et al, 2014, p.2). Gamification is the use of game mechanics in non-game contexts (Detarding et al, 2011) (Sheldon, 2012), the main idea is to increase engagement (Sheldon, 2012). Gamification is growing in popularity in the education sector (Kapp, 2012 cited in Neve et al, 2014, p.2). However, ‘learning through play is not a new concept. It is the fundamental way young mammals acquire knowledge of the world around them’ (Sheldon, 2012).

(Neve et al, 2014) created NoobLab, a gamified TEL platform. It was found that when students used NoobLab, the gamification enhancements had a considerably positive effect on student engagement. However, there were some problems raised. Many students refused to move on from exercises until they achieved a
‘gold medal’. It was observed that weaker students spent more time on individual exercises than they should have, desperately pursuing a gold medal that was potentially beyond their capabilities at that time. This seems to be a problem with the particular implementation of Nooblab and could be resolved in a number of ways.

(Sheldon, 2012) took a different approach, it used gamification to create The Multiplayer Classroom, an Alternate Reality game that was played in the real world in real-time. It changed a module at Indiana University and later Rensselaer Polytechnic Institute, to use terminology usually found in games. Each student would create an avatar that would represent themselves in the classroom. Students would not earn grades they would earn XP points. Teams were renamed to Guilds. Reading tasks would be called Quests. Writing papers would become known as crafting. Quizzes and mid-term exams were re-branded as defeating monsters. The Multiplayer Classroom is an experiment that has been through four iterations and boasts very promising results. Students are more engaged, average grades have risen from a C to a B+, attendance is almost perfect, students arrive early to classes and materials are retained at higher rates seen before the introduction of The Multiplayer Classroom. (Sheldon, 2012) also offers eight case studies where Universities and high schools across the US have implemented The Multiplayer Classroom into their classes, each with similarly positive results. One of the most successful parts of The Multiplayer Classroom were regular quizzes that pitted students against each other to earn XP by answering questions correctly.

Many studies agree that gamification is a valuable educational tool, which merits further research and development (Kapp 2012 cited in Jones et al, 2014).

Using Kahoot to gamify OOGP

With my background as a games developer, the use of games and gamification in the classroom has me intrigued. As developing a quality game for any purpose takes a large amount of time, money and manpower, I have decided to focus on gamification of the classroom for the purpose of my action research project. After thinking about how gamification would work in my Object Orientated Games Programing class, I decided to incorporate a weekly gamified quiz to recap of the content covered in the previous week's lecture and lab sessions. I chose to use free software called Kahoot! that provides the ability to create multiple choice quizzes, but also incorporates leaderboard functionality commonly found in computer games. Kahoot! is described as ‘a free game-based learning platform that makes it fun to learn – any subject, in any language, on any device, for all ages!’ (Kahoot, No Date).

Each week the quizzes are displayed on the projector (Fig. 2) in the classroom and played in real time by the entire class. Students can use any gadget, device or computer that has a web browser to join in with the quiz, whether that be on their mobile phones, tablets or computers provided. Students get a set amount of time to answer the multiple choice questions and when time is up or all students have answered, whatever comes first, students are provided with instant feedback.
The incorrect options are faded out and the correct answer is highlighted with a tick (Fig. 3). A bar chart is also displayed, demonstrating how many students selected each of the multiple choice answers, giving me an instant indication of the students’ knowledge of the subject around that particular question.

The students receive personalised feedback on the device that they are playing on (Fig. 4), informing them if they selected the correct answer; the number of points that they received, the total accumulation of points so far and which place they are in on the leaderboard. Students are also informed how far they are behind the person above them on the leaderboard, and who that person is.
A leaderboard is shown on the projector in-between every question (Fig. 5), displaying the top 5 students and their scores. Each question is worth a total of 1,000 points. The number of points available to the students reduces as the time counts down during a question. The aim is to provide a correct answer quickly as this will earn the students more points. The leaderboard shown between each question is the current running total of points each student has earned in the quiz up until that point.

At the end of the quiz, the highest scoring student’s name is displayed at the front of the class, including information about how many questions they got correct and how many they got incorrect. After the quiz, the students then get the opportunity to rate the quiz in terms of fun, how much they felt they had learned, if they would recommend the quiz and how the quiz made them feel.

The results of each quiz, including the short questionnaire, are stored in an excel spreadsheet that I can download.
Data Collection Methods
I will be collecting data in a number of ways. Firstly I will be collecting observational data every week when the students participate in the gamified quizzes. Secondly I will be collecting quiz result data that will provide me with information on what each student has learned each week. Thirdly I will be giving the participants a questionnaire to complete after the last quiz. The questionnaire will focus in how the students felt about the gamified quizzes. Lastly I will be comparing final results of the module to previous years’ results.

