EDITORIAL
The Application of Games in Higher Education by Louise Robinson
Page 5

ARTICLES
Articles, case studies and paper submissions.
Page 9

HIGHLIGHTS
Short articles, pilot work and breaking news.
Page 110

LETTERS
Letters to the editor
Page 138

“INSIDER KNOWLEDGE”
image from the Multi-User Laboratory Team, Keele Medical School winner of “Images of Learning and Teaching” Photo Competition held at the 2016 Keele Annual Teaching Symposium.
The Application of Games in Higher Education
Dr Louise Robinson provides an editorial piece for the sixth edition of JADE

Issues of Student Diversity and the Role of Technological Tools for Learning in Higher Education
Helen Millward

Assessing the impact of the cultural beliefs of medical students on the cadaveric dissection in gross anatomy
Rosalyn A Jurjus et al

Re-designing of a Problem Based Learning module to reflect a distinctive curriculum
Nazim Ali

Mobile Learning devices as collaborative tools to enhance biological identification skills in the lab and field
Sarah A Taylor

A case of embedding employability in the curriculum
Aikaterini Koskina

Data Mining for Learning Analytics; does lack of engagement always mean what we think it does?
Ed de Quincey et al

Undergraduate Research (UR): Context, Benefits and UR in Action
Chris Little

Locating the Babel Fish
Philip Devine

How can we make e-mails more readable? The role of space
James Hartley

Letter to the editor
Emily Ouyang
Welcome to JADE. JADE was launched two years ago by the Learning and Professional Development Centre. The journal was developed as a space to share practice for Keele staff and students that wished to write about their educational experiences as part of their scholarly practice. It was established to publish reflections on and inquiries into the acts of learning and teaching and to disseminate that work. Staff and students at Keele University act as writers, readers, reviewers, editors; and perhaps most importantly as learners and collaborators in the endeavour to improve student learning experiences and outcomes through their contributions to JADE.

JADE celebrates teaching scholarship, an act I have previously described as a journey of discovery and personal growth, and makes teaching scholarship public – open to scrutiny and sharing with interested others. Over the past two years, the readership of JADE has grown and broadened to include colleagues beyond Keele, and in 2015, we took two decisions that will further support JADE to grow and flourish. First, we have decided to accept submissions for published articles from staff or student members of other Universities and to publish these if they are deemed to be interest to our Keele and wider readership. In making this decision, we have expanded the potential community of scholars that can contribute to JADE’s future but hold steadfast the desire to sustain the journal as a place for scholarly discovery of both staff and students. Second, in support of encouraging submissions from student scholars, we also took the decision in 2015, to appoint a student Associate Editor to solicit for and encourage student contributions.

JADE continues to be a space that models innovation and creativity in the scholarship of teaching and learning. I sincerely hope you enjoy your experience of contributing to JADE, as a writer, reader, reviewer or editor, and as a learner and collaborator in scholarly endeavour.

Dr. Jackie Potter
Head of the Learning and Professional Development Centre

Louise began her academic career at the University of Derby in 2012 and teaches subjects primarily related to Molecular Biology including Wildlife Forensics and Phylogenetics. Her teaching responsibilities lie throughout the undergraduate programmes in Forensic Science, Biology, and zoology as well as supervising projects on the related MRes programmes.

Louise became a Fellow of the Higher Education Academy in 2013 and was invited by the HEA to host a workshop on Gamification after presenting at the HEA Inspire to succeed: Transforming teaching and learning in STEM conference in 2015. She is an advocate of gamification within HE teaching and has witnessed the benefits of introducing these mechanics in both classroom and laboratory settings.

Dr Louise Robinson | University of Derby
Programme Leader & Lecturer

The Application of Games in Higher Education

Gamification, defined as the application of game design elements in non-game contexts (Deterding et al., 2011), is a relatively new venture within higher education but its utility in multiple teaching environments makes it an exciting new avenue for undergraduate teaching. The term ‘serious games’ is applied when gaming is used for an educational purpose in which the acquisition of knowledge is the prime reason for undertaking the game (Michael & Chen, 2005).

There is an interesting similarity between games and education in the way a ‘player’ passes through levels, develops skills, and gains achievements as they progress. By simply altering the language used in the educational process, it can be seen that some of the key concepts of games already exist in different forms. For example, it has been said that all games contain goals, rules, and feedback (McGonigal, 2011) and when reading any module specification you will find it to contain learning objectives, assessment, and feedback. Our learning objective outlines what needs to be achieved (our goal) and the assessment sets out the boundaries in which it can be accomplished (the rules). On the path to realising this goal there will be formative feedback for the player/learner to observe their progress (in-game feedback) and summative assessment.
to demonstrate how well the learning objective has been met (post-game feedback/goal achievement). When goals are completed, the player/learner then progresses to a higher level and faces a more difficult task. The individual is also expected to take what was learnt from the previous achievement and apply it in a different situation to help attain the new goal. The adoption of gaming structure and language has been seen to be successful in engaging students by setting ‘quests’ and gaining ‘experience points’ - therefore in some instances turning a task into a challenge can provide a greater level of motivation (Hannify, 2012; Stott, & Neustaedter, 2013).

Arguably the most important factor which games bring to an educational environment is the freedom to fail (Stott, & Neustaedter, 2013; Dichev et al., 2014). Often in higher education there is little room for error without having the potentially drastic consequences (as seen by students) of having no results to write about or having to admit that our approach or conduct was flawed. One of the greatest ways we learn is through experiences which did not go to plan, but how can someone learn from their mistakes if they are not given the freedom to fail? The psychological impact of not achieving results in an academic setting is most often negative, either towards the subject as a whole or more damagingly, towards the individual themselves. These negative emotions are far less likely to occur if the experience is one of a game and often the desire to try again in order to ‘win’ is greater. The students which are most engaged with an assessment are those who believe that they can do well; the students who are aiming for the ‘high score’ and believe that it is achievable. This level of determination can only occur through positivity of which this behavioural change is something games can help to promote. The adoption of game elements within a classroom can be instigated in many ways and the experience can be private, with only the learner knowing their ‘score’ and observing progress; competitive, with each individual knowing the achievements of others and determining their ranking; or co-operative where teams or perhaps whole classes are working towards a shared goal. Tasks developed with a gameful design can be played outside of contact time and provide virtual instruction and feedback to a deeper level than an online test can achieve whilst maintaining the determination to succeed.

The power of games to quickly develop skills, create a ‘hook’, and promote a feeling of success should not be taken lightly nor be seen as ‘time wasting’ or ‘switching off the mind’. Many games involve a level of concentration, cognition, and strategy development which are viewed as an enjoyable way to spend free time. The key to effective gamification is to understand why games are successful and what makes them enjoyable to play. The factors that allow a game to function whilst maintaining the interest of the player are referred to as play mechanics but equally as important are the interaction of the players (dynamics), and their emotional state (Robson et al., 2015). By using a few of these play mechanics it is possible to ‘gamify’ a session, in which the material being taught is presented to the student in a game format; this is known as Game Enhanced Learning (GEL). It may be unfair to apply games in assessment which determines summative grades but the learning process itself is well suited to this dynamic by allowing the student to engage with stimulating activities, visually track their progress, and become more confident with the material they are learning.

This approach encourages creativity in the academic and depending on the individual, they may create and implement entirely new ideas or simply use facilities such as Quizlet in order to begin to introduce gamification within their teaching. Understanding the key criteria of games can help promote GEL sessions and therefore in order to use games to teach, first we must learn what games can teach us.

References


Introduction

‘The concept of diversity encompasses acceptance and respect. It means understanding that each individual is unique, and recognizing our individual differences. These can be along the dimensions of race, ethnicity, gender, sexual orientation, socio-economic status, age, physical abilities, religious beliefs, political beliefs, or other ideologies. It is the exploration of these differences in a safe, positive, and nurturing environment. It is about understanding each other and moving beyond simple tolerance to embracing and celebrating the rich dimensions of diversity contained within each individual’ ([http://gladstone.uoregon.edu/~asuomca/diversityinit/definition.html](http://gladstone.uoregon.edu/~asuomca/diversityinit/definition.html) accessed 11/12/15).

University classrooms are becoming increasingly diverse with the HEA (Higher Education Academy) suggesting ‘A diverse student body is one which includes individuals of different nationalities, race, creed, colour, religion, gender, age and socio-economic groupings.’ ([https://www.heacademy.ac.uk/enhancement/definitions/diverse-student-bodies accessed 15/02/16](https://www.heacademy.ac.uk/enhancement/definitions/diverse-student-bodies accessed 15/02/16)). As such, a ‘10%’ rise of non EU student enrolment in UK Universities over a five year period ([http://www.universitiesuk.ac.uk/highereducation/Documents/2014/InternationalStudentsInHigherEducation.pdf accessed 23/10/15](http://www.universitiesuk.ac.uk/highereducation/Documents/2014/InternationalStudentsInHigherEducation.pdf accessed 23/10/15)), alongside international student numbers as high as ‘63%’ in some UK institutions ([http://www.thecompleteuniversityguide.co.uk/international/international-students-the-facts/by-university/ accessed 23/10/15](http://www.thecompleteuniversityguide.co.uk/international/international-students-the-facts/by-university/ accessed 23/10/15)), can be seen as demonstrating an increasing level of diversity in University classrooms.

This paper aims to discuss the connection between diversity within University classrooms and the role technology plays in improving student engagement and learning through the example of a critical incident occurring within the author’s own teaching practices. The impacts of the use of technological tools for learning are discussed in relation to the social and medical models of disability, followed by an exploration of the need for a continually improving inclusive curriculum design in relation to the needs of an increasingly diverse student population. The paper culminates with the recommendation of additional access for students to technological tools to aid in learning; specifically translation tools such as Todaysmeet ([https://todaysmeet.com accessed 12/05/16](https://todaysmeet.com accessed 12/05/16)).
Technology

‘When it comes to implementing new technology into the classroom, teachers often have one of two responses: Their initial reaction is either “Oh no!” or “Oh wow!”’ (Stanfield, 2013:34). However, if providing teachers with flexibility to try new concepts and ideas motivates, empowers, and challenges them to become better educators who are equipped with new skills to engage their students in learning’ (Stanfield, 2013:35), then technology is a tool we must make use of in the quest for techniques to aid in student engagement.

A diversified student population brings to the fore a need for increasingly inclusive teaching and learning techniques in today’s University classrooms. Urso and Rodrigues Fisher (2015:32) suggest technology as a potential aid in the quest for an inclusive and engaged classroom with a ‘large number of learning tools available [which] can ... provide an exciting environment for the educator to innovate lessons in a manner never possible before’. In addition, ‘John Dewey pointed out that changes in methods and curriculum in public schools are as much a product of technological changes and the changing needs of commerce and business as anything else’ (Dewey, 2001/1915 cited in Kilfoye, 2013:53), hinting at the implications of technology in moving from the perspective that ‘the student has little chance to use what he learns inside the classroom on the outside’ (Kilfoye, 2013:54), to the increasingly present focus on developing skills transferrable to life after University.

Through infiltration of our teaching techniques, technology has become widely relied upon within our lectures, tutorials, and assignment submissions, becoming ‘one of the most valuable tools available for developing critical thinking, self-disclosure, collaboration, and presentation’ (Kilfoye, 2013:53). In addition, the use of technology within the University classroom gives the possibility of an ‘increased the amount of instructional time’ (Stanfield, 2013:35), rather than time spent on activities indirectly related to engagement and learning; for example organizing presentation groups.

As such, the use of technological tools within lectures and seminars serves a diverse student population through increasing the possible methods of engagement available to students, while also utilizing a format familiar to them; for example with how ‘students today socialize and entertain themselves online’ (Kilfoye, 2013:54), ‘we can conclude that they are engaged by social networking sites, video games’ (Urso and Rodrigues Fisher, 2015:32) and more. As noted by Urso and Rodrigues Fisher; “Today’s younger adult learners are known as the Millennials (18-29 years) and Generation X (30 to 45 years), … Befitting their era, they are popularly known as the “digital natives,” ... This group of individuals has not had to adapt to new technologies. On the contrary, this generation is known for their avid uses of it. Born into the age of social media they are Internet connected, users of mobile technology, and connected through social networking’ (2015:32). Therefore, the evolution of technological tools for learning; for example from using PowerPoint presentations in lectures to technology allowing students to participate in those lectures using polling software, has illuminated the potential for increased student learning and engagement, regardless of issues of diversity amongst the student population. As such, due to its adaptability to different languages, learning styles, and methods of engagement, technology can be utilized as a powerful tool in the effort to both attain and retain a diverse student population.

Critical incident

A critical incident can be seen as an occurrence within practice which prompts us to engage with issues at a deeper level, which in turn, leads to learning about ourselves, others, or our practices. The critical incident explored within this paper is that of the use of technology as a translation tool to be used by students. Several reoccurrences have since taken place within the author’s own teaching practices, with the initial incident occurring in 2014:

‘As a relatively young tutor, I felt it important to establish and reinforce my stance on the use of mobile phones within session time. After asking one international student to put a mobile phone away, the student informed me that he had been using it to translate several words that he did not understand. Initially I did not think much of the incident and allowed the student to continue to use his phone as a translation tool.’

However, after a period of reflection, the importance of having such a translation tool easily accessible to a group of students with diverse backgrounds became clear. This illustrated further questions for consideration; how could this tool be used by other students, should a translation tool be offered by the University or tutor, and what were the overall implications of having such a tool available in a Higher Education setting?

Due to the multinational nature of the University classroom, students from diverse backgrounds may bring to the fore different perspectives and interpretations of concepts and linguistic turns. Therefore, rather than the traditional notion that ‘schools continue
to obstruct or prevent students from using smartphones, MP3 players, iPads, and handheld or mobile computers in classrooms’ (Kilfoye, 2013:54), embracing the use of technology within the classroom could aid both student understanding and acceptance of diverse learning environments. Barnett (2006:3) suggests there is a ‘need to develop trust within diverse groups, so that students can learn from each other’s’ differences’. For instance, while not only useful for individual students, technology as a translation tool is also highly applicable to groups of students and teaching practitioners. If several students of a shared Mother tongue have issues with a phrase or word, the ability of one student to use a translation tool to find the problematic term and share meaning in a more accessible format has the potential to benefit the understanding of multiple students. In addition, teaching practitioners may also benefit from the implementation of this practice through a reassurance that students have a satisfactory understanding of the concept in question. As such, learning can be viewed as both an individual and social concept, with students sharing information they may have had difficulty with, with their peers.

Medical and social models of disability

The issue of using technology as a translation tool can be linked to both the medical model of disability and the social model of disability. The use of a translation tool to aid understanding can be seen as an individual concern for students; however social interaction with peers through discussion of difficult linguistic terms could have wider benefits for student understanding.

The medical model of disability suggests that the problems of an individual are theirs alone and not a concern for others; articulated by Kinrade (2015:26) ‘as identifying and relating to disabled people in terms of their impairments’ with ‘an unbending hostility to medical interventions, even those that seek to prevent or cure impairments’ (2015:26). For example, with an international student having difficulty understanding the meaning of a word, the fault would lie with that student, rather than a lack of support and clarity given by another.

In contrast, the social model of disability states that society is disabling individuals by designing everything for the masses, or as Kinrade suggests, ‘that disability results not from impairment but is attributable to the physical, attitudinal and communication barriers created by society or, perhaps more accurately, which society fails to dismantle or change’ (2015:26). Using the example given above, the fault would lie with society for not ensuring that the necessary infrastructure was in place to allow the student to gain the same level of understanding as their peers. In addition, the social model of disability advocates the view that society could do more to rectify this issue and make it easier for everyone to have the same opportunities regardless of disability.

In referring to the technological critical incident discussed within this paper, the inclusion of a translation tool would give equal opportunities for learning to students from diverse backgrounds, suggesting that internet technology has the potential to become ‘the great equalizer in education’ (Kilfoye, 2013:56). While the addition of such a translation tool fits with the social model of disability through the implementation of a tool for use by the masses, a better fit can be seen with the medical model of disability. The introduction of such a tool would allow students to address any language difficulties at an individual level, bypassing any potential barriers to learning such as embarrassment in lack of understanding, or unease in asking for help.

Inclusive curriculum design

Consideration of the social and medical models of disability brings to light the need for an inclusive curriculum design which promotes and supports learning for all students regardless of nationality. An inclusive curriculum design should aim to ‘create as inclusive a learning environment as possible’ (www.universities-scotland.ac.uk/raceequalitytoolkit/ accessed 10/12/14) to ensure all learners have the same opportunities. Keele University’s Dignity and Respect Framework supports this view stating that we should ‘take action to understand the needs and customs of different groups with whom we work and interact’ (Keele University:5). In addition, the Framework suggests we should attempt to create ‘collaborative engagement with a range of student groups in order to ensure full participation in University life and proper access to services’ (Keele University:6).

While these points suggest a multitude of applicable situations surrounding diversity, they can also be linked to the need for a translation tool to be used by students. Understanding the needs of all of the people with whom we interact is crucial within the learning environment. For example, language barriers to learning require consideration due to the differing levels of understanding and knowledge about the English language possessed by students. Without the ability for students to translate difficult linguistic terms, it would be impossible to provide all students
with equal opportunities for learning. In addition, without ensuring collaborative engagement with students from diverse backgrounds it would be difficult to understand the diverse needs of the student population upon any given topic.

In a similar vein, the use of an inclusive curriculum design can promote further learning. By taking into account the students’ educational, cultural and social backgrounds, a teaching practitioner may be able to include additional context upon the subject in question which could expand student learning while making the topic more relevant for other students. This inclusion would provide benefits in understanding for both home and international students while aligning with the need to ‘promote positive relationships and to improve the quality of our working lives’ (Keele University:2), through improved communication between both students, and students and teaching practitioners. This in turn, would help to ‘Support the development of an integrated community, in which the needs, customs and traditions of all are valued and respected’ (Keele University:10).