Limitations of Data
This semester there are 15 students that are taking Object Orientated Games Programming. Of these 15, only around 9 students regularly attend. These 9 students all agreed to participate in the action research project. This is a very limited data set.

Observations
It was immediately clear that the use of quizzes increased student motivation to a level that I have not seen in a programming class before. This is backed up by 77% of participants either agreeing or strongly agreeing that the quizzes made them engage with the module more than they would have without them. It really meant something to the students to beat their peers’ scores. It was not uncommon for students to participate in some light hearted trash talk before, during and after quizzes. If a student were to overtake or beat their peers’ scores they would often jump out of their seat, with arms raised, shouting ‘yes!’ The competition provided by the gamification was very motivating, with 77% of participants agreeing that it was important to beat their peers’ scores. One participant also commented ‘They (the quizzes) were very engaging to participate in and compete against peers’.

One unexpected result from the project is that it initiated peer led discussion between questions. When the students found that they had got a question correct and their peers had chosen the wrong answer, after a short period of gloating, the students then explained which answer was correct and why. This seemed to re-enforce their own understanding of the subject whilst also helping the weaker students to improve their own understanding.

There are some areas for improvement, however; students appeared to struggle with the longer questions that had a lot of text on the screen. This is backed up with one participant commenting that “It was tough for questions that had a lot of small text”. This seems to be a limitation of the Kahoot! platform itself with only a small area of screen space dedicated to the actual question. In the future it is would be best to stick to smaller questions that appear big on the screen at the front of the class.

The quizzes did not seem to impact upon attendance in any way. This is backed up by all of the participants agreeing that they felt the quizzes did not influence their attendance at all.

With each Kahoot! quiz, I collected information on what each student that participated had learned from the previous lecture and lab session. This allowed me to see trends in what the entire class had learned or not learned as a result. It also allowed me to quickly identify the students that were beginning to struggle with the subject. Having this information I was able to recover materials that the whole class was struggling with, or approach a particular student to help out with a specific topic that they had fallen behind in.

Student Opinions
The students were very happy with the approach taken with 100% of participants either agreeing or strongly agreeing that the quizzes made the module content more enjoyable to learn and 66% of the participants agreeing that the quizzes made programming less boring. The students felt that having a quiz to recap the topics covered in the previous lecture and lab session was very beneficial, with 77% of participants either agreeing or strongly agreeing that the quizzes helped them to remember and to better understand the topics covered in previous lectures. The students also found that the quizzes helped to highlight the areas in which they were lacking, with 88% of participants either agreeing or strongly agreeing that the quizzes identified areas of programming that they needed to improve in. Form the students’ point of view, this is possibly the most beneficial aspect of using the Kahoot! quizzes in class. If a student realises early on that they have not quite understood a particular topic or concept, it gives plenty of opportunity to seek help or revisit that particular aspect of the module. The use of the Kahoot! quizzes made a small portion of students re-visit the previous weeks materials in preparation, however, 55% of participants felt that the quizzes did not make them revise module content in preparation. When asked, the students suggested they would like to see this kind of quiz expanded into other modules with 66% of
the participants either agreeing or strongly agreeing that they would like other modules to use similar quizzes.

Data Analysis
In May of 2015, 50% of the students taking OOGP in the traditional format, obtained a passing grade. Comparing this to May of 2016, 73% of students taking the gamified version of OOGP obtained a passing grade. It looks like gamification may have had a positive impact on grades to some extent, however, with a cohort of just 15 students and a change in lecturer, it would be difficult to draw a solid conclusion on this.

Future Works
In the future I would like to extend the use of gamification in OOGP to incorporate more game elements as used by (Sheldon, 2012). If the positive results remain consistent, I would also like to apply the same techniques to other modules that I teach. I would also like to explore the use of games in the classroom as (Neve et al, 2014) has with NoobLab. This seems like a very promising field in educational research.

Conclusion

The use of gamification has without a doubt increased student motivation in Object Orientated Games Programming to a level I have not seen before. It may have also had a positive impact upon student grades, however, to prove this I would need to run the action research project over a number of years to confirm that grades were consistently increased across multiple cohorts. To me, the most valuable part of this project has been the ability to collect data on what students have learned week by week, allowing me to stage early interventions either in a single student or the entire class. Based on the results from this cohort, I will definitely be running my gamified class again next year, with improvements from my observations and from the feedback that I have received. I would have to agree with (Kapp 2012 cited in Jones et al, 2014), gamification appears to be a valuable educational tool, which merits further research and development.
References


Evaluating Sport Rehabilitation students’ value of communication skills in order to enhance the Summative Assessment of Musculoskeletal Injuries

Jessica Law

Jessica graduated in 2010 and the first five years of her career as a Sport Rehabilitator was based in private clinical practice. One of her roles as Lead Clinician was to mentor final year students (HE6) from the University of Bolton while they were on their final year placement. Feedback to the students’ at the end of their clinical placement would often include reference to their communication skills and how these need to develop in order to enhance patient care.