Conclusions and recommendations

This paper has explored the uses of technological tools for engagement in relation to an increasingly diversified student population within the University classroom. While the discussion within this paper is a clear indicator of the need for ever evolving approaches to teaching and learning, we must also consider the necessity of an increasingly inclusive curriculum design in response to an ever-more diverse student population. As such, Universities need to become more proactive in determining how to make teaching and learning an inclusive and productive experience for all students regardless of issues of diversity. As the race equality tool kit suggests; ‘Learning and teaching in a classroom has come to reflect a world that is now characterised by globalisation. Learning and teaching frameworks should now be able to meet the needs and requirements of a diverse student population in terms of ethnic, cultural, religious and linguistic diversity.’(www.universities-scotland.ac.uk/raceequalitytoolkit accessed 10/12/14).

In addition, the use of technological tools as an aid to student understanding has been explored through a critical incident occurring within the author’s own teaching practices. In connection to the discussion of the social and medical models of disability, the need for the availability and signposting to students of a translation tool for their use would greatly benefit understanding and engagement through reducing barriers to learning; for example less embarrassment at needing clarification on linguistic terms, or a reduction in stress at having to ask tutors for help, thus aiding in the development of an increasingly inclusive curriculum design. The implementation of such a tool; for one example see TodaysMeet (https://todaysmeet.com) accessed 15/02/16, would facilitate an environment where ‘Participants can learn from each other and share their insights, improving participation and deepening learning’ (https://todaysmeet.com/about/backchannel accessed 15/02/16), while also becoming a platform that can enable new activities and discussions, extend conversations beyond the classroom, and give all students a voice (https://todaysmeet.com/about/backchannel accessed 15/02/16), without negatively impacting teaching time. While there are several potential avenues in which students could access such a translate tool; for example on their own mobile devices or through the University website, this paper recommends that signposting to such a tool would prove invaluable in promoting student engagement within the University classroom.

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Introduction

It is well established that cadaveric dissection offers a unique learning experience for medical students in anatomy courses (De Melo Bastos and Proença, 2000; Arráez-Aybar et al. 2004; Drake, 2014). In addition to the intended academic benefits of learning about the human body first-hand, there exists a non-academic advantage which includes both personal and emotional development among students, on the grounds that dissection promotes humanistic values and the teaching of ethical issues to future physicians (Weeks et al., 1995; Swenson and Rothstein, 1996; Arráez-Aybar et al., 2008; Plaisant et al., 2011; Rabow et al., 2013; Jones et al., 2014). The approach to human cadavers is regarded by many as a way for the learner to develop as a person (Arráez-Aybar, 2008; Cohen et al., 2009). It is very useful for his/her emotional, professional and moral development (Larkin and Mcandrew, 2013; Arráez-Aybar, 2014). In addition, if well presented, it introduces students to death in a controlled manner and provides a first encounter with the patient-physician relationship, since the cadaver could be considered as their first patient (De Horne et al., 1990; Finkelstein and Mathers, 1990; De Melo Bastos and Proença, 2000; Dyer and Thorndike, 2000; Lempp, 2005; Plaisant et al., 2011).

In the mid-1980s some anatomists began to take a real interest in the perceptions, attitudes and behaviors of medical students regarding cadaver dissection (Penney, 1985; Shalev, 1985). In the past decade, in parallel to the almost universal reforms movement taking place in medical education, the number of studies addressing anatomy teaching and, in particular, the effect of culture on the students’ emotional reactions during the dissection experience, increased tremendously in the United States (US) as well as in other countries (Lempp, 2005; Notzer et al., 2006; Arráez-Aybar et al., 2008; Sergentanis et al., 2010; Lamdin et al., 2012; Martyn et al., 2014). Various aspects of the student-cadaver reaction were examined. For some, there was a large amount of spirituality involved in such a relationship and they resorted to religion as a coping mechanism. They developed an “Interfaith service for Thanks and Respect” for the “awesome” gift, the cadaver, which was, for some, an extraordinary privilege (Sukol, 1995).

Historically, the link between religion, spirituality, culture, and medicine has been well documented throughout time and is a subject as old as humanity itself (Gregory, 2003). The nature and anatomic location of the soul has been subject to philosophical, theological, and scientific ideas from the Egyptian Pharos to the contemporary period (Santoro et al., 2009). In every period, the theological, and scientific ideas from the Egyptian Pharos to the contemporary period (Santoro et al., 2009). In every period, the contemporary period (Santoro et al., 2009). In every period, the concept of the soul has shaped the anatomy discipline as well as cultural beliefs, dissection perception.
reactions, mainly anxiety, in viewing (or using) cadaveric material, a small percentage of medical students showed persistent negative (Shalev and Nathan, 1985). In a study conducted in Spain, only a few medical schools remained skeptical about the relevance of this subject matter despite the fact that reliable studies suggested that 80% of Americans believed in the healing power of God or prayer to improve the course of an illness (Pachalski, et al., 2014). As reported by Barnard et al. 1995, introducing spirituality and religious themes into the curriculum could foster the respect of medical students for the individuality of the patient in his or her cultural context and increase awareness of values and faith as resources for dealing with illness, suffering, and death including the dissected cadaver (Barnard et al., 1995). Social forces of culture and religion can bring people together for cooperative success or can divide people for persecution and suffering. Culture defines the social forces within a community, influencing the conventions of behavior. On the other hand, religion defines how the community members interpret their role in the universe. With this teaching Barnard (1995), and others, have endeavored to assess the cultural aspects of religious beliefs and how they affect cadaveric dissection. The results showed that the students who reported turning to religion as a mean of coping with such stressful experiences (Hancock et al., 2004; Mc Garvey et al., 2001). A study conducted at a university in New Zealand concluded that the initial stress associated with the dissection experience dissipated relatively rapidly (Hancock et al., 2004). Another study conducted in Cardiff in the United Kingdom (UK) showed that serious distress caused by dissection was rare among the student population (Evans and Fitzgibbon, 1992). In 2002, a study conducted in the UK, which assessed the emotional impact of cadaveric dissection on medical students, concluded that students did not perceive their first exposure to cadaver dissection as an aversive experience, but rather as a positive and challenging life event (O’Carroll et al., 2002). On the other hand, a study by Dempster et al., in 2006, in Ireland, started with the assumption that cadavers constituted a potential stressor for medical students (Dinsmore et al., 2001), while others found it a positive experience (Mc Garvey et al., 2001). A study conducted at a university in New Zealand concluded that the initial stress associated with the dissection experience dissipated relatively rapidly (Hancock et al., 2004). Another study conducted in Cardiff in the United Kingdom (UK) showed that serious distress caused by dissection was rare among the student population (Evans and Fitzgibbon, 1992).
Some authors have considered that important cultural differences such as traditions, society, even age of entry into medical school may account for the various reactions to the dissection experience (Evans and Fitzgibbon, 1992; McEvoy et al., 2014). On the other hand, a study conducted in a South West Nigerian Medical school showed that the great majority of students agreed that cadaver dissection was accepted culturally (91.7%) and religiously (86.69%). The majority of those students belonged to the same ethnic groups and approximately 73% were Christians and 25% were Muslims (Oyeyipo and Falana, 2012). In 2009, a study conducted by Mitchell among medical students in British and Chinese medical schools assessed the cultural influences on learning anatomy. Data showed that student learning was driven by assessment in both groups, though British students seemed to enjoy studying anatomy more than their Chinese counterparts. He concluded that the ‘cultures of learning’ influence students’ approaches and highlight the differences in perceptions among learners (Mitchell et al., 2009).

Another longitudinal study from the University of Gondar in Ethiopia analyzed students‘ attitudes towards human cadaveric dissection both before and after exposure to dissection. It showed that for the majority, fear and nausea had decreased, while excitement had increased. The report concluded that anatomical dissection by itself was not considered as a stressor (Mulu and Tegabu, 2012). So far, there is uncertainty in understanding how cultural or religious views are related to dissection experience (Piaisant et al., 2011). Despite such research, the cultural identity of medical students as it relates to their emotional responses to the dissection room needs further investigation.

The purpose of the present study is to examine the emotional impact of cadaver dissection across cultures and whether or not cultural views impact the learner’s dissection experience. We hypothesize that by integrating their own cultural beliefs into this professional experience in the dissection laboratory, medical students will show a better coping mechanism. It is our hope that the findings will be useful to better prepare students for the dissecting room experience.

Materials and Methods

Ethical Approval:
This project was approved by the Institutional Review Board (IRB) as an exempt study (IRB # 081246) and participation was voluntary for consenting students.

Design of the study:
This study used both quantitative and qualitative approaches to evaluate medical students’ experiences in the gross anatomy laboratory. The participants were first-year medical students who were enrolled in the course over two consecutive academic years. Eighty medical students were recruited at the close of the course and their consent was gained via e-mail. They were of various cultural backgrounds with a mean age of 24.1 ± 2.6 years. The demographics are displayed in Table 1. 41.3% (n=33) were male and 58.8% (n=47) were female.

The anatomy course occurred over 17 weeks and consisted of 52 lecture hours (embryology and gross anatomy) and 58 laboratory hours of cadaveric dissection. Before the start of each laboratory session, students were debriefed for a short period to keep them up-to-date on the progress of dissection. The study participants were asked to complete a three-part online subjective assessment survey (survey created using Google forms, see appendix A). It was comprised of variables that related to 1) the dissection experience, using various positive and negative descriptors; 2) cultural identity and importance; and 3) learning outcomes from the dissection experience. Likert scales were used for all questions, and students were also given the opportunity to offer free-text responses to selected questions. Participants were divided into two groups based on personal importance of cultural identity as evidenced by responses to Item 1 (“My culture is important to me”) in the Assessment of Cultural Identity scale. The two groups identified were the cultural group (Group 1, N = 44, Likert responses 4, 5) and the non-cultural group (Group 2, N = 36 Likert responses 1, 2, 3). A number of psychometric tests were used to assess each individual’s perception of a potentially stressful situation. The ALE Scale is a reliable and valid psychometric tool that assesses the outcome and the positive and negative emotional reactions to a potentially stressful situation in terms of threat, challenge, or loss (Ferguson et al., 1999). The ALE scale assigns a numerical score that is dependent on the extent to which participants experienced 16 different emotions, such as fear, worry and excitement, when appraising a life event. The three dimensions of the ALE Scale have good psychometric properties, with high internal consistency estimates. They have been used previously to study the impact of cadaver dissection on first-year medical students in multiple studies (O’Carroll et al., 2002; Dempster et al., 2006). We used a modified ALE scale in part A of our survey entitled “Appraisal of Dissection Experience” which was built on positive and negative emotions as the main dimensions. In this scale ranging from 1 to 5; (1) meant “not at all”, (2) “a little”, (3) “moderately”, (4) “much” and (5) very much.
Data Analysis and Statistics

Pooled quantitative data were subjected to statistical analyses using InStat software (GraphPad Software, Inc., San Diego, CA). Means, standard deviations and p-values were calculated for each question and groups (1 and 2) were compared using the Mann-Whitney U test to compare two groups, and the sign test for comparison within a group. Statistical significance was set at p < 0.05. Qualitative data were analyzed for themes and subthemes and significant comments have been tabulated for illustration. Triangulation was an important step in this study to ensure that biases were minimized as much as possible in the qualitative data analysis (Moustakas, 1994). Concepts and conceptual mapping was done using Leximancer version 4.0 (Leximancer, Brisbane, Queensland, Australia), computer-assisted statistical data software that analyzes text. It finds the most commonly used words and calculates the relevance of other words used in the text. A colored concept map generated using Leximancer demonstrates stronger concepts in warmer colors (red, brown/orange) and minor relevant concepts in cooler colors (shades of green, blue and purple). The size of the circles is a visual representation of the themes. The words within each circle represent the thesaurus of relevant words that were included in the development of the concept (Sweetman et al., 2013).

Results

Population characteristics

A total of seventy nine first year medical students filled the questionnaire with an average age of 24.1 years ± 2.6 and a range between 21 and 34 years. This is a post-graduate, bachelor degree-holding mature population consisting significantly more of females 58.8% than males 41.3%. 73.8% are U.S. citizens, while the remainder constitute at least nine different nationalities; 8.8% represent multiple ethnicities: Hispanic, Middle Eastern, Asian and African American (Table 1).

Importance of cultural views in dissection

In line with the objective of this study to examine the effect of the cultural identity and views of medical students on their perception of cadaveric dissection and their impact on the learner’s beliefs and attitudes, the sample was divided into two groups based on identification with and personal importance of cultural views. On a scale of 1 to 5 for the first 2 questions reflecting the importance of cultural views to students, group 1 (cultural) scored 4.59 ± 0.5 and 4.52 ± 0.59, and group 2 (non-cultural) scored 1.78 ± 0.9 and 2.83 ± 1.32, respectively (Table 2). Despite this broad cultural spectrum, perceptions, beliefs and attitudes did not differ significantly regarding some basic issues such as (1) the concept of human mortality is frightening (2.77 ± 1.24 in group 1 vs. 2.64 ± 1.5 in group 2), and (2) cultural considerations should be part of a gross anatomy course (2.34 ± 1.38 in group 1 vs. 2.33 ± 1.2 in group 2). As evidenced in Table 2, although culture is important to group 1 students, it impacted “little” or “moderately” their experience in the cadaver lab, but significantly more than for group 2 (P<0001). Both groups agreed that cultural consideration is not a major part of the gross anatomy course. In addition, both groups agreed that dissection helped a “little” or “moderately” in the students' emotional development, 2.45±1.28 vs. 2.28±1.37 in groups 1 and 2, respectively.

Appraisal of the dissection experience

Both groups did not differ significantly with respect to the appraisal of negative experiences encountered during dissection (Table 3a). They considered dissection to be a little nauseating, scary, painful, depressing, unbearable and anxiety provoking, with a total mean of 1.68±0.25 in group 1 vs. 1.65±0.29 in group 2 (P=0.26). On the other hand, both cultural (group 1) and non-cultural (group 2) groups appraised dissection positively as being enjoyable (3.93±1 vs. 3.58±1.3), challenging (3.86±8 vs. 4.00±1.04), stimulating (3.91±0.77 vs. 3.67±1), exciting (3.82±0.99 vs. 3.44±1.13), interesting (4.45±0.7 vs. 4.14±0.96) and informative (4.43±0.7 vs. 4.00±0.93) (Table 3b). In brief, both groups provided high numerical appraisals of the positive aspects of dissection. However, the cultural group deemed the dissection experience to be more positive, with an overall average of 4.01±0.4 vs. 3.69±0.35 for group 2.

Assessment of learning outcomes

Regarding the assessment of learning outcomes, both groups greatly appreciated the academic benefits of cadaveric dissection despite the fact that the cultural group (group 1) perceived this experience as significantly more positive in most of the parameters and variables included in the questionnaire (P< 0.05). Familiarity with the human body as a consequence of dissection was very highly appraised in both groups (4.7±0.51 in group 1 and 4.39±1, in group 2). As shown in Table 4, all students were in agreement that cadaveric dissection promoted a combination of theory and practice, teamwork, practical skills, and it widened the spectrum
of learning outcomes which are essential to future doctors. The cultural group was significantly more positive in all of the above aspects, with the exception of the development of psychomotor skills in preparation for the clinical work (see Table 4).

Gender difference
After comparing other criteria for grouping such as gender, age, and citizenship among others (data not shown), only gender showed a statistically significant correlation (P< 0.005) regarding the dissection experience. As illustrated in Table 5, male students were remarkably less negative (1.34 ± 0.16 vs. 1.89 ± 0.31) and more positive (3.74±.41 vs. 4.04±0.35) compared to females, respectively. However, in general, the dissection experience for all students was significantly more positive (P<0.001) than negative (Figure 1 and Table 6).

Conceptual differences and dissection
The concept maps (Figure 2 and 3), as well as the analysis of students’ written statements (Table 6), show there was a remarkable difference in the qualitative comments between the two groups. Further analysis of the written statements was performed using concept maps and conceptual mapping by Leximancer data analysis software, which calculates the relevance of words (Figure 2 and 3). Colored concept maps were generated that demonstrate stronger salient concepts in red, brown or orange and minor relevant concepts in shades of green, blue and purple. The size of the circles is a visual representation of the concepts, while the words in the circle are the relevant words included in the development of the concept. Figures 2 and 3 represent the summary of the data. There were two major concepts in Figure 2, for group 1, in brown and red/brown that stressed culture and spiritual beliefs when dealing with the dissection of the body. In this group, spiritual belief coincided with cultures and promoted learning through dissection. As for minor concepts, the cultural group had 9 minor concept circles with shades of green, blue and purple. Group 1 stressed belief, culture and respect for the cadaver, religious and family views and the importance of dissection of cadavers on learning anatomy. On the other hand, the non-cultural group had only eight circles, with one large brown to red circle (Figure 3). That circle represents the scientific value of dissection as a means of learning that deserves respect. The other 7 small circles of relevant minor concepts highlight the importance of dissection for education, with little mention of culture and identity.

Discussion
The majority of our study subjects reported their recollection of the dissection experience as largely positive, which corresponds to other reports that used similar research techniques (O’Carroll et al., 2002; Smith and Mathias, 2010). Overall, both groups in the present study reported more positive than negative perceptions, similar to other reports (Dempster et al., 2006; Mulu and Tegabu, 2012). In our study, and as reported before by others, a minority of students experienced some adverse consequences like nausea (Dempster et al., 2006). Negative feelings include fear and nausea which decrease over time (Mulu and Tegabu, 2012). The few students who reported high-stress levels were most probably under academic stress rather than emotional stress (Evans and Fitzgibbon, 1992) or it may have been due to chemical odors and eye irritations (Mulu and Tegabu, 2012).