Jessica took up a full-time position as an Associate-Lecturer in Sport Rehabilitation in April 2015. From her experience in clinical practice she was keen to focus on the importance of communication skills from the beginning of HE4 and could use clinical scenarios to demonstrate as this would enable the students to develop their knowledge whilst relating to “real-life” practice.
Abstract

The aim of this project was to alter the weighting of the mark scheme for the HE4 Summative Assessment of Musculoskeletal Injuries to include assessment of communication skills. The Summative Assessment for Musculoskeletal Injuries in HE4 did not assess communication skills therefore, it was not the most appropriate method of assessing clinical competence. Action research was used to evaluate the clinical experiences gained their clinical placement at the Sports and Spinal Injuries Clinic (SSIC) within University of Bolton. A focus group consisting of 23 students, from the current HE5 cohort, were chosen to participate in the study. A 6 Question online Survey, based on the common themes reported, was produced using Survey Monkey.

83% of students strongly agree the addition of communication skills would better prepare students for clinical placement, 74% strongly agree it would enhance the understanding of each musculoskeletal test in the assessment and knowledge of what it is testing, 70% strongly agree it would give more confidence when talking with patients, 53% strongly agree it would help with developing clinical reasoning skills, 78% strongly agree it would help when explaining the assessment, diagnosis and treatment to a patient and 83% strongly agree it would enhance their ability to work within a team. The data collected has allowed alteration to the weighting of marks in the current mark scheme to now include a percentage of marks awarded for communication skills, interpersonal skills, professionalism and differential diagnosis. This will ultimately enhance the assessment of clinical competence and constructive alignment.

KEYWORDS
Communication, summative, assessment, clinical competence

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Finally, thank you to Dr. David Kitchener for his encouragement as without him this article would not have been published.
A Graduate Sport Rehabilitator (GSR) is a graduate level, autonomous, healthcare practitioner who specialises in the assessment and management of musculoskeletal injuries in conjunction with exercise based rehabilitation. The aim of the BSc (Hons) Sport Rehabilitation programme is to provide students with the knowledge, skills and clinical competencies required for a career in Sport Rehabilitation. The successful completion of a British Association of Sport Rehabilitators and Trainers (BASRaT) accredited course also ensures that students have displayed their ability to safely and competently apply clinical reasoning across a variety of situations and assign each patient with an affective individualised treatment plan. Professionalism and regulation should run as a developing strand of the curriculum throughout the course of study (BASRaT Educational Framework, 5th Edition, 2014).

The programme standards are governed by BASRaT and are devised by the Educational Framework. Any institution which is BASRaT accredited is also required to undergo BASRaT re-accreditation in line with their standard programme re-validation. This separate process of programme re-validation is controlled by both an institutions individual quality assurance team and the guidelines set out by external educational bodies, such as the Quality Assurance Agency (QAA). All institutions that are accredited by BASRaT must adhere to developing and delivering programmes which are constructively aligned with the stated Learning Outcomes of each module. Assessments must be appropriate for the individual module and assess competence alongside fitness to practice. Compliance with these guidelines is paramount in order to achieve the intended product/outcome, the Graduate Sport Rehabilitator.

Clinical competence has been described as encompassing three main elements; the first element being clinical skills, which includes communication, history taking and physical examination. The second element being knowledge and the third being problem solving (Newble et al., 2000). Communication with a patient is a core clinical skill (Gadre et al., 2015) and assessment of communication skills has now been included in the formal curriculum of Medical Schools (AGME, 2013).

Sport Rehabilitation students who progress from HE4 to HE5 were struggling with communication skills when dealing with patients during their clinical placement in the Sports and Spinal Injuries Clinic (SSIC). Upon consultation with the current HE5 it was apparent that the majority of students had not deemed communication skills important at HE4 as it was not assessed.

The Summative Assessment for Musculoskeletal Injuries in HE4 did not assess communication skills therefore, it was not the most appropriate method of assessing clinical competence or Learning Outcome 1 in the Module Handbook – ‘Demonstrate the ability to take a detailed subjective and objective assessment’ BASRaT state in the Educational Framework that students should start developing the critical skills and knowledge required to provide the best care to a patient.

The main objective of this project is to use Action Research, to evaluate students’ clinical experiences of communication skills, to enhance the Summative Assessment of Musculoskeletal Injuries and to alter the weighting of the allocation of marks on the current mark scheme, to include communication skills. This will ultimately better prepare HE4 students for the role of a Sport Rehabilitator and clinical placement in HE5.
Communication skills are deemed a core clinical skill (Gadre et al., 2015) and clinicians must be able to communicate with patients in order to provide the most appropriate diagnostic hypotheses, treatment and care thereafter (Windish et al., 2005). Evans et al., (1991) postulate that training in communication skills can enhance a students’ ability to collate accurate, relevant information. Notably, medical students are rarely educated on the integration of communication skills and clinical reasoning which may inhibit the understanding of the significant link between the two and ultimately undervalue the psychosocial aspects of patient care (Windish et al., 2005). In 2003, Windish et al., (2005) conducted a study in curricular intervention where 121 medical students underwent a 6 week course of learning communication skills and clinical reasoning in an integrated method. 95 % of students found it beneficial to these two skills in an integrated fashion and had a greater appreciation for the important link between good communication skills and the medical results achieved through clinical reasoning which in turn enhanced a more patient-centred approach to care.

The HE4 module ‘Musculoskeletal Injuries’ teaches students the fundamentals of assessing common musculoskeletal injuries. This includes both a subjective history (questions regarding patient history and mechanism of injury) and an objective assessment (physical examination). The assessment for this module, to date, has been a practical scenario based examination with the weighting of the marks being 50% subjective and 50% objective. This layout was primarily a ‘tick box’ exercise which resulted in students passing if they performed the check list, rather than assessing the students’ understanding of the process of an assessment and interpreting the information gathered to determine a clinical diagnosis.

Assessment is used to certify the competence of future clinicians (Epstein & Hundert, 2002). Clinical competence has been defined as having key elements such as experience, integrating knowledge into practice, critical thinking skills, communication, professional and safe practice (Smith, 2012). To certify clinical competence, assessments must have a summative function which allows a decision to be made regarding fitness to practice. The test must be appropriate for the assessment of objectives validated in learning outcomes set by the curriculum therefore, to assess communication skills, an interactive test would be most appropriate (Wass et al., 2001).

Assessment of communication skills can be assessed in the OSCE (Objective Structured Clinical Examination) where students’ are required to perform a number of procedures consisting of technical and non-technical skills (Pugh, 2013). Clinical Reasoning Problems (CRPs) are another assessment method and upon further reading ultimately encompass all skills taught on this particular module. This method is based on clinical reasoning skills and using these skills to identify and interpret certain clinical features. Each problem is based on a real life clinical scenario comprising of patient presentation, history taking and physical examination to determine a clinical diagnosis. The key element of this examination process is to determine a differential diagnosis and then prove or disprove the diagnosis with clinical reasoning (Groves et al., 2002).

Miller’s Pyramid of Competence was designed in order to outline the issues involved when analysing validity of assessment (Wass et al., 2005). An assessment needed to be derived in order to differentiate between the competencies of students who have performed at a ‘Knows or Knows how’ level on the pyramid (where the student has worked methodically through a list of criteria) compared to a student who has performed at a ‘Shows how’ level (worked methodically through the scenario using their communication skills to interpret the information gathered and to use their clinical reasoning skills to produce a diagnosis with clinical evidence). CRPs are a valid and reliable method of assessing clinical competence ($\alpha=0.83$) and have a sufficient power to detect the differences in level of skill of the students (Groves et al., 2002). This method would increase constructive alignment within the module and curriculum and enhance reliability when assessing a students’ clinical competence.

Assessments must be appropriate for the objectives being assessed and must replicate a time frame similar to that in clinical practice (Wass et al., 2001 and Groves et al., 2002). The examination, to date, was 35 minutes in duration and consisted of a scenario where
the student had to work through a subjective assessment, an objective assessment and a viva voce on common clinical conditions. On reflection, the summative assessment was not optimal for assessing the learning outcomes in the module handbook as it did not assess deep understanding, clinical reasoning via a differential diagnosis or communication skills. The aforementioned skills are encompassed in clinical competence therefore the current summative assessment to determine clinical competence of a student was not appropriate.

The examination, to date, was 35 minutes in duration and consisted of a scenario where the student had to work through a subjective assessment, an objective assessment and a viva voce on common clinical conditions. The time frame, for the summative assessment, was also not appropriate as in the SSIC an Initial Consultation is 60 minutes and this allows ample time to complete a subjective and objective assessment, diagnosis and treatment. This summative assessment must reflect the needs of a Sport Rehabilitator in clinical practice therefore extending the time of the examination to include 30 minutes for subjective and objective followed by 10 minutes for viva voce would be more appropriate.

Action research will be undertaken as the method of curriculum development. It has been postulated that educators in Higher Education intuitively adopt the Action Research cycle; Planning, Action, Evaluation and Reflection (Blakley-Reid, 2000). Alterations to the weighting of the marks in the current mark scheme will be aided by the evaluation of clinical experiences gained by the students, their self-reflection and value of this particular clinical skill following clinical placement in the SSIC.

Methodology

Prior to commencing the Action Research Project, an email was sent to the programme leader to gain permission to conduct the study.