Despite cultural disparities among the students, both groups (cultural and non-cultural) agreed that only a little cultural consideration should be part of the gross anatomy course. This may be a characteristic of the “melting pot” phenomenon in the United States, where social forces of culture and religion can have effects that bring people together for cooperative success, while cultivating inherent positive attitudes and perceptions regarding important subjects like dissection in medicine.

It appears that the student populations in the present study, like the majority of students applying to medical school, were somewhat prepared for the dissection experience (Evans and Fitzgibbon, 1992). Indeed, students applying to medical schools in the US perform shadowing or community work that can lay the foundation for such an exposure (Dempster et al., 2006), and if not, simply showing a movie or images of what to expect in the dissection room can be enough to decrease the first-time anxiety (Arráez-Aybar et al., 2004; Dempster et al., 2006). Prior experience with exposure to prosections was also shown to be effective in reducing the stress of first exposure (Böckers et al., 2012). A study of students at Mayo Medical School that assessed whether the assistance of a 3rd year medical student on the first day of anatomy dissection decreased the physical and emotional stress among 1st year medical students showed that students had significantly fewer negative physical reactions and reported lower levels of anxiety when having an upperclassman at the dissection table (Houwink et al., 2004). A discussion of death and dying with students was also found to be helpful in this regard (Druck and Johnson,1994; Tschernig et al., 2000), as was encouraging students to name their cadaver and providing more information to them.
about age and cause of death (Williams et al., 2014). Willingness to be a body or organ donor correlated with a positive experience in the dissection room (Anyanwu et al., 2014). Our role as educators is to ensure preparedness for all students admitted from various cultural backgrounds by using various combinations of the above approaches (Penney, 1985).

It has been shown that learning is maximized in an environment that fosters a moderate state of positive arousal due to neural plasticity and negative stress (Cozolino and Sprokay, 2006). Indeed, our own dissection laboratory typifies this type of learning environment. Students from both groups appraised the dissection experience highly and had more positive emotions, which should help to maximize learning. It has been reported that students feel cadaveric dissection as absolutely essential for learning anatomy, and that students in medical schools where this practical aspect is no longer taught will lose out on knowledge and skill elements that are essential for the practice of medicine (Lempp, 2005). Both groups, cultural and non-cultural, perceived the time spent on dissecting cadavers as a rewarding counter-balance to many hours of class time (Lempp, 2005) and provided valuable active learning time (Jurjus et al., 2013). The dissection exercise promoted their learning outcomes and fostered in them the spirit of teamwork as well as the psychomotor skills of compassion and professionalism (Weeks et al., 1995; Slotnick and Hilton, 2006). Dissection created the proper environment for self-directed learning from a resource that they might not be able to encounter elsewhere in their career. It was once-in-a-lifetime valuable and relevant learning experience, enhanced by discussions in the laboratory that promoted peer education (Kotzé and Mole, 2013).

In this study, cultural students (group 1) had significantly more positive experiences than non-cultural students (group 2) in the dissection laboratory. Cultural views were strongly correlated to religious views. Although it has been reported that some religious students viewed anatomical dissection as a threat to the sanctity of the human body (Notzer et al., 2006), it didn’t prevent these students from giving this experience a personal and religious meaning. In the present study, this is reflected in the qualitative comments and concept maps that tend to be more reflective and less reactive. Cultural students tried to connect the human body to their religious beliefs and perceived it more positively, while the non-cultural students were looking at the body more as a learning tool (Hancock et al., 2004), but both did so with much respect.

In the present study, no correlation was found between age and the experience of dissection. However, a previously published study had shown that mature students like ours were less stressed overall compared to other students (Evans and Fitzgibbon, 1992). However, these were British students whose age corresponds to our traditional students’ age when entering medical school (Evans and Fitzgibbon, 1992). Thus, more studies need to be conducted before ruling maturity in or out as a factor that affects the experience of dissection. In the present study, males showed more positive experiences than females in appraising dissection. In the literature, gender differences have also been reported in the dissection room where 48% of female students, compared to 34% of the male students, indicated that they preferred observing rather than actually performing a dissection (Plaisant et al., 2011). In addition, female students tended to show higher levels of mental distress (Böckers et al., 2012). A study by Druce et al., showed a negative association for men but a positive association for women with previous experience with death and reaction in the dissection room (Druce and Johnson, 1994). The question is: Is gender the underlying factor for this correlation, or is it the effect of previous exposure to death? This question is still pending as well, for studies around the topic are still contradictory. Previous experience with dead bodies and death was correlated with students being more upset in the dissection room rather than more comfortable as would have been assumed (De Horne et al., 1990; Evans and Fitzgibbon, 1992). However, a study conducted in a South West Nigerian Medical school, 50% of students reported that prior experience with a dead body helped them develop coping mechanisms (Oyeyipo and Falana, 2012).

Personality traits are another potential factor in the dissection experience. A study conducted among French medical students found that a relationship existed between personality traits and attitudes towards the dissection room. Subjects completed a personality inventory and a questionnaire assessing their attitudes to human dissection. Feelings of curiosity were strongly correlated with personality traits of extraversion, energy, and enthusiasm. The rated level of anxiety was positively correlated with personality traits of negative affectivity (Plaisant et al., 2011). A valid question for further investigation would be to correlate the personality trait differences with the gender differences.

Limitations

The findings of this study may have limited ability for generalization to other institutions in the US or beyond because of the small sample size. This cross-sectional study could be complemented by a longitudinal study over 3 years in the same university with a larger
sample size. In addition, a comparative study between universities with a larger sample size could also add value and strengthen the results. If the study was to expand its scope beyond US medical schools, the ages of the students may become a factor. The average age of medical students in the US is 24.1 years but this could vary between schools, especially comparing students outside of the US. To help address possible differences due to the age factor, researchers could consider running the survey at the beginning and at the end of the course to gather more reliable data on students’ experiences and beliefs.

Future Directions

As these results may not be comparable to other institutions, the next step is to conduct a similar study at other locations in the US to further validate these findings on a wider scale nationally; the data could be further expanded by conducting studies at institutions internationally. In addition, surveying students at both the beginning and the end of the anatomy dissection course at each institution will provide more reliable data.

Conclusions

The evidence presented is helpful to anatomy teaching faculty, inviting them to take cultural factors into account when preparing students for the dissection experience. This study showed that strong cultural identities apparently do not deter the majority of students from their studies and, on the contrary, the impact of their cultural views might enhance their enjoyment of dissection. This study is the first to reveal that a cultural identity may significantly account for perceived learning disparities in cadaver dissection experiences. Acknowledgment of cultural sensitivities is a timely reminder for those engaged in course design. Gender differences were evident, as males tended to experience more intense positive and negative experiences than females. Both cultural and non-cultural groups perceived dissection as helping slightly in emotional development of students, and both groups experienced very similar negative feelings such as nausea and anxiety. Both groups positively appraised dissection as enjoyable, stimulating and informative; however, the cultural group appraised it even more positively. In addition, the cultural group had a more positive perception of the benefits of dissection in most parameters. Medical educators may use these results to reinforce existing preparation of students for the dissecting room experience. Communication among faculty and students during dissection, as well as among peers, should be promoted. A larger study will be conducted to increase our sample size and compare student populations from around the United States and from other countries.

Acknowledgement

The authors would like to acknowledge the teaching staff in the gross anatomy course and laboratory. They also would like to thank the medical students who took part in this study.

References


Figure Legends

Figure 1: Evaluation of the dissection experience for all students who participated in the study was more positive than negative (P < 0.001). The two tailed p-value was calculated using the unpaired t-test with Welch correction. The experience was considered significantly more positive in all groups (P < 0.001).

Figure 2: Concept Map Group 1. Colored concept map figure generated using Leximancer shows the strongest concept in warmer colors (red, brown/orange) and the more minor relevant concepts in cooler colors (shades of green, blue and purple here). The size of the circles is a visual representation of the concepts. The words within each circle represent the thesaurus of relevant words that were included in the development of the concept.
Figure 3: Concept Map Group 2
Colored concept map figure generated using Leximancer shows the strongest concept in warmer colors (red, brown/orange) and the more minor relevant concepts in cooler colors (shades of green, blue and purple here). The size of the circles is a visual representation of the concepts. The words within each circle represent the thesaurus of relevant words that were included in the development of the concept.

Table 1: Demographic Data: Cultural (Group 1) vs. Non-cultural (Group 2) students

<table>
<thead>
<tr>
<th>Age</th>
<th>Group 1 [N=44]</th>
<th>Group 2 [N=36]</th>
<th>Overall [N=80]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>23.7</td>
<td>24.7</td>
<td>24.1</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.3</td>
<td>2.9</td>
<td>2.6</td>
</tr>
<tr>
<td>Minimum</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Maximum</td>
<td>30</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17 (38.6%)</td>
<td>16 (44.4%)</td>
<td>33 (41.3%)</td>
</tr>
<tr>
<td>Female</td>
<td>27 (61.4%)</td>
<td>20 (55.6%)</td>
<td>47 (58.8%)</td>
</tr>
<tr>
<td>Citizenship</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S.</td>
<td>30 (68.2%)</td>
<td>29 (80.6%)</td>
<td>59 (73.8%)</td>
</tr>
<tr>
<td>Non-U.S.</td>
<td>14 (31.8%)</td>
<td>7 (19.4%)</td>
<td>21 (26.3%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>5 (11.4%)</td>
<td>5 (13.9%)</td>
<td>10 (12.5%)</td>
</tr>
<tr>
<td>Black or African American</td>
<td>5 (11.4%)</td>
<td>2 (5.6%)</td>
<td>7 (8.8%)</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>2 (4.5%)</td>
<td>0 (0.0%)</td>
<td>2 (2.5%)</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>3 (8.8%)</td>
<td>0 (0.0%)</td>
<td>3 (3.8%)</td>
</tr>
<tr>
<td>Mixed/Multiple Ethnicities</td>
<td>6 (13.6%)</td>
<td>1 (2.8%)</td>
<td>7 (8.8%)</td>
</tr>
<tr>
<td>Native American</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Other</td>
<td>0 (0.0%)</td>
<td>1 (2.8%)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>South Asian/Indian</td>
<td>4 (9.1%)</td>
<td>0 (0.0%)</td>
<td>4 (5.0%)</td>
</tr>
<tr>
<td>White</td>
<td>13 (30.2%)</td>
<td>27 (72.2%)</td>
<td>40 (50.0%)</td>
</tr>
</tbody>
</table>

* one student didn’t give his age
Table 2. Assessment of Cultural Identity, Cultural (Group 1) vs. Non-cultural students (Group 2).

<table>
<thead>
<tr>
<th>Question</th>
<th>Group 1 (N=44)</th>
<th>Group 2 (N=32)</th>
<th>t-test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiar with a set of cultural norms</td>
<td>4.30 (0.68)</td>
<td>2.89 (1.32)</td>
<td>1.90</td>
<td>0.061</td>
</tr>
<tr>
<td>My religion is important to me</td>
<td>4.16 (0.67)</td>
<td>2.18 (1.36)</td>
<td>2.00</td>
<td>0.036</td>
</tr>
<tr>
<td>My cultural norm important to me in the culture</td>
<td>3.53 (0.78)</td>
<td>1.75 (1.26)</td>
<td>2.00</td>
<td>0.033</td>
</tr>
<tr>
<td>My religion played an important role in my life</td>
<td>3.14 (0.89)</td>
<td>2.09 (1.40)</td>
<td>1.67</td>
<td>0.096</td>
</tr>
<tr>
<td>The concept of human mortality is frightening</td>
<td>2.81 (0.84)</td>
<td>2.09 (1.40)</td>
<td>1.67</td>
<td>0.096</td>
</tr>
</tbody>
</table>

Table 3a. Appraisal of the Dissection Experience, Negative Experiences, Cultural (Group 1) vs. Non-cultural Students (Group 2).

<table>
<thead>
<tr>
<th>Question</th>
<th>Group 1 (N=44)</th>
<th>Group 2 (N=32)</th>
<th>Median (Q3-Q1)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stressed out</td>
<td>2.07 (1.27)</td>
<td>1.35 (1.00)</td>
<td>1.75 (0.80)</td>
<td>1.12</td>
</tr>
<tr>
<td>Paid</td>
<td>3.56 (0.62)</td>
<td>2.12 (1.67)</td>
<td>2.50 (2.00)</td>
<td>1.12</td>
</tr>
<tr>
<td>Difficult to understand</td>
<td>3.04 (0.62)</td>
<td>1.50 (1.50)</td>
<td>2.00 (2.00)</td>
<td>1.12</td>
</tr>
<tr>
<td>Anxiety-producing</td>
<td>3.13 (0.87)</td>
<td>1.50 (1.50)</td>
<td>2.00 (2.00)</td>
<td>1.12</td>
</tr>
</tbody>
</table>

Table 3b. Appraisal of the Dissection Experience, Positive Experiences, Cultural (Group 1) vs. Non-cultural Students (Group 2).

<table>
<thead>
<tr>
<th>Question</th>
<th>Group 1 (N=44)</th>
<th>Group 2 (N=32)</th>
<th>Median (Q3-Q1)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomically correct</td>
<td>2.07 (1.27)</td>
<td>1.35 (1.00)</td>
<td>1.75 (0.80)</td>
<td>1.12</td>
</tr>
</tbody>
</table>

Table 4. Assessment of Learning Outcomes, Cultural (Group 1) vs. Non-cultural Students (Group 2).

<table>
<thead>
<tr>
<th>Question</th>
<th>Group 1 (N=44)</th>
<th>Group 2 (N=32)</th>
<th>Median (Q3-Q1)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall improvement</td>
<td>2.07 (1.27)</td>
<td>1.35 (1.00)</td>
<td>1.75 (0.80)</td>
<td>1.12</td>
</tr>
</tbody>
</table>
Table 5. Dissection experience in Males vs. Females.

| Criteria | Females (N=67) | Males (N=33) | Mann-Whitney U-
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissection Experience</td>
<td>Mean (IQ)</td>
<td>Median (IQ)</td>
<td>Mean (IQ)</td>
</tr>
<tr>
<td>Negative</td>
<td>1.80 (4.10)</td>
<td>11.0</td>
<td>1.34 (1.0)</td>
</tr>
<tr>
<td>Positive</td>
<td>3.74 (4.40)</td>
<td>26.34</td>
<td>4.04 (3.0)</td>
</tr>
</tbody>
</table>

Table 6: Analysis of Qualitative Data

<table>
<thead>
<tr>
<th>Theme</th>
<th>Selected Quotes from Group 2 (culture)</th>
<th>Selected Quotes from Group 2 (non-culture)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>“Cultural, spiritual and religious beliefs affected/expected experience. I believe that God created man in his own image. Dissecting and discovering the human body helps me to better understand and appreciate how God has created it.”</td>
<td>“Can’t do this on my own. I need help. Cultural expectancies influence my decision-making.”</td>
</tr>
<tr>
<td>Cancer</td>
<td>“I see myself as a healer. Breathing human being with feeling, body and self.”</td>
<td>“I think of... I can’t see my Ophelia, I hate the idea of being a healer. Because of this, dissecting the cadavers the very first day was an emotional experience.”</td>
</tr>
<tr>
<td>Cancer</td>
<td>“Dissection helped me face pain, death, mortality, and personal emotional development. A better understanding of the body, the causes behind pain and disease, and the fear of death diminishes and my anxieties and frustrations can come to an understanding.”</td>
<td>“Not the reality of human mortality.”</td>
</tr>
<tr>
<td>Cancer</td>
<td>“Dissection made me question how I would feel and what I would do in a similar situation.”</td>
<td>“Cultural beliefs influence the understanding of the emotional experience.”</td>
</tr>
<tr>
<td>Cancer</td>
<td>“Dissection promotes emotional detachment and professional development.”</td>
<td>“I think that if I had been given an opportunity to understand the disease processes and the impact on the patient, I would have been more emotionally detached and more caring towards the patient.”</td>
</tr>
<tr>
<td>Cancer</td>
<td>“Cultural attachment affects the beginning point of the emotional experience.”</td>
<td>“Can’t do this on my own. I need help.”</td>
</tr>
</tbody>
</table>

Background to the design of Keele University’s medical programme

The overarching aim of Keele’s MBChB programme is to develop medical students into becoming excellent clinicians and to achieve the best standards specified by the medical professional body, the General Medical council (GMC). Based on GMC’s guidelines, I have taken a reflective approach and evaluated how the module is designed to equip students in fulfilling the three concurrent roles of a clinician, namely a scientist, a practitioner and a professional (GMC Tomorrow’s Doctors 2009). Firstly, in my consideration the cancer module achieves this goal where it uses five distinct learning themes to enable students acquire knowledge, skills and develop professional attitudes in order to become GMC-standard doctors (Figure 1).
The design of a programme however should not be exclusively focused on preparing students fit for employment. Rather the design should also reflect its purpose of enabling the overall development of a student both personally and academically. This critical point resonates with the characteristics of a ‘good teacher’ whose role is to facilitate this transformation. Thus the design of Keele’s MBChB modules not only meets the specifications of the GMC but also attempts to equip students with a set of skills and experiences which will help them develop academically, personally and professionally. Contained within Keele University’s strategic plan these are qualities collectively referred to as Keele Graduate Attributes (KGA) which exemplifies the quality and distinctiveness Keele Graduates are aspired to attain. In a fee-paying education era these measures ensure universities remain responsive and accountable to the interests and need of students (Brown 2011).