A consultation was conducted with the 44 students in the current HE5 cohort to explain the changes to be introduced to the HE4 Musculoskeletal Injuries. The researcher asked all 44 students to document how they believed the changes would have benefitted them through their transition into HE5 and commencing clinical placement in the SSIC. From the experiences documented the common themes were determined, these being; preparation for clinical placement, understanding of the assessment, communicating with patients, clinical reasoning, explanation of the assessment to a patient and working within a team.

A 6 Question online Survey was produced using Survey Monkey. Each question was designed based on the common themes in order to monitor students’ value of communication skills upon completing HE4, progressing to HE5 and commencing clinical placement in the SSIC. The questions were as follows;

1. The addition of communication skills would better prepare students for clinical placement?
2. Communication skills would enhance the understanding of each musculoskeletal test in the assessment and knowledge of what it is testing?
3. If communication skills were assessed, this would give more confidence when talking with patients?
4. Communication skills will help with developing clinical reasoning skills?
5. Having good communication skills will help when explaining the assessment, diagnosis and treatment to a patient?
6. Having good communication skills will enhance your ability to work within a team?

The most appropriate answer options for these questions, as they are based on the personal experiences of the students are; Strongly Agree, Agree, Somewhat Agree, Disagree, Strongly Disagree.

A focus group of 23 students were chosen to participate in the study. These 23 students were randomly allocated myself as Personal Tutor at the beginning of the year. The URL link and accompanying instructions were emailed to each of the students individually.

Prior to participation, the participants were assured anonymity when completing the survey and a written consent form (Appendix 1) was filled out by each participant. Ethical considerations were in keeping with The University of Bolton’s Code of Practice on Ethical Standards for Research and an RE1 Ethics form was completed (Appendix 2).
Results

Results were automatically generated by the software on Survey Monkey in the form of a bar graph. The results were evaluated, analysed and pie chart representations were designed for each question.

1. The addition of communication skills would better prepare students for clinical placement?

Fig.1 Pie chart to show the results from Question 1

Fig.1 Portrays the students’ experiences on whether the assessment of communication skills would better prepare them for clinical placement. It can be seen from the chart that 83% of students strongly agree and 13% agree that this would benefit them.

2. Communication skills would enhance the understanding of each musculoskeletal test in the assessment and knowledge of what it is testing?

Fig.2 Pie chart to show results from Question 2

Fig.2 Portrays the students’ experiences on whether communication skills would enhance the understanding of musculoskeletal testing and the knowledge behind it. It can be seen from the chart that 74% of students strongly agree and 26% agree that this would benefit them with the deep learning of assessment skills.

3. If communication skills were assessed, this would give more confidence when talking with patients?

Fig.3 Pie chart to show the results from Question 3

Fig.3 Shows that 70% of the students strongly agree and 25% of students agree that if communication skills were assessed it would give more confidence when talking to patients.
4. Communication skills will help with developing clinical reasoning skills?

Fig.4 Pie chart to show the results from Question 4

Fig.4 Shows how students believe how communication skills could help develop clinical reasoning. 53% of students strongly agree and 30% of students agree the two complement each other.

5. Having good communication skills will help when explaining the assessment, diagnosis and treatment to a patient?

Fig.5 Pie chart to show the results from Question 5

Fig.5 Shows that 78% of students strongly agree and 22% of students agree that by assessing communication skills this would enhance the students' ability to explain the assessment, diagnose and treatment to a patient.

6. Having good communication skills with enhance your ability to work within a team?

Fig.6 Pie chart to show results from Question 6

Fig.6 From the students' clinical experience in the SSIC, 83% of students strongly agree and 13% of students agree that communication skills can enhance your ability to work within a team.
Discussion

It is clear to see from all 6 questions that students now highly value the importance of communication skills in clinical practice. The focus group felt they would have been better prepared for clinical placement if communication skills were taught and examined at HE4.

To ensure reliability, two sets of data were collected. The initial themes were collated from the experiences of all 44 students and then 23 of these students completed the questionnaire. As 23 students participated in both sets of data this will increase intra-participant reliability.

To ensure validity of the study, the design was based upon the Learning Outcomes in the Module Handbook which from the programme standards governed by BASRaT and are devised by the Educational Framework.

A potential limitation to the study which may have an impact on the results is subjectivity. The students are answering the questions regarding their own personal experiences therefore, the element of subjectivity can skew results.

Another limitation to the current study could be the population size, if all 44 students had completed the questionnaire rather than the focus group of 23 students, this would increase the reliability of the study.

The results collated from the Action Research has highlighted the key areas students felt they were unprepared for when commencing their clinical placement in HE5 and how they believe the teaching and assessment of communication skills would better prepare them. On reflection of the Summative Assessment mark scheme it was apparent that the marking of the assessment was on a very superficial level and therefore lacking in the assessment of deep knowledge and understanding of clinical reasoning.