In meeting these demands, programmes and modules can also be designed following guidelines of external regulators such as the Quality Assurance Agency (QAA). Infused by the KGA, each module of Keele’s MBChB programme aims to enable students to think independently, synthesise information, solve problems, communicate clearly and appreciate the social, environmental and global implications of their studies and activities (Keele University MBChB Programme Specification 2014).

Completing the first module of Teaching and Learning in Higher Education Programme (TLHEP) has enabled me to understand the pedagogies and educational research which define the abovementioned competencies as higher order thinking skills (HOTS). I now understand that a major challenge of a programme is ensuring that learning opportunities within a course is designed to encourage students to be actively involved in acquiring these skills rather than relying on them to be passive consumers. This requires effective programme design, a process which should reflect up to date knowledge and best practice. Module two of TLHEP has enabled me to develop my understanding of these best practices which include utilising the constructive alignment concept, assessment tools, internationalisation, sustainability and the appropriate use of information and communications technology (ICT). I have used these five criteria to evaluate the cancer module and have based my evaluation on established educational theories.

Introduction to the cancer module

The cancer module introduces students to cancer and sets out to achieve two core aims: to enable students to learn normal cell biology and secondly how these normal processes are altered in cancer. The philosophy of Keele’s MBChB programme is to encourage medical students to take responsibility of their own learning in order to prepare them for life-long learning. This ethos is reflected in the structure of the module which makes use of student-led learning approaches to facilitate students achieving the outcomes of the programme as well as meeting the standards set out by the GMC. Student-led learning is effectively achieved through small group teaching and this format has been proposed to be suitable for incorporation into medical education (Tomorrow’s Doctors 2009). The GMC also emphasises the importance of practical class learning to enable students develop their clinical skills.

Figure 2: Graphical representation of the structural components of the cancer module. Each week’s learning theme is set by the PBL cases which act as hubs. Week 1 and two’s learning theme is based on bowel cancer. The focus of week three is leukaemia and week four centres around lung cancer.

Taking these recommendations into consideration the main
structural components of the cancer module includes lectures; PBL and practical classes. Looking at the organisation of these activities in the context of the PBL cases of each week, the function of PBL in the curriculum could be viewed as being the focal point of learning serving to contextualise it (Figure 2).

Here I will first take an interrogative approach to explore the effectiveness of the module’s structure; the basis of adopting PBL and its success in ensuring students achieve the desired outcomes. I will also examine whether the learning students are encouraged to undertake is closely matched by the way it is assessed i.e whether the two axis are aligned.

**Structure of the cancer module and constructive alignment**

In deconstructing the module I will first examine whether the learning outcomes, the teaching and learning activities and assessment methods are systematically aligned. A constructively aligned module is a conjugate of two concepts. First it aims to be student-centred and encourages learning to be constructed by undertaking relevant activities. This differs from traditional teaching where knowledge is expected to be transmitted from teacher to students. Instead in a constructively aligned module the teacher acts as a facilitator for student learning. The second concept of alignment sees that the content of the module matches with its specified ILOs and the way it is to be assessed (Biggs 2003). The cancer module utilises PBL to achieve constructive learning and adopts a format where the teaching topics of lectures and practical classes are aligned to the focus areas of PBL.

Described by Boud, ‘the principal idea behind problem based learning is that the starting point for learning should be a problem, a query or a puzzle that the learner wants to solve’ (Boud 1985). The cancer module makes use of clinical cases as the starting point which acts as a central theme for all the other teaching materials. This way PBL serves to put the scientific knowledge and clinical skills, which students are expected to acquire, into a relevant context (Albanese and Mitchell 1993). As an innovative educational concept the use of patient problems in PBL is designed to lead students in considering the patient as ‘whole’ (Barrows 1980). Students are expected to identify learning issues which encompass all the domains of medicine. Taking into account students have different learning styles a critical aspect to consider here is that not all students are able to adjust to the independent learning format of PBL (Dorman 2005). In considering the conception of PBL which was designed for medical students of North America who already are graduates, it is recognised that the format of PBL may need to be adapted to meet the requirements of the younger students of UK’s medical school (Taylor and Miflin 2008). As such Keele has adopted a PBL format which has a blend of directed learning through the use of lectures and seminars. Classified as hybrid PBL, in this format PBL acting as a hub enables students to contextualise information and knowledge acquired through other resources such as lectures and seminars (Samarasekera and Karunathilake 2011). The function of lectures here is to provide up to date information on the key concepts. Secondly lectures enable detailed information to be delivered in a simplified way through diagrams and use of figures. This can be highlighted as one of the key strengths of lectures where information can be segmented in order to help student understand complex issues.

The main outcome of Keele’s MBChB Year 1 is to enable students establish a well-rounded knowledge base on major aspects of human anatomy and physiology as well as develop the related clinical skills. In this respect the cancer module is an exception since the topic of cancer mainly deals with abnormality of normal functions. Thus parallel to the topics of cancer there is a separate strand of material which aims to cover the normal processes altered in cancer. In this approach cancer topics are delivered concurrently in the context of normal i.e. non-diseased states. As such students are able to see the relevancy of the learning topics and hence become motivated to expand their knowledge. Here the requirement of being motivated is assumed as a “superior condition” of adult learners which need to be addressed in order to engage them in their learning (Knowles 1975).

In this context the utilisation of PBL in the cancer module serves to promote the principles of adult learning as proposed by Knowles. Firstly the use of clinically relevant cases fulfils the criteria of ‘need to know’ and the ability to ‘motivate’ students. It also highlights ‘the immediate relevancy’ of the learning topics to their working life. The ethos of self-directed learning within PBL encourages learners to be responsible for their decisions and its unique format enables existing knowledge to act as the foundation to build new concepts.

The governing power of students in establishing their own learning outcomes raise the issue of how to effectively assess learning when there is a mismatch between students defined ILOs and the designated ILOs of the module. Here I will focus on whether a specific ILO of The cancer module deemed as core knowledge has been identified as a learning topic across the 12 PBL groups of Year 1.
In week 2, students tackle the investigative methods and diagnosis of cancer. Students are expected to know the various terminologies associated with cancer to be able to document and gather information according to standard guidelines. Thus the set ILO to this requires students to 'Describe the basic classification of tumours'. Analysing the ILOs of the PBL groups for week 2 shows that 8 groups out of the 12 groups listed this as one of their ILOs. Given that this equates to approximately 37% of the student cohort who did not emphasise this ILO as core knowledge, a test item on the topic becomes unfeasible. This clearly challenges the notion of constructive alignment in the cancer module and becomes an important point for me to consider in the redevelopment of the module.

Assessments of the cancer module

Assessment is an integral part of a module and its importance is recognised by the QAA which defines the purpose of assessment as a tool: 1) to promote learning and 2) provide a means to measure the extent of learning achieved by students against the ILOs of a module. In accordance with the pedagogy of constructive alignment, assessment materials should be designed in such a way which tells us how well students have succeeded in meeting the module’s ILOs. Thus assessments should closely track the outcomes of the curriculum in order to drive learning.

The assessment of the module is undertaken using a range of items which includes written and practical work. Grounded in sound medical educational research, the selection of the test items follows the framework of Miller’s Pyramid (Miller 1990). As detailed in Figure 3, the ‘knows’ forms the base of the pyramid which tests students factual knowledge. This acts as the foundation upon which clinical competence can be built upon. At the second layer of the pyramid students are expected to apply their acquired knowledge and this can be examined by students’ ability to solve problems. The ‘knows’ and ‘knows how’ are deemed suitable categories for assessing Year 1 students utilising both written and practical assessments (Wass 2001). The top two layers: ‘shows’ and ‘does’ are designated for students to demonstrate their competencies in simulated or actual clinical settings and is generally assessed beyond Year 2.

Here I consider the extent to which the assessments of the module aid students in their learning. My evaluation takes into account the assessment criteria proposed by Brown (Brown 2004) as strategies to transform assessment into a learning force. A critical factor is the timing of assessment. Assessment of the module is undertaken at different key stages using formative and summative strategies. This allows students to reflect on their performance and identify learning deficiencies in order to be better prepared for subsequent assessments. Furthermore, students can learn through assessment when it is coupled with effective feedback. The aim of feedback is to help students understand where they went wrong and more importantly clearly specify what they need to do to improve.

There are few options to consider which could further increase the effectiveness of the feedback we provide. Currently feedback is given by Year 1 leads who oversee the overall running of all the modules.

Figure 3: Assessing medical competencies using Miller’s pyramid.

Miller’s pyramid represents a framework for designing medical examinations. In the first two layers students’ overall grasp of knowledge and its effective application is tested using written exams such as multiple choice questions and key feature problems. Using simulated clinical settings students ability to demonstratively put their knowledge into practice can be assessed in the ‘shows how’ level. Finally direct observation of students at work denoted by the top layer provides an actual measure of students’ competencies. (Figure adapted from Miller 1990).

Contributions from exam markers could help students receive detailed ‘question specific comments’ since they will have first-hand experience of knowing the most common errors committed by students. However the challenge in implementing this is whether all markers will be able to find time to accommodate more teaching time.
Addressing contemporary issues such as internationalisation and sustainability

Internationalisation of the curriculum serves to equip students with competencies and awareness to be able to serve a multi-cultural society. A curriculum blended with competencies and awareness of diversity issues stemming from cultural, social and national differences is defined as an inclusive curriculum. This bedding of knowledge, understanding and awareness of different perspectives into the curriculum aims to integrate an international, intercultural, or global dimension into the delivery of education (Knight 2004).

I consider the PBL classes as the ideal setting for students to become familiar and engage themselves in discussions centring on a variety of topics encompassing both local and international issues. The makeup of the PBL groups which consists of students representing different cultural and religious background provides a suitable format for exchange of a wide range of views and opinions. This acts as a platform enabling students to consider the issues arising from a globalised society. As citizens of a globalised society, students are more mobile and have opportunity to consider taking elective training or even working abroad (Singh 2012). Thus there is a need for students to learn about the common problems faced by international health care professionals. In this context the module could be redeveloped so that there is initiative for students to be part of a global academic community where they have opportunities to address issues such as inequalities and sustainability.

Environmental factors play a major role in determining health which the World Health Organisation estimates accounts for a quarter of deaths worldwide (WHO 2006). As such there is growing appreciation that imposing interventions and modifying environmental risk factors has the potential to reduce the disease burden of the healthcare system or a country. Thus there is a call from academic and professional health care professional bodies to designate specific learning outcomes to educate students on sustainability. While the issue of sustainability requires effective promotion its development can be most far reaching when it is incorporated within the education system. Here the QAA stipulates that a curriculum must set outcomes so that students can be equipped ‘with knowledge and understanding, skills and attributes needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present, and for future generations’ (QAA 2014).

As a way of introducing students to the aetiology of cancer, PBL cases cue them to consider the relationship between environment and human health. In keeping with the ethos of self-directed learning the intention here is to encourage students to apply deep knowledge and develop critical awareness of the role of the environment in cancer development. This strategy is aligned to the GMC’s learning outcomes on sustainability which recommends that students should be able to:

- Recognise the role of environmental and occupational hazards in ill-health and discuss ways to mitigate their effects.
- Discuss from a global perspective the determinants of health and disease and variations in health care delivery and medical practice.
- The cancer module’s approach to educating sustainability lacks explicit outcomes. As a module which spans only for four weeks it is no doubt a challenge to incorporate the curriculum adequately with all the essential learning outcomes including aspects of public health. However the module could be redeveloped to make use of innovative learning formats such as ‘Flipped learning’ to accommodate for the time and resources needed to engage students with sustainability issues such as climate change.

Technologies to support delivery of the cancer module

Learners entering today’s educational system are heavily reliant on information and communications technologies (ICT) and thus a well-designed module should use appropriate technologies for interfacing with students. As the generation which has the most experience with technology they are aptly classified as the ‘Digital Natives’. Learners of this generation are more likely to engage with the learning environment when it is presented with visuals and elements that blend a mixture of different media (Prensky 2001). The choice of technology to use in education is continuously expanding. These choices allow us to design and deliver learning materials which can be accessed by a diverse range of students having different learning styles or needs. With the aid of technology, education is no longer fixed on a single delivery point such as the classroom but rather can be accessed remotely without being constrained by time and space. However the choice of technology to use must be aligned to its effectiveness in helping students learn. This resonates with the established notion that a designated technology must reflect its usefulness in being the most appropriate for students achieving the desired learning outcomes (Sidman 2007).

Adapting to the rise of ICT, almost all universities within UK including Keele have undergone transformations to not only improve the quality of education but to meet the requirements of the ‘Digital
Natives’. Notable changes include the accessibility of information through different sources (e.g. text books, internet), adapting to different learning styles and overcoming the challenges of time and distance to provide choices to students as when and where learning should take place (Oliver 2015). This has been greatly facilitated through the use of virtual learning environments which give students access to learning materials on demand.

The advantages of ICT include the ability to examine the academic integrity and maintaining rigour of student assessments through the use of plagiarism checkers. The specifications of a well-designed module such as rigour of assessments, internationalisation and sustainability can all be enhanced by ICT. ICT within Keele Medical School has been used innovatively to enhance student learning in the form of producing study video resources. Called Keele Basic Bites (www.keelebasicbites.com), these are short video clips of a laboratory skill or technique which students can use as revision aid (Morris 2014). This exemplifies how ICT such as video technology can be harnessed to make medical education effective, efficient and cost-effective. As a learning method video based learning fulfils the criteria of student-led learning however a balance needs to be achieved in the amount of material that can be put forward for students’ use. With limited amount of material students may be less encouraged to seek the resources while excess amount of the material could result in students being too reliant on the resources and showing less commitment to actual practical classroom teaching.

Redesign of the Cancer Module

Given that the curriculum of the cancer module centres on PBL it was inevitable that my evaluation of the module would have significant focus on PBL. Criticism of PBL has ranged from its lack of cost effectiveness to questioning the validity of the theoretical concepts upon which it is founded on (Colliver 2000). From my experience of delivering PBL and from student feedback I have formed my own views on the strengths and weaknesses of PBL. With the emphasis of equipping medical students to meet the skills, knowledge and attributes specified by the GMC, I concur with the view that PBL offers to be one ‘whole of curriculum’ enabling students achieve these competencies (Barrows 1984). However the structure of PBL curriculum needs to be consistent with the intellectual maturity of the students. Here I have found that as school-leavers, Year 1 students often struggle with the concept of self-directed learning. Thus providing some structure to PBL especially for Year 1 students may benefit in building their confidence by helping them identify their deficiencies or organising their knowledge (Schmidt and Moust 2000). Thus my redevelopment plan of the cancer module includes changes to the facilitation of PBL. It also includes use of technological platforms to enrich student experience and widen the module’s internationalisation agenda.

Recalibrating the constructive alignment of the cancer module

Change in PBL delivery to reflect its alignment with assessment

My evaluation of the PBL format suggested that PBL encompassed the principles of adult learning. It provides motivation to learn and gives students opportunity to designate their ILOs. However this flexibility can pose problems where students may fail to recognise core knowledge or when there is significant variation within the ILOs. Thus in my new design of module I would implement the following changes. In addition to the notes that PBL tutors have access to I would also provide a crib sheet specifying the essential concepts which the students need to address in their discussion through appropriate facilitation. This would inevitably lead to the students framing ILOs which tackle these key concepts or core knowledge. The result would be that all the 12 PBL groups would have generated ILOs which are incorporated with elements relating to the core knowledge. This provides the advantage of being able to devise assessment materials from PBL knowing that all students have been signposted to the essential information. There are however drawbacks to this format. Foremost is the issue whether it represents the true ethos of PBL and provides the autonomy of student-led learning. The clear answer to this is that this form of PBL is not pure but rather can be described as supported PBL. My approach however takes into consideration that PBL works best when adjusted to meet the requirements of the students as well as the tutor (Taylor and Miflin 2008). It is argued that Year 1 medical students may not have enough educational experience to direct their studies towards what they are expected to learn or achieve. Furthermore given that many PBL tutors have no previous medical training there can a tendency for PBL sessions to be less effective for acquiring the desired outcomes and so providing a supporting structure would be beneficial (Williams 2004).
Rearranging the lecture series of the cancer module to foster spiral learning. In the current format there is disjoint in the delivery of lectures where complex topics are presented before students have the opportunity to grasp the basic concepts (left panel). In the proposed format the topics of the lectures build on one another and there is a theme where complementary sides of both the normal versus cancer state is presented in the same week (here week 4 would be an exception since it covers aspects of cancer therapy).

Rearranging lectures to present learning topics in a logical way
As an introductory module to cancer, it is aimed to provide students with knowledge of how normal cells become abnormal. To grasp these concepts the relevant lectures of the module cover micro-molecule structure/changes and how these changes control cell behaviour. The order of the lectures is depicted in Figure 4 and shows the topics of the lectures diverge from the principles of the biological system i.e. gradual progression from micro-molecular level to the cellular level and tissue level. I propose to concurrently run the two themes of normal vs cancer each week whereby the same biological system is studied in both conditions. As such in this format students’ progress to complex topics gradually and in a logical manner. This provides opportunities to revisit core concepts allowing students to build upon them in order to develop better understanding. As an example, in week 1 students learn DNA structure and the concept of gene. This knowledge then acts as the base for students to learn about how genes are altered in cancer as well as the influence that environment exerts. My choice of selecting such a format is influenced by my understanding and acknowledgment of the effectiveness of a spiral curriculum (Bruner 1960). I envision that the spiral organisation enabling students to progress from simplistic concepts to complicated ideas would reinforce acquired information. It also will provide students the opportunity to use HOTS and become accustomed in applying previously gained knowledge. A major challenge in implementing this change is the issue of timetabling where some lecturers may have restricted availability. This often can lead to a lecture timetabled according to the lecturer’s availability rather than how it fits within the themes of the module.

Defined and focused topic to make lecture effective
As a trained cell biologist my familiarity with the core knowledge of cell biology is recognised as strength and thus I was tasked in revamping the cell proliferation lecture. I have been informed that the content of this lecture overlaps with two other lectures and that it lacks clear learning outcomes. Upon studying the lecture I could see that much of the content comprised broad themes and there was minimal focus on cell proliferation and implication in cancer. Thus I have redesigned this lecture with the aim of providing students an understanding of cell proliferation in the context of both normal and diseased states. I reasoned that a narrow yet defined topic would allow me to sufficiently delve into the right depth of detail and provide the context to present information from both the normal and cancer-focused perspective. As such my lecture focused on one specific cellular pathway and showed how it is linked to cancer. By limiting the topic I had scope to talk about how deeper understanding of the pathway has benefitted the development of drugs to tackle cancer. This fits with the GMC’s broad aims of enabling students to be equipped with the required knowledge and
skills in fulfilling roles such as scientist and a practitioner.

**Widening the internationalization and sustainability agenda using application of novel ICT platforms**

Internationalization of the medical curriculum aims to equip doctors with knowledge of different languages, cultures and the practicalities associated with the delivery of healthcare in an international setting (Bateman 2001). PBL represents the main method of channeling internationalization into module. This is reflected by the make-up of individual PBL groups which contain a diverse collection of students with an array of backgrounds stemming from different cultural, social and religious divisions.

In its current format PBL cases of module are largely restricted to settings within the UK which I think fails to expose students to the issues of international health. In redeveloping the module I would include PBL cases involving patients from different cultural and locations of the world highlighting inequality or challenges faced by the countries health care system. Critical analysis of the cases would allow students to become aware of how medical care is acted on by various factors such as the prevalence of diseases, the demographics of the patients. PBL cases woven with socio-political and economic affairs have been reported to provide students a broadened perspective on global health issues. As such students become accustomed to or develop a ‘fit to work’ portfolio in international settings through their experience of recognising constraints and viewpoints stemming from different factors such as economics, ethics, and politics (Ali 2011 Lancet).

Given that environmental factors account for the development of a majority of cancers it is essential that medical education incorporates learning outcomes which teach students the importance of safeguarding the environment through sustainable approaches. Overseen by the Sustainable Healthcare Education (SHE) Network, a number of universities have adapted their curriculum to promote sustainability within the healthcare system (Centre for Sustainable Healthcare). Learning materials on sustainability which can be incorporated within the module is limited by the space within its timetable. As such innovative learning model such as Flipped Learning could help to accommodate for the shortage of classroom time. In this format I would provide students with articles, lecture videos and Powerpoint presentations on a wide variety of topics ranging from climate change to the dependence of health on environment. The aim here is for students to ‘first gain exposure’ to material outside of class, thus requiring minimal contact time.

Classroom time can then be focused on the ‘processing’ part of learning providing opportunities to explore topics in greater depth and creating conducive learning opportunities. Furthermore, classroom time could be used to engage students in debates, creation of learning resources or partaking in Dragon’s Den style competition to pitch ideas on improving sustainability.

Flipped learning has all the features compatible with the learning styles of today's generation which are described as Millennials (Oblinger 2005). With the opportunity to immerse in multimedia, Millennials will be attracted by having the choice of learning through actively doing things and discovering instead of listening to lectures. In Flipped learning students become heavily engaged with ICT and as a student-led learning approach, are responsible for using the right resources to build knowledge. However students may resort to using resources which are popular but lack academic rigour or credibility thus requiring sufficient guidance in using the best tools and resources.

**Conclusion**

My knowledge and understanding of educational theories and the principles of curriculum design has guided me in undertaking this critical evaluation of the cancer module. This has involved examining whether the module maintains a constructive alignment between the student-led approach of PBL and assessments which is more teacher-controlled. A solution was proposed which emphasizes the need for PBL facilitators to provide implicit direction so that students are able to recognize core knowledge. Furthermore a re-organisation of the lectures was proposed in order to be consistent with the format of a spiral curriculum. The proposed changes have been guided by my understanding and aspiration of meeting the standards of UKSPF descriptors. Lastly this demonstrates that my own development has followed a spiral course whereby I have built on my knowledge and skills attained from module one of the TLHEP to understand the features of good teaching and a well-designed curriculum.

**References**


1. Introduction

1.1 The taxonomy 'crisis'

Species identification and taxonomy are key skills required by prospective employers that are often perceived by students and staff as outdated and boring. A study by Nimis et al. (2006) found that lengthy paper-based classical keys are littered with technical jargon, making them difficult for the layperson to use and are not appropriate for educational projects or citizen science. Hence, students become quickly disengaged with species identification, feeling overwhelmed by the options and preferring to flick through books and look at the photographs/diagrams rather than go through the formal process of identification using descriptive and illustrative keys. Such a surface learning approach to identification means that students cannot identify similar species in different habitats as they do not know the traits that define a given plant family, etc. Academic institutions have also stepped away from traditional taxonomic courses (Table 1a). For example, in 2011, Birmingham University proposed to abandon the Biological Recording programme despite it being the only such Masters course on offer in the UK that provided habitat and species identification skills for ecological consultants (BBC News, 2011). A report by the Institute of Ecology and Environmental Management (IEEM, 2011) revealed there has been a national decline in species identification skills at a time when it has never been more important to protect the nation’s biodiversity and sustainability of ecosystems. This has knock-on implications for the wider scientific community (Table 1b), jeopardising the long-term integration of technology into our lives (spell checker, predictive texting, Satnavs, etc.) means we are losing the ability to use all of our senses, to think on our feet, and question what we see, hear, feel, etc. Multi-sense learning involving the brain and our body is critical not only to science, but also develops a broader set of skills needed to cope with every day-to-day life tasks.

Species identification provides the perfect forum for a blended learning approach that brings together Kolb’s (1984) experiential learning cycle and Biggs and Tang’s (2007) constructivist model of learning activities. The learner builds on prior experiences of species from smell, touch, etc., and uses relational questioning to consider “how is this different to the last plant?” Much of the prior knowledge used in the constructivist model of identification is gained subliminally through childhood adventures making mud pies and catching ‘creepy crawlies’ in backyards and local woods with friends. But for a whole generation of today’s children, the pleasures of a free-range childhood are missing (Louv, 2005). Monbiot (2012) considers the removal of children from the natural world to be a second environmental crisis. It is therefore down to universities to educate adults in the ways of nature and to provide these childhood experiences.

1.2 The pedagogy of taxonomy

Identification is a critical skill for a biologist that is an active, experiential and exploratory learning activity (KeytoNature, 2010). Students must experience the target organism using all of their senses: smell it, touch it, listen to the way it sounds when crumpled and view it from multiple angles (tasting is not recommended as it may be poisonous), etc. Therefore, species identification brings together a unique set of skills that involve visual learning, visual thinking and visual communication (Stanley, 1996). Identification is not about the final answer, but the process used to achieve the final answer, and as such should not be done as a solitary activity. The problem here is that verbal communication is something that is often lacking between students. I have personally witnessed students sitting side-by-side in a tutorial messaging each other via Facebook, rather than engaging in oral communication. The prolific integration of technology into our lives means we are losing the ability to use all of our senses, to think on our feet, and question what we see, hear, feel, etc. Multi-sense learning involving the brain and our body is critical not only to science, but also develops a broader set of skills needed to cope with every day-to-day life tasks.

Table 1. Examples of the demise of taxonomy in (a) UK university sector and (b) wider science community (Source: House of Lords, 2008)
the communication gap to help students work collaboratively. As Churches (2009, p8) notes “collaboration is not a 21st Century skill, it is a 21st Century essential”. The Field Studies Council (FSC) has rolled out iPhone and iPad apps of their highly acclaimed laminated species identification (ID) keys (FSC, 2012), and at present this is the only mobile learning platform available, which is why Apple iPad ® mobile digital devices were selected for this study. Interactive ID key apps for mobile devices are useful in education, in the promotion of nature-aware tourism and in projects of citizen science (Nimis et al., 2012). In October 2013, at the time of the Apple annual iPad event, there were 1 million apps in the iPhone App Store (Ingraham 2013), of which 475,000 were native to iPad (Costello, 2014). Carrington (2007, 2013) related the wealth of different apps available to Bloom’s digital taxonomy (Churches 2009) to demonstrate that mobile devices can impact all levels of learning (Figure 1). With an appropriate app tool kit, mobile digital devices can fully enhance the field work experience by enabling students to record species as annotated images, maps, videos, sound recordings, etc.

Figure 1: The pedagogy wheel V2.0 relating iPad apps to Bloom’s digital taxonomy and Puente dura’s Substitution Augmentation Modification Redefinition (SAMR) model to examine how mobile devices might impact learning (Source: Carrington, 2013)

Published studies to date have focussed on the use of mobile digital devices as a “personalised device” in a school setting based on a one-to-one model of one iPad per student (e.g., Burden et al. 2012). Some universities have followed suit. For example, in 2014 the University of Western Sydney gave all new undergraduate students an Apple iPad ® as part of their “Blended Learning Strategy” (University of Western Sydney, 2014). This forms part of a three-year plan to blend all units and courses, and has required a massive capital investment to purchase 30,000 devices and establish a team of technologists and designers to support teaching staff (Rankine and Macnamara, 2014). However, such an individualistic approach could act as a barrier to collaboration and would be beyond the scope of many UK university budgets. There is an urgent need to clarify how portable technologies can be effectively used for teaching and to examine the impacts on learners (Hopkins, 2014), and to do this in a way that is financially feasible.

1.4 Study aim and objectives

This study investigates the potential of a collaborative iPad-based problem-solving activity to enhance tree identification skills. The specific objectives are: (i) develop a student-led field-based tree ID activity that utilises an Apple iPad ® and a suite of educational apps, (ii) evaluate practicalities of the task, and (iii) assess the impact of the activity on student learning. Excerpts of this work have been submitted previously for the MA module Teaching and Learning with Technology at Keele University, and a preliminary version of this study was published as Taylor and Procter (2015).

2. Methods

2.1 Study design

The pilot study took place in semester 1 of the 2013-14 academic year on Keele campus. Twelve final year undergraduate students were selected on a first come first served basis who met the following requirements: (i) enrolled on LSC-30043 Conservation Biology and (ii) completed LSC-10033 Ecology and Environment in Year 1. The gender split of participants was relatively equal, with five females and seven males taking part from across the Biology, Applied Environmental Science and Environmental Sustainability degree programmes. Ethical approval for the project was given, and all participants were informed of ethical considerations relating to the project and that they could withdraw from the study at any time. To
encourage engagement, a pizza lunch was provided, and students received a £10 Amazon voucher and a certificate of participation on completion of all of the feedback components.

Students received the class materials developed for a first year ecology module (LSC-10033), along with a short session on how to use the Apple iPad®. Student pairs were then given 1-hour to go out and identify eight tree species growing on the Keele campus (Appendix 1) utilising a device with inbuilt GPS and a suite of educational apps (Appendix 2). To make the activity as independent as possible and avoid the possibility of tutor bias, student pairs were unaccompanied for the field activity. Trees were selected to capture the range of species that year 1 students participating on LSC-10033 would likely encounter when completing their forest field work task, plus a few wild cards were thrown in to test the scope of the ID apps (e.g. ornamental rowan and non-native deodar cedar). For each tree species, students were required to try out the four tree apps and record success or failure of identification, as well as keep notes on the ability to locate the tree.

2.2 The educational apps

A suite of nine apps were used to facilitate all aspects of the fieldwork task: (i) locate a tree, (ii) ID the tree species, (iii) evaluate the tree ID activity, and (iv) share data outputs (Appendix 2). Here&Near (Dvoychenko, 2012) was used to create a user-friendly tour map of the eight target trees. Targets can be viewed on a map, with additional text and image information to facilitate location of the correct tree (Figure 2); this is especially important where several arboreta specimens occur close together at proximities less than the geographical positioning accuracy of the inbuilt GPS. Students added extra commentary and imagery on ease of finding and identifying target trees in edit mode and shared this information by emailing a link to the central Gmail account.

Figure 2: Screenshots of the Here&Near app showing: (left) locational map of eight target trees on Keele campus, (middle) text descriptions, and (right) images of trees.

Four tree ID apps were selected for this study to capture the range of options available; evaluation of these apps as the ultimate focus of this study. The four tree ID apps have slightly different approaches (Appendix 2) and varying capabilities to key out the eight target trees; no one app could identify all the target trees (Appendix 1). The Field Study Council’s (2012) single-start-point is based around leaf shape while the non-linear multiple-entry-method of Isoperla’s (2012) British Tree ID, quantifies fit to tree genera based on a suite of tree attributes. The Forestry Commission’s (2012) ForestXplorer requires access to the internet for the app to run, and includes information on forest sites as well as tree fact sheets and a “tree species finder” key that starts from multiple entry points, but unlike Isoperla (2012) these features cannot be done additively. LeafsnapHD (Columbia University et al. 2011) utilises image analysis software to match new leaf material to an extensive image database, but the potential to confirm identification of trees keyed out with the other three apps is limited by the lack of English species in the database, and requires access to the internet for it to work. FSC (2012) trees have fact sheets of 44 tree species (17 unlobed, 9 lobed, 4 compound and 15 needles) of native and introduced origins, and is the only app that can key seven out of eight of the target trees, although downy birch is only to genus level. ForestXplorer has 28 trees, with a focus on commercial species planted in the UK, and can successfully identify six out of eight of the target trees to species. Isoperla (2012) has 82 tree species in 44 genera, but keys out target F to the wrong species and does not include rowan in the database. LeafsnapHD has the largest tree database of 184 species and is aimed at a North American market, although some species introduced from European are also included, but if only keyed out three of the target species. A UK version of this app was launched in 2014 (after the pilot study took place) with 156 tree species from across the UK (Columbia University et al. 2014), however some target species were still not included.

The whole process of identification was documented in the field with the inbuilt camera, which can take front- or back-facing photographs and short videos. These can be shared with team members by uploading to the communal Dropbox account and each device had a separate allocated folder. Students can also record audio commentary to static pictures with the Fotobabble app and type up text commentary in OpenOffice.
2.2 Evaluation of activity and impact on learning

Five evaluation tasks took place throughout the workshop utilising a variety of approaches and apps (Appendix 3). The pre-activity questionnaire gauged the level of prior knowledge and adoption of mobile devices for educational purposes, while the post-activity questions focused on transformations induced by engagement with the activity. Students were numbered 1 to 12 so that pre- and post-evaluation could be tracked while ensuring student anonymity. Students were required to rate the apps using a four-tiered scoring system (1: poor; 2: mediocre; 3: good; and 4: excellent) and the top performing ID apps for each student were identified, where two apps had tied scores both were reported. Statements such as “Tree pads will improve species identification skills” were rated using a five-tier rating system (strongly disagree, disagree, neutral, agree, strongly agree), and comparison of pre- and post-activity responses enabled quantification of the degree of transformation of opinion. Impact on learning was gauged by the number of target trees correctly identified and a reflective statement on how they felt tree ID apps would enhance learning.

3. Results

3.1 Prior engagement with mobile devices for learning

All students owned at least one device, 67% of students had two or more, and one student had four devices. The iPad was the least common device, while the iPod was the most ubiquitous device with 75% owning one (Figure 3). Half of the participants had used an educational app, but this occurred infrequently (Figure 4), and only 8% had used one in a school or college setting (Appendix 4.1 – Q4). Three quarters of the students had utilised a camera on a mobile device before, and 42% had used Dropbox, while only 17% had used the QuickOffice app, and none had any experience with the species ID apps (Appendix 4.1 – Q5). The majority of students thought that tree apps would “aid identification skills” (Figure 5a); by contrast half of students were neutral or disagreed that iPads would facilitate collaboration (Figure 5b). Motivation for taking part in the workshop was largely based around gaining skills in tree ID and mobile digital devices, but two students did specifically acknowledge the pizza and Amazon voucher (Table 2).
Figure 5: Level of participant agreement with statements (a) tree apps will improve species identification skills [Appendix 4.1 – Q6], and (b) iPads facilitate collaboration [Appendix 4.1 – Q7]

Table 2  Motivations for taking part in the workshop [Appendix 3a - Q8]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Experience on iPad and more information on apps</td>
</tr>
<tr>
<td>2.</td>
<td>Chance to go on iPad and see if it is helpful as an educational tool (it be interesting to see if the tool is actually helpful to identification)</td>
</tr>
<tr>
<td>3.</td>
<td>Use tree identification skills</td>
</tr>
<tr>
<td>4.</td>
<td>Better ID skills</td>
</tr>
<tr>
<td>5.</td>
<td>Experience in being trees by using iPads for academic work</td>
</tr>
<tr>
<td>6.</td>
<td>Learn how to use an iPad and improve tree ID skills</td>
</tr>
<tr>
<td>7.</td>
<td>Knowledge of the best apps, their interface and accessibility, that I can potentially use myself for educational and personal purposes</td>
</tr>
<tr>
<td>8.</td>
<td>Pizza, amazon voucher, knowledge and memories</td>
</tr>
<tr>
<td>9.</td>
<td>Experience in being trees by other biology apps</td>
</tr>
<tr>
<td>10.</td>
<td>“Good apps to identify trees” other biology apps</td>
</tr>
<tr>
<td>11.</td>
<td>Free pizza, an amazon voucher and an insight into available biology-based apps</td>
</tr>
<tr>
<td>12.</td>
<td>“Learn how to use the apps provided”</td>
</tr>
</tbody>
</table>

Numbers 1-12 refer to participant numeric identifiers. Arranged by motivator types (in bold).