The data collected has allowed the weighting of marks in the current mark scheme to be altered by the module tutors from the original mark scheme (Appendix 3) to now include a percentage of marks awarded for communication skills, interpersonal skills, professionalism and differential diagnosis (Appendix 4). The Summative Assessment will continue to consist of a Subjective Assessment (50%), an Objective Assessment (50%) however, the layout will now be based on CRPs. This method is based on clinical reasoning skills and using these skills to identify and interpret certain clinical features and the key element of this examination process is to determine a differential diagnosis and then prove or disprove the diagnosis with clinical reasoning (Groves et al., 2002). The duration of the examination will be lengthened from 35 minutes to 40 minutes in order to reflect a practicable time frame used by clinicians in clinical practice.

The changes to the weighing of the marks in the mark scheme to include differential diagnosis, clinical reasoning and communication skills will allow the student to be assessed as a clinician. This will ultimately enhance the assessment of clinical competence and constructive alignment. Further research, using an Action Research method, could investigate the most effective methods used to teach communication skills.
Conclusion

In light of the above findings, it has shown that the Action Research Study has been extremely beneficial and it has brought to the forefront the value students now possess for communication skills within the skill set of a Sport Rehabilitator in clinical practice.

The alterations to the weighting of the mark scheme will now increase constructive alignment within the module and the programme. The assessment responsible for certifying clinical competence will have increased validity in regards to the Learning Outcomes and the role of a Sport Rehabilitator in practice.

In terms of wider perspectives this will enhance students’ professionalism, clinical reasoning skills and communicational skills by assessing the student as a clinician. This will therefore, in turn, improve employability prospects and patient care.

References

ACGME common program requirements. Chicago, IL; Accreditation Council for Graduate Medical Education; 2013.


Towards a framework for the adoption of the problem based learning approach in law

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Abstract

‘Action learning’ is based on the concept that ‘through the process of reflection and action it is possible to solve problems’. (Savin Baden; 2004). The aim of this action research project was to investigate the use of the Problem Based Learning (PBL) approach within the Skills 102 module, for Law students to develop the appropriate skills required to become independent learners. The study highlights that despite it being on a small scale the students perceived PBL as a positive engaging experience. Hence it is worth investing further time in the context of the Skills 102 module. The recommendations include further improve the gains from the process these include intra-peer assessments within the PBL and review of the role of the facilitator.

KEYWORDS
PBL-law-Skills-independent learners-assessment.
At present I am an Associate Lecturer at the University of Bolton Law School. I started this role from July 2015. Currently in semester 2, I am teaching the Module Skills 102 to first years enrolled on the Foundation Law Degree. The aim of this action research project is to investigate the use of the Problem Based Learning (PBL) approach within the Skills 102 module, for Law students to develop the appropriate skills required to become independent learners.

One of the requirements of our stakeholders the QAA is for law schools to within their learning and teaching requirements develop the curriculum to provide students the opportunities to be creative, critical and become independent learners (UKQC B3). The learning outcomes for the Skills 102 Module require students to undertake research on a chosen topic of interest in the legal context, and as a part of the summative assessment submit a structured report on it. This assessment is then followed up by an oral presentation and a Personal Development Portfolio (PDP). The PDP requires students to reflect on their learning experience throughout the semester within in this module.

The current design of the curriculum is based on the productive model. Taba (1962) points out that this type of curriculum development model advocates a technical productive process which include steps such as diagnosis; formulating objectives; selection/organisation of the contents; selection/organisation of the learner experiences; determining the methods and terms to be evaluated. The students in the context of their programme plans are provided with lectures on legal research skills followed by learning exercise sessions. The students are given formative feedback throughout the learning exercise sessions. These sessions are aimed for the students to raise any issues on the set exercises and ultimately gain confidence in order to successfully complete the summative assessments. The PDP documents and the student feedback track the behaviour objectives of the students. As Tyler (1949) pointed out that the role of the instructor is to bring about significant changes to student behaviour. However one the problem with this model is that it is more like a shopping list with limited opportunities for interactions (Smith, 1996, 2000). This was the case as in the classroom the prepared students answered and did not want to deliberate with students who had not adequately prepared or were hesitant to participate. In contrast as McKimm (2008) points out that the authentic PBL approach allows the learner to specify the learning objectives, and shifts the emphasis towards reflecting on the problem. Some aspects of problem learning are used within legal education. Such examples include students retaining feedback, set assessments, which emulate real life events, or factious circumstances and require the student to application of the law and provide solutions. The aim of this action research project will be to apply the PBL approach within the sessions to determine whether or not students can define their learning goals, and work both individually or collectively to attain their agreed learning outcomes and eventually become independent learners.
Boud and Feletti (2003) perceive PBL as a technique to structure the curriculum to allow students to engage with practical problems that act as a stimulus for learning. ‘Reiterative’ or ‘closed loop’ PBL can endorse an adequate well-structured knowledge base (Barrows, 1986). In accordance to Barrow’s taxonomy the ‘reiterative’ or ‘closed loop’ methods are most likely achieve the essential objectives of the PBL. These include developing self-directed learning and motivation in students; and the structure of knowledge linking with professional practice.