3.2 The field activity

Despite the maturity and honourable intentions of the students who volunteered, the whole thing descended into chaos reminiscent of a kindergarten. Within the first three minutes of handing out the devices a video of me giving instructions was posted on to YouTube (without my consent), screen displays were changed to distorted photographs of themselves and a student “broke” their device by taking the plastic stand off and putting it back on so that it trapped the volume button rendering it temporarily inoperable. However, things quickly calmed down. The students were keen to document the entire process (Figure 6) and spent the full hour in the field. One group only had time to complete six target trees, while others examined additional trees and there seemed to be a competition as to who could bring back the largest leaf for image analysis in LeafsnapHD (the winner is depicted in Figure 6 top right). All students thought the activity was well organised (42% agree, 58% strongly agree), fun (42% agree, 58% strongly agree), and adequately instructed to achieve the task (33% agree, 67% strongly agree) [Appendix 4]. App ratings were highly variable and some groups did not use all the apps (Table 3).

Figure 6: Self-documentation of the activity: (top left) getting to grips with the device, (top right) image of leaf for use in LeafsnapHD, (bottom left) students standing by the ornamental rowan (target tree G); (bottom right) Fotobabble screen shot

The majority of students agreed (75%) or strongly agreed (17%) that Here&Near was a great way of producing a self-guided tree ID tour,
although one student responded “neutral”. Overall, 92% rated the app as good or excellent (Table 3). Team 1 noted:

“The location feature using the [internal] GPS allowed for relatively smooth following and positioning. The locator also identified your direction using an internal compass which helped when working out what tree you were facing - helpful when near a cluster of trees and having to only examine one. The app interface does need a little ‘polish’, but generally it is very useful to find target trees.”

Other teams found that the photo images helped to deal with some inaccuracies in locations of the target trees.

There was a divergence of opinion on which tree apps worked best when it came to identifying the target species. British Tree ID was the only app to achieve 100% good or excellent ratings (Table 3) and was the top scoring app when ratings were compared across individual student responses (Figure 7). By contrast, LeafsnapHD was the only app to get a “poor” rating (Table 3) and had the joint lowest top rating along with FSC trees (Figure 7). There were a plethora of favourable comments on Tree ID, including:

“TreeID was found to be most useful”, “Treeid was the best… X is buying Treeid now!”, and “TreeID was good with its feature for comparisons between similar looking species to help you when you’re stuck between two lookalike species.”

<table>
<thead>
<tr>
<th>Educational app</th>
<th>% students who rated app</th>
<th>Rating range</th>
<th>Median rating</th>
<th>% ratings ≥3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbaria</td>
<td>100</td>
<td>2-4</td>
<td>3</td>
<td>92</td>
</tr>
<tr>
<td>FSC trees</td>
<td>67</td>
<td>2-4</td>
<td>3</td>
<td>80</td>
</tr>
<tr>
<td>ForestXplorer</td>
<td>75</td>
<td>2-4</td>
<td>3</td>
<td>83</td>
</tr>
<tr>
<td>LeafsnapHD</td>
<td>100</td>
<td>1-4</td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td>British Tree ID</td>
<td>100</td>
<td>3-5</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Photobabble</td>
<td>42</td>
<td>2-4</td>
<td>3</td>
<td>80</td>
</tr>
<tr>
<td>Quickmode</td>
<td>58</td>
<td>1-4</td>
<td>2</td>
<td>43</td>
</tr>
<tr>
<td>Video camera</td>
<td>50</td>
<td>1-5</td>
<td>3</td>
<td>83</td>
</tr>
</tbody>
</table>

Ratings: 1 (good), 2 (mediocre), 3 (good), 4 (excellent). For details on apps see Table 2 and for raw data see Appendix 4.2 - Q5
*Some apps were not rated by all 12 students

Table 3: Student ratings of the apps used in the workshop activity

All students felt the £2.49 charge was reasonable, as it “was significantly better than the free alternatives”, but “students are not often wanting to pay for apps unless it is a necessity.” However, team 3 reported that “they did not make use of Tree ID”, as:

“ForestXplorer and LeafsnapHD were the combo we preferred. ForestXplorer allowed us to go through a ‘simplified virtual key’ and look at possible tree ID’s for the characteristics we could see. The leaf snapper tool was useful as despite not revealing specific species, it did give us an idea of what the family could be. It also had several photos different views of the leaves and fruits.”

Not all shared this opinion. Team 4 complained that they only identified 5 out of 8 trees correctly “due to the leaf ID app [leafsnapHD] giving us wrong answers”, while Team 1 noted that:

“LeafsnapHD was pointless for its picture feature, as out in the field it refused to work and failed to upload with limited internet signal and also saying the paper we used as a background wasn’t ‘plain white’. And “ForestXplorer did not work for us for the first 5 trees, as it had frozen.”

Instead Team 1 preferred FSC trees as a starting point:

“...as it did not need internet access and so we could use it when out of range of the wifi. This reduces a lot of accessibility problems
when out and about in the field. However, the list was very generic, e.g. birch, and so we could not distinguish further. From FSC we would use the other apps.”

3.3 Does a mobile digital device facilitate collaboration and impact learning?

The pre-study assessment of the capability of an “iPad to facilitate collaboration” highlighted a degree of variability in student opinion, with only 50% of students agreeing that devices would facilitate collaboration (Figure 5b). Comparison to the post-study assessment revealed that one third of respondents had increased their ranking and no students disagreed with the statement (Figure 8). Reasons for the change in stance on role in facilitation included:

“[facilitates] if limited in numbers and required to share. Increasing devices would discourage teamwork.” [changed from disagree to agree]

“it has showed me that there is disagreement in certain plant identifications” [changed from disagree to agree]

Unlike collaboration, there was not a predictable change in stance on whether tree apps improve species ID, with two students lowering their score and three marginally increasing it (Figure 8). The proportion of agree or strongly agree was slightly down on the pre-study assessment (83% vs. 92%, respectively). Reasons for a change in stance were:

“it brings the focus away from the trees and getting to identify for you, like leafsnapHD” [changed from agree to disagree]

“i think it could be helpful, but some apps, such as leafsnapHD, don’t actually force you to learn about the trees” [agree to neutral]

“Some of the apps were quite accurate” [neutral to agree]

“More useful than I thought it would be” [agree to strongly agree]
school to college. Large iPad device teaching sets have now become common place in schools, with many schools having blog pages on their use (e.g., Andrews, 2014). Therefore, future cohorts of students moving through the education system will likely have a far greater experience of using these devices. Students’ lead technology-filled lives outside their studies, but many of them have only minimal access to personal technology for learning as part of their education (Gliksman, 2013, p. 10), which concurs with the findings of this study (Figure 4). It is time for change as there is a growing expectation by students for personal technologies to be seamlessly embedded so that they can be used when and where it is most appropriate (Burden et al., 2012).

Watching the students get to grips with the devices (Figure 6, top left) made me reconsider the case for Digital Natives theory (Palfrey and Gasser, 2008; Prensky, 2010). All the students were born in the early-mid 1990s during the digital technology explosion, growing up immersed in technology and can therefore be deemed as “digital natives”. All were reliant on some level of technology (Figure 3) and were actively looking for ways to integrate technology into their lives (Table 2). This is demonstrated by the motivation of the students to register for the workshop, rapidity with which the proffered slots were taken up by students and the eagerness of the students to engage with all aspects of the activity. I am a “digital immigrant” and could barely turn the device on, let alone alter the settings, which may be the reason for the meltdown of my laptop (see section 4.3)? By contrast, the students had a natural flair tackling the device, quickly navigating the functions, often by trial and error rather than following the instruction sheet. None of the students exhibited fear of the technology or breaking the device, even when the sound button got trapped, and enjoyed the whole process. However, the self-selection process for interest in iPads makes it difficult to deduce if this digital native competence is representative of their entire cohort. Also, I think perhaps not imparting vast quantities of cash to purchase an iPad makes them less scared of breaking the device?

4.2 Transforming practice

Fieldwork provision in schools, colleges and universities has declined over the last decade (Barker et al. 2003), along with general engagement with nature-based activities (Louv, 2005). The changes to fees structure and decreased finances may further threaten fieldwork provision (e.g., Streich, 2010). It is therefore critical to make the most of learning opportunities when in the field (e.g., Baggott and Rayne 2007). The Higher Education Academy funded a cross-disciplinary study on “enhancing fieldwork learning” using affordable and ubiquitous technology, with a focus on the potential of Apple iPad *® devices (Enhancing Fieldwork Learning, 2014). Such innovative technologies need to be developed and implemented in a pedagogically sound way (JISC 2009), and this study reflects the first steps in tackling this within the Keele curriculum.

Species identification is an excellent way for our students to (re)-connect with nature, while gaining key employability skills and establishing a social network so that students can support each other in the journey. This is something that was highlighted in the student responses, and was one of the reasons for increasing the collaboration facilitation score. The poor initial performance on the collaborative potential of iPads is surprising considering multimedia have quickly become the means of modern communication (Gliksman, 2013, p. 14). Mobile devices can be used as a means of bridging the communication gap to help students express themselves and work collaboratively, and it is clear from student engagement with this activity that the use of a device brought a new angle to tree ID (Table 4). Indeed, the enthusiasm and excitement for the tree ID apps supports the findings by Nimis et al. (2012) that interactive apps make species identification more accessible.

The Apple iPad *® has a 5 megapixel camera, which can be used to collect photos/videos of the specimens and the habitat in which they are growing. Rather than having the students carry out this process, I took the photos and set about developing an Action Research project involving in something very exciting and far bigger than I could have imagined. I put in a second successful equipment bid for another set of six devices, and set about developing an Action Research project on the use of mobile devices as a means of emulating ecological consultancy style fieldwork in my final year conservation biology consultancy style fieldwork in my final year conservation biology module. I also adapted the trees ID workshop so that it could be run as a stand-alone outreach activity in a classroom setting, using teaching sets of tree twigs to bring fieldwork indoors.4.3 Study limitations and future work.
The number one complaint from students was issues relating to Wi-Fi and internet coverage. A study by Welsh et al. (2015) on student perceptions of mobile devices also identified reduced connectivity as one of the main challenges. The devices have a SIM slot, but since this activity was taking place on campus I wanted to test the boundaries of the newly set-up outdoor Wi-Fi. I had not realised the signal was so patchy, with many of the target trees falling outside the coverage area, for example to the west of the Huxley building (Figure 9). I think ratings of the ForestXplorer app would have been far higher if it had not kept dropping out due to the patchy signal. The internet issues are also to blame for some of the inaccuracies in target trees locations. This would have been an issue when recording the location and finding the target tree. SIM cards would greatly increase the running costs of outdoor educational activities. A way around this could be to tether the devices together, rather than load each with its own SIM card (Figure 10). However, this means the devices cannot be used independently of each other and students would need to maintain a visual with the tether point, therefore restricting the geographical range of activities.

Something I was surprised the students did not complain about was having to carry the heavy weight of the mobile digital device around the field – although perhaps this is only really an issue for the class organiser who has to carry the entire teaching set? And the ruggedised weather proof case added further to the weight of the device. Mauchline (pers. Comm., 2015) overcame this problem by using the smaller and lighter Apple iPad mini ®, and perhaps a sacrifice in screen size and camera quality is worth the lighter weight. However, developments in iPad technology means that the weight of devices is getting less, at 444g and 304g, respectively, for the Wi-Fi+cellular versions of the Apple iPad Air 2 ® and iPad mini 4 ®, compared to 730g for the older versions (Apple 2016).

This activity was supposed to be embedded into a year 1 undergraduate module in semester 2 of 2014. However, problems with the Apple laptop used to manage the devices in Apple Configurator ® meant the devices were locked down and could not be set up. There is nothing more stressful and upsetting to fail and let your students down at the last hurdle. The laptop had to be sent off to AppleCare for fault checks and was not returned until after the lab activities were scheduled to take place. As a result a paper-based exercise had to replace the iPad activity. This demonstrates the problem of relying on technology, and the need for a Plan B in case things go wrong. The “iPads in HE” conference that took place in March 2014 was similarly affected by technical difficulties, and this is probably the biggest issue holding back the roll out of mobile learning devices. Furthermore, in such an evolving field, the dangers of using free apps are that support may be discontinued. For example, the Here&Near app used in this study has not been updated since 21 June 2012 (Dvoychenko, 2012), and subsequent upgrades to the iOS in 2015 have disabled the share facility rendering the app defunct. I contacted the Here&Near app developers, but never received a response, so I am now unable to share revisions to the tree tour with the teaching set of devices (cue more tears) – I got around this by manually altering the tour on each device, but this is not a sustainable solution so its back to drawing board.

But there is hope for the future. The IEEM (2011) report has put species identification on the main agenda, and Warren et al. (2015) have re-engaged academia in the state of play. Things are changing. The abandoned Biological Recording course was rescued by Manchester Metropolitan University (MMU, 2012), and Reading University offer a unique Masters programme specifically targeting species identification skills that is “designed to offer students a stepping-stone into Ecological Consultancy” (University of Reading, 2016). Indeed, students are becoming more targeted at developing employment skills, with a study by France et al. (2016) identifying that students could make clear links between the use of mobile apps and the development of graduate attributes, and thereby employability skills. Making tree ID “fun” and relevant to future careers is half the battle.
Figure 10: Mobile data access scenarios: (a) iPads tethered to a single mobile phone, (b) each iPad is an independent mobile unit (Source: drawn by SLT from MS ClipArt).

5. Conclusions

This study demonstrates the relevance of a group-orientated collaborative problem-solving approach to tree ID. Through a two-way dialogue, students were able to discuss the difficulties and pitfalls of tree ID, thereby gaining confidence in the process and use a digital mobile device to keep accurate visual records of the identified trees. The tree tour was hampered by the patchy nature of the outdoor Wi-Fi signal, which reduced GPS accuracy and prevented access to the ForestXplorer app. In future, targeted trees will be restricted to the Wi-Fi hotspots and the leafsnapHD removed from the suite of educational apps as it did not promote learning. None of the ID apps tested in this study were capable of identifying all eight target trees species. This is partly because of the inclusion of cultivars to demonstrate that no identification key is infallible and that you often have to pursue multiple resources. This is true of traditional and digital keys as there will always be limits to what is included. One thing is clear; tree ID apps will never replace the need for a taxonomic expert to appraise the identification given, so the future employment of ecologists is safe!

ii. Acknowledgements

The inspiration for this study came from attending the Enhance Fieldwork Showcase events run by Brian Whalley, Derek France and Julian Parks. This study was funded by a School of Life Sciences teaching equipment grant and a Keele University teaching innovation grant. I especially want to thank my former and current heads of schools, Anne Loweth and Dave Hoole respectively, who were prepared to take a chance on something new. Many thanks to the following final year undergraduate students who gave up their spare time to participate on the pilot study workshop: Amy collier, Davy Falkner, Holly Farrington, Abi Gazzard, Kristen Hirsh-Pearson, Katie Marsh, Kenroy Millwood, Alex Melson, Max Reboul, Ben Salt, Richard Sant and Nathan Wisniewski. Thanks to Hannah Lane at Mount Allison University, Canada, for help with the initial innovation grant application, to Craig Armstrong and Yassir Rashid in Computing Services for their technical assistance in the mysterious workings of Apple Configurator, and to Apple Care for dealing with all my tech problems. Special thanks go to the iPads in Higher Education committee who provided useful feedback on a conference proceedings version of this study, and to fellow conference delegates who showed me that I am not alone in my endeavours. Finally, thanks to Matthew Street, Georgina Spencer, Matt West and Russell Crawford in the LPDC, and Patricia Proctor and Ian Stimpson for their continued help and support.

iii. Disclaimer

This study is an independent publication and has not been authorised, sponsored or otherwise approved by Apple Inc, or any of the educational app developers.

iv. References


Appendix 1.

The eight target arboreta trees utilised in the study and associated ability of the tree ID apps to correctly identify the species

<table>
<thead>
<tr>
<th>Location</th>
<th>Common name</th>
<th>Scientific name</th>
<th>Status*</th>
<th>FSC trees</th>
<th>Forest App (Hill)</th>
<th>Forest App (DWD)</th>
<th>British Tree ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Holly</td>
<td>Ulex europaeus</td>
<td>Native, evergreen needleleaf</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>B</td>
<td>Yew</td>
<td>Taxus baccata</td>
<td>Native, evergreen needleleaf</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>C</td>
<td>Beech</td>
<td>Fagus sylvatica</td>
<td>Native, deciduous broadleaf (retains dead leaves)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>D</td>
<td>Downy birch</td>
<td>Betula pubescens</td>
<td>Native, deciduous broadleaf</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>E</td>
<td>Pedunculate (English) oak</td>
<td>Quercus robur</td>
<td>Native, deciduous broadleaf (variegated)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>F</td>
<td>Deciduous (Himalayan) cedar</td>
<td>Cedrus deodara</td>
<td>Non-native, evergreen needleleaf</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No (C. atlantica)</td>
</tr>
<tr>
<td>G</td>
<td>Rowan (ornamental variety)</td>
<td>Sorbus aucuparia</td>
<td>Native, deciduous broadleaf (variegated)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>H</td>
<td>Scots (Scotch) pine</td>
<td>Pinus sylvestris</td>
<td>Formerly native, evergreen needleleaf</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Leaf type: deciduous (lose leaves in winter), evergreen (retains leaves all year round), broadleaf (hardwood), needleleaf (conifer); Geographical range: native to the UK, formally-native as became locally extinct, non-native introduced to the UK through assistance of man.

Appendix 2.

Educational apps required for the tree ID activity and associated learning impact (Authors own)
Appendix 3.

Teaching activity evaluation tasks

**Evaluation tasks**

- Pre-activity questionnaires – handwritten notes on handout*
- Gender
- Do you own one of the following mobile devices?
- How often do you use educational apps on a mobile device?
- Have you ever used a mobile learning device(s) in an educational setting?
- Have you ever used the following apps?
- Tree apps will improve identification skills?
- iPads facilitate collaboration?
- What are you hoping to get out of this session?

- Evaluation during field-based activity - digital documentation in Here&Near
- How easy was the tree to find?
- What species do the four apps key the tree out as?

- Evaluation of field activity – free text in Openoffice
- Were you able to easily locate the target tree using the information in Here&Near app?
- With reference to Table 2.1, how many of the trees did you correctly identify using the apps?
- Which tree apps did you prefer and why?
- Is the “TreeID – The British Tree Identification Guide” worth the £2.49 fee?
- Did you encounter any major issues?

- End of session reflective audio/video diary - Fotobabble/Video camera
- Do you think integrating this exercise into the LSC-10033 Ecology & Environment preparatory lab session would enhance tree identification skills?

- Post-activity questionnaire – handwritten notes on handout *
- The event was well organised
- The activities were fun
- The instructions given were adequate to achieve the tasks
- Here&Near was a great was of producing a self-guided tree ID tour
- Rate the apps you used
- Tree apps will improve species identification skills (has the rating changed as a result of the workshop and why)
- iPads facilitate collaboration (has the rating changed as a result of the workshop and why)
- Any suggestions on how this exercise could be improved

*See appendix 4 for a breakdown of the questionnaire scoring categories

Appendix 4.

Student responses to teaching evaluation questionnaires

**A4.1 Responses to pre-session TEQ**

(ID = respondent code, N = total number of students for response category, % = proportion of students giving a particular response)

1. Gender (circle your response)

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>4, 5, 8, 9, 10, 12</td>
<td>1, 2, 3, 6, 7</td>
</tr>
<tr>
<td>N (%)</td>
<td>7 (58%)</td>
<td>5 (42%)</td>
</tr>
</tbody>
</table>

2. Do you own one of the following mobile devices? (circle all that apply)

<table>
<thead>
<tr>
<th></th>
<th>iPod</th>
<th>iPad</th>
<th>iPhone</th>
<th>Android</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>1, 2, 3, 4, 5, 7, 9, 10, 11, 12</td>
<td>12</td>
<td>5, 7, 11</td>
<td>1, 3, 6, 11, 12</td>
<td>7, 8, 9, 10, 11</td>
</tr>
<tr>
<td>N (%)</td>
<td>10 (83%)</td>
<td>1 (8%)</td>
<td>3 (25%)</td>
<td>5 (42%)</td>
<td>5 (42%)</td>
</tr>
</tbody>
</table>

2 noted iPod was a “rubbishy one”

Other (please specify):
7 = android tablet, 8 = not declared, 9 = Kindle Fire, 10 = windows phone (Nokia), 11 = Acer Aspire laptop (windows 8)

3. How often do you use educational apps on a mobile device? (circle your response)

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Once</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Everyday</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>1, 2, 3, 4, 8</td>
<td>6</td>
<td>5, 10, 12</td>
<td>7, 9</td>
<td></td>
</tr>
<tr>
<td>N (%)</td>
<td>5 (42%)</td>
<td>1 (8%)</td>
<td>3 (25%)</td>
<td>2 (17%)</td>
<td>0</td>
</tr>
</tbody>
</table>

*#11 did not respond, however as has used in educational setting (Q4) assume it is not “never”
4. Have you ever used a mobile learning device in an educational setting?

<table>
<thead>
<tr>
<th>School</th>
<th>College</th>
<th>University</th>
<th>Other (no)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>11</td>
<td>6, 7, 9, 11, 12</td>
<td>1, 2, 3, 4, 5, 8, 10</td>
</tr>
<tr>
<td>N (%)</td>
<td>1 (8%)</td>
<td>1 (8%)</td>
<td>5 (42%)</td>
</tr>
</tbody>
</table>

Other (please specify): Other stated had not used, so taking this to be “no”

5. Have you ever used the following apps? (tick all that apply)

<table>
<thead>
<tr>
<th>App</th>
<th>Student ID</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Here&amp;Near</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commander Compass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dropbox</td>
<td>4, 5, 7, 8, 9, 11</td>
<td>6 (50%)</td>
</tr>
<tr>
<td>Quickoffice</td>
<td>9, 11, 12</td>
<td>3 (25%)</td>
</tr>
<tr>
<td>Fotobabble</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSC trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ForestXplorer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LeafsnapHD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treeid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera</td>
<td>1, 2, 4, 5, 6, 9, 10, 11, 12</td>
<td>9 (75%)</td>
</tr>
</tbody>
</table>

6. Tree apps will improve species identification skills

<table>
<thead>
<tr>
<th>ID</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>0</td>
<td>0</td>
<td>1 (8%)</td>
<td>9 (75%)</td>
<td>2 (17%)</td>
</tr>
</tbody>
</table>

7. iPads facilitate collaboration

<table>
<thead>
<tr>
<th>ID</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>0</td>
<td>3 (25%)</td>
<td>3 (25%)</td>
<td>6 (50%)</td>
<td>0</td>
</tr>
</tbody>
</table>

8. What are you hoping to get out of this session?
See Table 2 in main report

A4.2 Responses to post-session TEQ
(ID = respondent code, N = total number of students for response category, % = proportion of students giving a particular response)

1. The event was well organised (circle your response)

<table>
<thead>
<tr>
<th>ID</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>5 (42%)</td>
<td>7 (58%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. The activities were fun (circle your response)

<table>
<thead>
<tr>
<th>ID</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>5 (42%)</td>
<td>7 (58%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. The instructions given were adequate to achieve the tasks (circle your response)

<table>
<thead>
<tr>
<th>ID</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>4 (33%)</td>
<td>8 (67%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Here&Near was a great way of producing a self-guided tree ID tour

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>3</td>
<td>1, 2, 4, 5, 7, 9, 10, 11, 12</td>
<td>6, 8</td>
<td></td>
</tr>
<tr>
<td>N (%)</td>
<td>1 (8%)</td>
<td>9 (75%)</td>
<td>2 (17%)</td>
<td></td>
</tr>
</tbody>
</table>

5. Rate the apps you used: 1 (poor), 2 (mediocre), 3 (good) and 4 (excellent)

<table>
<thead>
<tr>
<th>Student ID</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Here&amp;Near</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Commander</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Dropbox</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quickoffice</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fotobabble</td>
<td>3</td>
<td></td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSC trees</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ForestXplorer</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LeafsnapHD</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
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<tr>
<td>TreeId</td>
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<td>3</td>
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<td>4</td>
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<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Camera</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

6. Tree apps will improve species identification skills

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>10</td>
<td>2</td>
<td>1, 3, 4, 9, 11, 12</td>
<td>5, 6, 7, 8</td>
</tr>
<tr>
<td>N (%)</td>
<td>1 (8%)</td>
<td>1 (8%)</td>
<td>6 (50%)</td>
<td>4 (33%)</td>
</tr>
</tbody>
</table>

Has the rating changed as a result of this workshop and why?
1 = same as apps were quite accurate
2 = I think it would be helpful, but some apps such as leafsnap don’t actually force you to learn about the trees
3 = more useful than I thought it would be
4 = was more fun than expected
5 = Yes, same rating mas before, but now know the breadth and wealth of apps available - didn’t know there were so many!
6 = yes, because it brings the focus away from the trees and letting it to identify for you like leafsnap

7. iPads facilitate collaboration (you may have changed your mind)

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>2, 10, 11</td>
<td>1, 3, 4, 5, 6, 7, 8, 9, 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N (%)</td>
<td>3 (25%)</td>
<td>9 (75%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Has the rating changed as a result of this workshop and why?
1 = did not expect apps to be helpful
2 = the apps (some) are useful, however, it is slower to type in than write for who people who aren’t used to them
3 = not particularly, they help but so many students have them and/or laptops, etc. in lectures. In practicals or labs they’d be 5x better
4 = yes as it has showed me that there is disagreement to certain plant identifications
5 = if limited in numbers and required to share, individual iPads would discourage teamwork
6 = iPads discourage interaction between
8. Any suggestions on how this exercise could be improved:
2 = No. I think it was really well done. I learnt a lot about ipad apps. I would be interested in doing another workshop with other ID apps. I think it would be okay for the first year module, but shouldn’t be the only thing used.
5 = using ipads was a fun and engaging way to learn
6 = use leafsnapHD in the labs with leaf samples, ensure wifi coverage?
7 = none
8 = not really, would have been very useful for my dissertation research, integration at open days would be good
9 = very good, room for growth, but no obvious faults, very productive
10 = another workshop on other biology apps would be good. In conservation biology might work
11 = the problem caused by the apps themselves were greater than the organisation problems
Rationale and objectives

The stated aim of the bachelors’ degrees at Keele University is to develop ‘a well rounded graduate who is capable of making positive and valued contribution in a complex and rapidly changing world’ (Programme Handbook). This is in line with the University’s strategic plans 2015-2020 to provide not only programmes of study that are current, academically rigorous and vocationally relevant, but also help students acquire the necessary skills to make a smooth transition from education to work. Developing Professional Knowledge and Practice in HRM is a second year undergraduate module designed to help students manage that transition successfully. Specifically, this module is designed for HRM students and seeks to address employability knowledge and skills as part of the professional accreditation of the undergraduate HRM courses by the Chartered Institute of Personnel and Development (CIPD).

The module aims to develop a critical understanding of a range of issues that are central to the HRM profession and the competencies needed by HR professionals. Specific objectives addressed by the module include:

• To demonstrate a critical understanding of HRM as a profession.
• To develop knowledge of contemporary business issues affecting the HR function in various environments.
• To analyse the business and external contexts of HRM and their implications for employment practice.
• To demonstrate a critical awareness of own knowledge and skills in relation to the HR profession through reflective practice.

Development

Having established that an employability module would enhance the curriculum, its development progressed through three key stages.

Stage 1 focused on the design of the module’s content. Both primary and secondary research was conducted in order to determine what knowledge, skills and attributes needed to be addressed by the module. Primary research involved interviews with graduate recruiters, career specialists and former students. Secondary research involved the review of various publications mainly by the CIPD and the Higher Education Academy.

This stage established the parameters of the module and the skills it should be addressing:

• Identification and evaluation of HRM and organisational issues through the application of appropriately structured analytical approaches.
• Utilisation of knowledge, understanding and skills through the application of appropriate methods to critically analyse evidence and provide appropriate alternatives and/or recommendations.
• Demonstration of an ability to undertake independent study and management of own learning, time and continuous professional development.
• Ability to perform as a self-managing individual and a collaborative member of working groups.
• Communicating ideas to others.
• Demonstration of critical and reflexive thinking and ability to engage with personal development planning.

This stage was based on Knight and Yorke’s (2004) USEM framework that outlines employability as four inter-related components:

• Understanding involved topics like understanding of HRM as a profession, and analysing the business and external contexts of HRM and their implications for employment practice.
• Skillful practices involved activities like student-led lectures, and group-based primary research mini projects.
• Efficacy beliefs involved awareness of graduate attributes, personal development plans (PDPs), and self and peer review.
• And, meta-cognition involved the use of critical and reflexive thinking as part of PDP.

Stage 2 involved detailed planning in terms of delivery and assessment. This stage was based on the ‘capability envelope approach’ that provides a framework of support for the process of students’ taking responsibility for the overall strategy of their learning (Stephenson and Yorke, 1998; Stephenson, 2001). Within this framework, specialist content is provided through a variety of learning modes, including:

• ‘Exploration’, where students are supported in planning and delivering module activities through drop-in sessions and online forums.
• A series of ‘learning engagements’, like student-led lectures, group research projects, and engagement with HR practitioners.
• A ‘progress review’ aiming to support reflective activity, self and peer assessment, the creation of learning logs and PDPs.

In terms of assessment, the framework involved ‘demonstration’, where students are expected to integrate what has been learnt in a portfolio of evidence. The use of a portfolio for assessing student learning is consistent with the self-development and reflective practice philosophy underpinning the module (Kolb, 1984), and is
an approach that is also found useful for continuing professional development (CPD) used in the workplace (Schön, 1987).

In order to make the module more appealing and useful for students I was keen to involve external speakers and employment specialists in its delivery, and also to build in opportunities for students to experience real world activities. The purpose of practitioner or policy advisory input was to illustrate how the content of the module is used ideally, or more often imperfectly in real-life, through case studies and other techniques. I managed to secure funding from Keele Management School to support such activities and also to engage a range of external specialists who were prepared to contribute their time for free.

Stage 3 involved the production of the module specification for review and validation. This included information about how the module is taught and assessed, the intended learning outcomes and employability skills for students, and indicative content. Total study time for the module is 150 hours including 30 hours of contact time and 120 hours of independent preparation and private study. The module was designated as one of the four 15-credit core level 5 CIPD accredited modules for HRM students that would be delivered over two semesters. Proposing a yearlong 15-credit module for the first time at Keele University constituted a challenge at the review and validation process. My rationale was that students should start the process of preparing themselves for their prospective placement year and graduate employment as early as possible in their second year of study and that this would also give them time to reflect on and develop their skills over a longer period of time. The module was successfully validated in 2015 by the University and the CIPD and was planned to run for the first time in 2015-16.

Delivery and impact

The module is delivered via a programme of interactive lectures, workshops, and guest sessions followed by practical activities, often requiring students to work in collaboration with classmates. Students are expected to contribute to classroom activities on a range of issues central to the HR profession. Such activities are conducted through various forms of active learning (e.g. case study, problem solving activities, group work, small group discussions and debates, round robin, concept mapping, brainstorming, peer review, sharing knowledge and experience). Students are also expected to engage with activities integrating theory and practice through a process of ‘reflection-on-action’ (try to make sense of experience after an activity) and ‘reflection-in-action’ (trying to make sense of experience while it is occurring). Reflective activities are based on evidence, knowledge and experiences from all HRM modules and students’ extra curriculum activities and experience through engagement with various learning tools, such as mind mapping, learning logs, and PDPs.

In particular, three key aspects of the module and its impact on student development included:

Thinking performer, reflective practice and CPD - The first part of the module introduces the conceptual device of the ‘thinking performer’ that focuses on HR professionals who can both think and reflect on the one hand, and perform and do on the other. This requires students to come up with a series of steps that would enable them to become thinking performers in different real life organisational settings and circumstances. Then students are introduced to the concept of self-development, reflective learning and CPD. This enables students to examine their learning processes, reflect on mistakes and successes and start becoming active and aware learners, thus reflective practitioners in their professional lives. Also, a CIPD representative comes and informs students about CPD across different occupational groups and provides them with the opportunity to complete activities on reflective writing, their own PDPs and learning logs and to make connections with their own CPD.

Students found this part of the module engaging and useful in helping them clarify what it was they needed to be thinking about. They started gaining confidence in applying what they learnt, then continue to reflect and develop further through the iterative reflective learning cycle. One of the really interesting outcomes was that a considerable number of students reported that reflective thinking had helped them to develop a questioning attitude and identify areas of change and development. Some students also acknowledged the importance of peer review as a tool for CPD and described it as some form of peer support between people who provide useful feedback to each other. However, the use of PDPs throughout the academic year raised pertinent questions of practicability. For some students engaging in PDP activity was seen time consuming, whilst tutor support appeared to be labour intensive. One response to both of these challenges could be to create opportunities for peer mentoring (e.g. final year students act as buddies), as these may influence attitudes and engagement and reduce the tutor’s workload. Also, a more intensive introduction to the module and to CPD could help with the process of PDP.
HRM in a strategic business context - The second part of the module is concerned with the interaction between HRM, the environment and the organisation. Students are required to explore issues associated with strategically managing HR in social, economic, political and international context. They are expected to analyse the environment of different organisations and to identify the implications of environmental influences for HRM practice through primary and secondary research that is communicated to peers in various forms. These workshop sessions are supported by a series of interactive lectures with external speakers on the main issues and challenges of HRM in various sectors and organisations. Students also have the opportunity to engage with problem solving activities in the business environment, like the stakeholders’ role in influencing HRM practice, and the role of ethics and corporate social responsibility in HRM.

Students found these activities challenging, especially in relation to group work. Perhaps a more intensive induction to the module will help in setting up groups and coaching them. Students also found the activities useful in preparing themselves when looking for prospective placements and graduate employment. To this end, an interesting and somewhat unexpected outcome was that some students acknowledged the role of small medium size firms in graduate employment and they started considering prospective employment in such firms instead of the typical graduate training schemes in large organisations. This outcome, in my opinion, was significant as it meant that students were developing a better understanding of the labour market opportunities.

HRM as a profession and graduate attributes - The third part of the module is delivered through a series of interactive sessions with HR practitioners, academics, career specialists and former students. It starts with the main tasks that HR professionals do, the challenges involved in undertaking these tasks and the potential strategies that HR professionals could employ in resolving these challenges. This is followed by an acknowledgment of the skills that HR professionals need to possess and the skills that employers are looking for in HRM graduates. Students are required to reflect on how they could evidence their skills for employment, to identify any potential skill gaps and to plan for how they can overcome these by engaging in appropriate development activities. A careers consultant also delivers interactive sessions on the students’ work preferences and motivations followed by a discussion on the career paths that HR graduates can follow, and encouraging students to develop a clear vision of where they want to be in the future. This is combined with employer presentations and networking events through the careers and employability services that help students to develop a suitable job search strategy, and gain realistic expectations of employers' needs.

It was surprising that most students had never really thought about how they might evidence their skills, and some assumed that employers would accept that having a degree was evidence enough of their skills. Students found it difficult at first with evidencing skills, but with some encouragement, support and feedback they became more confident in how they might do this. Indeed, it came as a shock to me to see the very poor quality of students’ first attempts at evidencing their skills and their ignorance of the employability skills outlined in module specifications. However, a really pleasing side effect of this process was that it enabled students to see just how much they had to offer and what they had achieved both within and outside their programme of study. Some students also identified career opportunities they did not have initially considered.