The reiterative PBL contains the following stages:

1. The problem is encountered and presented to students;
2. Students apply the knowledge and then evaluate the problem in accordance to the level of learning. The knowledge and skills are applied to the set problem in order for effective and reinforced learning to take place (the reiterative loop);
3. The learning has occurred within the process and the results are integrated into the student’s existing knowledge and skills (Barrows and Tamblyn, 1980).

Constructivism is the main theory that underlines the PBL's approach to learning and knowledge. Constructivists argue that learning is an active process and that new ideas are based on previous concepts. The cognitive structures are processed to give personalised meanings and organize experiences. (Kearsley, 1996). There are a number of educational principles that arise out of the constructivist view of knowledge. These encapsulate the essence of what the reiterative PBL intends to achieve. The first principle of multiplicity reflects that each individual will have a different viewpoint and hence we all arrive at positions. The principle advocates the importance of collaborative learning and the use of dialogue between individuals. This is evidently reflected in small group learning within the PBL approach. The principle of activeness highlights that learners need to actively engage with the task, this is also the case in reiterative PBL, as students need to apply this principle to find the solutions.

The principle of accommodation and adaption stems from Piaget’s theory of ‘schemes’. As summarised by Glaserfeld:

Cognitive change and learning take place when a scheme, instead of producing the expected result, leads to perturbation…. (Which)…in turn leads to accommodation that establishes a new equilibrium. (Glaserfeld, 1989:128).

The knowledge acquired by the student has happened by building on past experiences and connections. These processes then add to the establishment of the personal meaning and experience in what has actually been learnt. A mere experience does not amount to learning; there is the need for critical reflection to have occurred for learning to have in reality occurred (Boud et al 1985). The process of critical reflection requires students to deliberate and perform meta-cognitive actions in order to plan activities, measure the success/failure of their activities and revise their behaviour following their monitoring actions. The tutor throughout the PBL sessions provides the students the opportunities to deepen their meta-cognitive awareness and combine their knowledge with skills to foster a ‘deep’ approach to learning (Ramsden, 1992).

The principle of articulation requires students to be able to deliver their newfound knowledge to others. The learning outcomes require a collective understanding. There has to be sufficient time provided to students for this to occur. Finally the principle of timelessness highlights that learning is a lifelong process and never complete. PBL’s self-directional approach fosters this principle, as students continue to ‘discover’ and ‘construct’ on their reflections in their lifelong learning journey.

In order to test whether or not PBL can provide an adequate base for students to gain well-structured knowledge and become independent learners, my data collection started with providing three weeks’ worth of introductory lectures. The lectures looked at locating legal resources and how to use the law library. Following the lecture the class were provided worksheets, which they had to complete on an individual basis and bring their findings and discuss their results in the next sessions. The questions within the worksheets include a mixture of short questions and multiple-choice questions. After the three weeks, I divided the 28 students in to three groups and then each group was provided a unique legal
problem, which they had to resolve and discuss for the next session. In class the groups return and they sit in their designated groups; each group receives the other group’s problem and has an opportunity to discuss the other group’s problem. I provide some assistance to the groups as they discuss the new problem that they receive in class. After 30 minutes of discussion the groups discuss their original problem and provide solutions. Whilst the other group that was given the problem in the beginning of class can provide peer review as they have had time to discuss the other group’s set problem. All three problems are available on Moodle. Hence all 28 members can read and work on them in the context of the week. The advantage of this method is that each individual in the class can provide peer review to their peers and seek to provide an array of solutions to the set out problems.

At the end of the session I provide formative feedback and provide directions accordingly. In relation to summative assessments the PBL sessions are equipping students to prepare for the summative oral presentation. Students are liaising with legal resources to enable them to complete the summative written research assessment and this learning experience can be valued within the PDP portfolio. Finally after the six weeks I asked for the class to complete the questionnaire (appendix 1) to reflect on their learning experience. The three assessments seem were set to correlate with the learning objectives of the course. These were for the student to identify, analyse information needed to resolve a problem; to communicate ideas verbally and in writing; and collaborate productively in groups.

In order to be coherent with the University ethics procedure I completed the RE1 form which was approved by my supervisor. I also adhered to the five principles underpinning educational research as identified by BERA (2011:4). These are that:

All educational research should be conducted within an ethic of respect for
- The person
- Knowledge
- Democratic values
- The quality of educational research
- Academic freedom (BERA 2011:4)

At the outset I explained to the class that I would be utilising my observations in class and the questionnaires as data. I informed the students that this data was to be used for the purposes of my Action Research Project. The data collected would be on an anonymous basis. Throughout the project no identifying information about any individual would be revealed in written or other communication. In order to gain their informed consent I told the class that any student that does not want to be used within the data sample could inform me and there would be no negative inferences drawn upon that student. I understand that there will limitations within my data collection methods and an element of bias. Students may fill in the questionnaires with answers that they feel their tutor would want to see. My observations in class may reflect my preference for the PBL procedure, and interpret the results accordingly. In the future if I were to repeat this data collection exercise, I would like to have another independent facilitator with me who would record his/her

observation to ensure that I can limit the element of bias within the study.

In my observations within the PBL sessions I noticed that well developed students illustrated out that they had control over their learning, and seemed highly satisfied with the self-directed element. However there were also students who were still demonstrating a surface approach of understanding. They were reliant on their group members doing the reading and were merely participating in class with simple comments. During the observations, one of the reasons these students gave for not committing to the PBL was the time constraint within the weekly PBL sessions alongside other workload meant that they overlooked certain concepts that they had to focus on. As the PBL sessions were weekly regular meetings with peers became an issue, especially for those students who were not participating in class and put the effort in the PBL process. The well-done PDP’s made references to the PBL process and the ability for them to self-assess their peers. On the other hand the result of the questionnaires were disappointing as they were filled on a voluntary basis, hence I only received 15 responses. This also accounted to the fact that the attendance records were low for the three PBL sessions. Some responses merely stated a yes or no without any further deliberation from the student. Overall from the student responses it could be seen that the PBL approach triggered a positive attitude, it allowed a student centred environment and encouraged curiosity in learning.

I found the peer assessment technique very useful as it was
making students assess their peers’ contribution in accordance to their own assessment criteria. This method of inter-peer assessment method whereby their peers were assessing a group contribution emphasised the collaborative nature of PBL settings. I perceived it to value the process of learning, as students are encouraged to deviate from strategic forms of learning. From the responses in the questionnaires students enjoyed the peer review process, with a mention of the future possibility of scoring their peers within the PBL sessions.

Summary and Recommendations

The study highlights be it on a small scale that the students perceived PBL as a positive engaging experience. Hence it is worth investing further time in the context of the Skills 102 Module. This is also supported by external research as Bernstein et al (1995) report that students recognised the PBL method to facilitate thinking about the material rather regurgitating it and encouraged deep learning. Similarly, Cockrell et al (2000) argue that within the team leadership changes in accordance to the needs of the project, and that participating members are accountable to each other for achieving their set goals. This was evident in the groups as students relied on each other to feed in their input in the groups.

Whilst the PBL approach had made some positive gains, there are opportunities for further refinements. Boud (1995) argues that peers provide rich information, which is utilised by individuals to make their own assessments. In the future I would like use intra-peer assessment alongside inter-peer assessment. As students will be able to assess the product of what they have produced as a team as well as assess other teams. This should allow them to reflect on their practice and would encourage responsibility in the team, with reference to those students that are not so eager to actively participate with the PBL group. In order to gain the maximum out from questionnaires I would circulate the questionnaire in every session allowing those that have not had the opportunity to complete it do so. I could also provide evaluation questionnaires to students as part of my data, whereby there could rate the efforts of the group members. The results could then be factored in each student’s grade. The feedback would also assist to determine any malfunctioning in the groups. Early intervention can lead to helping students to refocus on the actions and possibly change behaviour in class.

I would also provide more guidance to students when introducing them to their problem in order for them to gain the maximum output from their PBL sessions. This would include assisting them in their groups to agree on unclear concepts, brainstorming, prioritizing the learning objectives, and areas to report back on. This could result in a hybrid approach whereby within the PBL they would have mini lectures to ensure that they are clear on concepts. I would also set ground rules to encourage students to take ownership of their effective performance. This could include a set of expectations in writing devised by the group to establish norms for group behaviour to ensure that all the group members participate. The group members could be assigned roles such as the group leader who ensures that the group is on track and establishes that the relevant resources are being located and used. A recorder could ensure that the group meets outside of the class time. The reporter may ensure that everything is drafted in accordance to the guidelines.

Des Merchais (1993) argues that facilitator training is essential in problem learning, as being a facilitator also means being a learner. I may be able to draw on these past experience sessions as learning tools to determine the appropriate times to intervene in order to stimulate productive discussions between the students. This will entail the use of a mixed facilitating approach, whereby I would encourage students to seek and learn facts through asking them directive questions referring to content (the directive conventionalist approach), combined with methods (the liberating supporter approach) to ensure that emphasis is placed on student centred learning skills.
Summary and Recommendations


Glaserfeld, E Von (1989) Cognition, construction of knowledge and teaching, Synthese, 80,121 -140.