Evaluation

The module was evaluated through multiple sources, including informal and formal feedback from students and peers, the external examiner and the CIPD, during and after its delivery.

Students - The feedback from students was overwhelmingly positive and they reported good progress with 90% passing the module and 10% achieving a mark of 70% or more. Student feedback was collated through group discussions, student representatives, staff student liaison committees, and a questionnaire. A high proportion of students agreed that the module was well structured and coherent (mean 3.57), well presented (mean 3.71), maintained their interest (mean 3.67) and was useful and relevant (mean 3.76). Some students also commended the ‘practical nature of the module’ that is ‘useful for employment’, and the ‘tutor’s ability to make learning fun’ and ‘provide first class student support’. Much of the discussion outlined in the previous section indicated that informal feedback from students during the module delivery was also positive and produced some really interesting reactions in the students.

Peers - Academic colleagues from the HRM team were initially concerned about whether students would engage at an appropriate academic level, but it was encouraging to see some excellent critical accounts in the students’ portfolios. Colleagues from within and outside the University were complementary of the module in terms of its pedagogic approach. I quote: ‘an innovative module that helps students to change their way of thinking’ (KMS Sharing Best Practice Seminars); ‘this module helps students develop their capacity to
think’ (Learning, Teaching and Student Experience Conference).

**External examiner and CIPD** - The feedback from the external examiner and the CIPD was also positive and highlighted the innovative and practical nature of the module in preparing students for employment. I quote ‘sound module with relevant learning outcomes to the students preparing them for the corporate world’ (external examiner); ‘it enriches the student experience by input from external speakers’ (CIPD); ‘creative teaching and learning strategies offer a student-centred, problem-based learning approach’ (CIPD).

**Conclusions**

Over recent years employability has become a significant driver across higher education with universities under increasing pressure to address it in the curriculum. This case study has presented one example of how Keele University is developing the employability of its HRM students by providing them with the skills and knowledge to enter employment. Yet, employability is not just about getting a job (Pegg et al., 2012) but about an individual’s potential of entering the labour market and remaining employable therein (Hillage and Pollard, 1998). As such, at the heart of our pedagogic approach is the philosophy of creating a student-centred learning environment that values reflection and experiential learning. This is important as the labour market is changing in ways that make it more important than ever for individuals to take responsibility for managing their own career development.

**References**


Title
Data Mining for Learning Analytics; does lack of engagement always mean what we think it does?

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School
School of Computing and Mathematics

Faculty
Faculty of Natural Sciences

Abstract
Context and Objectives: Learning Analytics (LA) has the potential to utilise student data to further the advancement of a personalized, supportive system of HE (Johnson et al., 2013). A number of LA systems are now being developed but there have been few studies that have analysed the usage of Virtual Learning Environments (VLE) in order to identify which analytics techniques and sources of data accurately reflect student engagement and achievement.

Methods: The interactions of 66 students with a Level 4 programming module on a VLE have been analysed via the simple K-means clustering algorithm to identify classes of behaviour and their characteristics.

Results: Two prominent classes were found with students achieving higher marks attending the lectures and tutorials more regularly and accessing all types of material on the VLE more frequently than students in the lower achieving cluster. However, there were a number of exceptions that had low levels of engagement that gained high marks and vice versa. Discussion: A student’s prior experience and characteristics of their degree programme need to be taken into account to avoid incorrectly interpreting high and low levels of engagement. Conclusions: The number of times students view online module materials will be an important factor for inclusion in any predictive LA models but must be able to take into account the differences in student backgrounds, delivery styles and subjects.

Context and Objectives
Traditionally a student’s progress and level of engagement has been measured by assessment and physical attendance. However, in a student’s day-to-day interactions with a university, other real-time measures are being generated and stored e.g. Virtual Learning Environment (VLE) interaction, Library and Online Journal usage. The analysis of this data has been termed Learning Analytics (LA) and defined as a method for “deciphering trends and patterns from educational big data ... to further the advancement of a personalized, supportive system of higher education.” (Johnson et al., 2013). Higher Education (HE) has traditionally been inefficient in its data use (Siemens & Long, 2011) but LA has the potential to identify at-risk learners and provide intervention to assist learners in achieving success (Macfadyen & Dawson, 2010).

Examples of systems that support elements of LA include the University of Southampton’s “Student Dashboard”; the Open University’s Anywhere app; the University of Bedfordshire’s student engagement system; London South Bank University’s partnership with IBM (Perry, 2014); Purdue University’s Course Signals (Arnold and Pistilli, 2012) and the Student Success System (Essa & Hanan, 2012). A detailed review of systems has been published by JISC (Sclater et al., 2016), who are currently in collaboration with 50 universities to build a learning analytics service for the UK HE sector (JISC, n.d.).

In order to build a predictive Learning Analytics system, a behavioural model built from an example training set of input observations e.g. previous student VLE interaction data, is needed. However, there have been few studies that have analysed the usage of pre-existing VLEs in order to identify which analytics techniques and sources of data accurately reflect student engagement and achievement. The work presented in this paper follows on from the study by de Quincey and Stoneham (2015) and analyses the VLE interactions of students for a Level 4 module using a clustering algorithm to identify potential groups of students with similar learning behaviour and to study the characteristics of these groups.

Methodology
The intranet within the School of Computing and Mathematical Sciences (CMS) at the University of Greenwich has been incrementally developed since 2002 and contains the key information and supports the main tasks that a student needs in order to complete their modules(1) (Stoneham, 2012). This includes digital versions of coursework specifications, previous
exam papers, screencasts and podcasts of some lectures, book lists, common teaching material, final year project documentation and relevant forms such as those for requesting extenuating circumstances, applying for ethical approval and for making general enquiries. Very few paper-based handouts are given to students so learning materials are only accessible to them via the intranet.

All student interaction with the CMS intranet is recorded in the form of server logs. When a user requests a file from a web server, an entry is recorded in a log file i.e. by loading a web page via a web browser, a user is making a request for a HTML file along with other files that are embedded components of that page such as images and videos; each of these file requests make an entry in a log. These server log entries contain information such as the name of the file that was requested, the address of the page that referred the user to the requested page, the IP address of the device that requested the file (this can indicate the location of the user), the time the file was requested and the username of the person requesting the file. As part of a previous study (de Quincey and Stoneham, 2015), functionality has been developed that takes this server log information and inserts it into a database, facilitating easier querying and analysis.

Server log data generated by 2,634 students across the School has been collected during the 2012-13 Academic Year with 2,544,374 interactions being recorded. Previous analysis (de Quincey and Stoneham, 2015) has suggested significant correlations between pairs of attributes on a Level 4 module called “COMP1314: Digital Media, Computing and Programming”. COMP1314 is a 30 credit introductory module to computers and programming, delivered via weekly 2 hour lectures and 1 hour practical tutorial sessions across both semesters by 2 different lecturers. It is assessed by 2 pieces of coursework and an exam.

During the running of this module in 2012-13, there were 14,467 interactions with resources and pages on the CMS intranet related to the module by the 53 students who were still enrolled by the end of the module. Significantly high correlation was found between a student’s final module mark and overall attendance at tutorial and lab sessions (r=0.64(1)) and a similar correlation between the final mark and their interactions with COMP1314 resources and pages on the CMS intranet (r=0.63).

Here, a more holistic approach has been used, with the simple K-means clustering algorithm (MacQueen, 1967) being applied to a subset of the data generated by the programming component of the module delivered in the second semester (over 10 weeks), including all 66 students who were originally enrolled on the module. The K-means algorithm attempts to find k clusters in a set of observations/samples. Once the algorithm is run and clustering is completed each sample is assigned to the cluster with the nearest centroid (cluster centre). The centroid of a cluster is one that best represents the cluster. The centroid’s attributes are computed by finding the means of the attribute values of the cluster’s members.

Results

For the programming component of the module there were a total of 2,622 views of related materials (mean=39.7 views per student). The following table shows the breakdown of views for the different material types.

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Number of Files</th>
<th>Total Views</th>
<th>Avg. Views per Student (n=66)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorial Instructions</td>
<td>11</td>
<td>1559</td>
<td>23.6</td>
</tr>
<tr>
<td>Lecture Slides</td>
<td>231</td>
<td>825</td>
<td>12.5</td>
</tr>
<tr>
<td>Coursework Specification</td>
<td>1</td>
<td>127</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Table 1: Breakdown of views per resource type

In order to determine clusters of student behaviour on the module, the following features were then considered:

- the student’s degree programme (a code comprised of “P” followed by a set of numbers)
- their coursework mark for the programming component of the module
- their physical attendance percentage in lectures and tutorials
- the number of times they have viewed module related programming materials such as lecture slides, tutorial instructions and the coursework (CW) specification.
Running the simple K-means algorithm on this set of data revealed the two most prominent classes of students with the following centroids (average values of the attributes considered):

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Full Data (66 students)</th>
<th>Cluster 0 (40 students)</th>
<th>Cluster 1 (26 students)</th>
</tr>
</thead>
<tbody>
<tr>
<td>programmeID</td>
<td>P11361</td>
<td>P11361</td>
<td>P03657</td>
</tr>
<tr>
<td>CW Mark</td>
<td>48%</td>
<td>34%</td>
<td>70%</td>
</tr>
<tr>
<td>Attendance</td>
<td>61%</td>
<td>55%</td>
<td>70%</td>
</tr>
<tr>
<td>Total File Views</td>
<td>40</td>
<td>24</td>
<td>64</td>
</tr>
<tr>
<td>Tutorial Views</td>
<td>24</td>
<td>15</td>
<td>37</td>
</tr>
<tr>
<td>Lecture Views</td>
<td>13</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>CW Spec. Views</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2: Returned clusters from the K-means algorithm

The above two descriptors of the two classes show a clear distinction between the performance of students within each cluster (according to their coursework mark). The better performing students in Cluster 1 (i.e. those who have achieved a 70% average mark) attended the lectures and tutorials more regularly and accessed all types of material on the CMS intranet more frequently than the students in Cluster 0.

Of greater interest however are “the exceptions” to the above inferences. The figure below shows the distribution of student marks compared to their degree programme (represented by the “P” code on the x-axis). Each point, representing a student, has been assigned a colour that relates to one of the 2 clusters detailed in Table 2 above.

Figure 1: Clusters of behaviour related to degree programme and final mark %

It can be seen that for P11102, P11916 and P03657 there are examples of students that have high levels of engagement and are achieving high marks. It can also be seen that in P11361, P12241 and P11916 that there are examples of students who have low levels of engagement and have achieved low marks. This is perhaps to be expected and is in line with the correlation co-efficients detailed in the previous section.

However, there are a number of students on P11361 that had low levels of engagement and have achieved high marks (Box A) and conversely on P03657 showing high levels of engagement, whilst achieving low marks (Box B).

It seems that there are a minority of students on particular degree programmes who have achieved a high coursework mark but share the attributes of those who have not and vice versa i.e. students that have performed well on the module but have similar behaviour to those that have not. Potential reasons for this finding are discussed in the following section.
## Discussion

A number of previous studies have demonstrated the importance of attendance and the effect this has on final grades e.g. (Schmidt, 1983; Park & Kerr, 1990; Ryan et al., 2010). From the findings of this study, it is clear that attendance for this module was important but that online engagement i.e. viewing module resources, is equally important for the majority of students. For future LA systems, views of materials related to modules will therefore be an important factor for inclusion in any predictive models.

However, the use of unsupervised learning algorithms such as simple K-means needs further investigation as it is how exceptions to typical student behaviour are identified that may determine the success of LA. For this module, when looking at the particular students that are demonstrating the opposite behaviour to what is expected, a number of potential explanations can be suggested.

For students on P11361 who showed low levels of engagement but achieved high marks, one explanation could be that these students did not actually do the work themselves and achieved the high marks by collusion or plagiarism. However, P11361 is a Games and Multimedia Technologies degree which attracts students who have a pre-existing interest in programming and quite often prior experience in the subject. The more likely explanation (and having seen the students’ progress through their degree) is that these students did not necessarily need to attend this set of lectures and tutorials and were not as reliant on the module resources as other students to complete the coursework.

The group that have shown the same level of engagement as the high achieving students but getting low marks is perhaps more worrying however. One explanation is that these students have not understood the materials and perhaps needed further support. P03657 is a Multimedia Technology degree which tends to attract students who are not sure which of the more specialised degree programmes to take and have lower levels of technical expertise when they start. These could be students who are engaged but their engagement is not being translated into higher levels of achievement. These students ideally would be highlighted by an LA system but perhaps would not be if their previous experience and motivation for doing the module was not taken into account. Another possible explanation is that some of these students have lower levels of digital literacy. Observing students interact with the CMS intranet in the tutorials(3) revealed that some will open the same file multiple times purely because they do not understand how to view separate pages in tabs or know how to download and save files in their own file stores. This repeated opening of files therefore is not increasing engagement, it is just the manifestation of their pre-existing digital practices or perhaps the increased reliance of having files available on demand online and not stored locally.

## Conclusions

It is clear therefore that although interactions with digital resources can represent engagement for students, there are other factors such as a student’s prior experience and characteristics of their degree programme that need to be taken into account. For computing in particular this will become an increasingly important issue with the increased focus on programming within the National Curriculum and students coming into degrees with expected higher levels of experience and knowledge.

It is also important to note that this study has been performed on one Level 4 module with a particular structure both in face-to-face delivery and in the resources that are provided. Models that LA systems use to measure engagement and progress must be able to take into account the differences in delivery styles across modules, degree subjects, teaching teams and universities. Currently, we are using the same method to analyse student behaviour on a Level 5 programming module at Keele and will be producing classification models in the form of decision trees that will indicate the likely trajectory of a learner, given their activity on the VLE. In the first instance this will allow us to determine how generalisable our method is across different modules and institutions. The longer term hope however is that such models will help us to identify early on those students that can be supported further and offer that support to them.

## References

1. In effect, the intranet is a bespoke VLE
2. i.e. the more a student attends, the higher the mark they achieve
3. As part of regular teaching activity


JISC (n.d.) Effective learning analytics Helping further and higher education organisations to analyse and understand their data. [online] Available at: <https://www.jisc.ac.uk/rd/projects/effective-learning-analytics> [Accessed 8th July 2016]


This paper will review some of the literature pertinent to the growing field of undergraduate research (UR) and discuss the potential benefits to developing an undergraduate research culture at Keele, citing the act of dissemination as crucial to the growth of fully developed research skills. Additionally, it will briefly detail an ongoing investigation into UR occurring at Keele during the 2015/16 academic year, funded by Keele’s Teaching Innovation Project (TIP) scheme. The JADE Student Learning Undergraduate Conference will take place on 1st June 2016. Following the conference, the abstracts and proceedings will be published in the Journal of Academic Development and Education (JADE). The current progress of this undergraduate conference will be detailed. This paper intends to increase awareness of UR and its potential benefits for staff and students, as well as offering a ‘view from the trenches’ from a learning developer running an undergraduate conference this summer. It is hoped that this may possibly encourage colleagues who perhaps may be thinking about pursuing UR by offering insight into these processes.

Context

Undergraduate research is a burgeoning field of practice and pedagogical research. The British Conference of Undergraduate Research (BCUR) (2010) occurs annually, hosted at a different university each year. The 2014 conference was hosted by the University of Nottingham, and the 2016 conference is scheduled to take place at Manchester Metropolitan University (MMU) on the 22-23rd March. The conference welcomes speakers from across the country to research. The organisation behind the conferences, based at the University of Central Lancashire (UCLAN), also promotes and supports undergraduate journal development. There are also a growing number of undergraduate research journals, often exclusive to the students of particular institutions. UCLAN’s undergraduate journal, Diffusion: the UCLan Journal of Undergraduate Research (2014), is one such example. However, they are some which accept publications from students outside of their parent institution, such as the University of Warwick’s Reinvention (2013) journal. Keele’s own JADE also encourages student, be they undergraduate or postgraduate, publication.

Walkington and Jenkins (2008) position publication as a route through which undergraduates may get the opportunity to fully enact the ‘research cycle’ (Caprio, 2014; Spronken-Smith et al, 2013). Here, research is seen as incomplete if authors do not get the opportunity to disseminate their findings widely. After all, the research and dissemination process for academic staff is often dependent upon reception by peers which are tracked by a number of means such as the Research Excellence Framework (REF), conference presentations and citations to name a few.

It is desirable, therefore, that similar opportunities are made available to undergraduate students. The authors recommend a range of strategies to enable students to complete the research cycle, many of which depend on adjustments to course assessment strategies (Mabrouk, 2009; Walkington & Jenkins, 2008). However, some of their key strategies in enacting undergraduate research do look at offering multiple opportunities, across different media platforms, using new and emergent technologies, all the while asserting the employability benefits to learners.

Discussions about student research often cite the dissertation or extended essay as an example of independent undergraduate research. One could also include any substantive final year project into these discussions. However, definitions such as this fail to acknowledge that these types of research are not independent research. They are focussed around the assessment criteria of the course and are only seen by a handful of people (McGuinness & Simm, 2000). Furthermore, they are created for a summative purpose and therefore not research. While dissemination within this ‘closed circle’ within summative assessment guidelines is often encouraged (Spronken-Smith et al, 2013), the growth of UR conferences and journals demonstrates that some students do wish to pursue research interests that remain separate from assessments.

Undergraduate research conferences have been found to impact upon students’ ability to articulate ideas to other undergraduates. Willison and O’Regan (2007) note that learners will articulate ideas in discipline-specific language with increased autonomy. However, Spronken-Smith et al (2013) note that in order to communicate this increased complexity of ideas to a broad audience, language must be made more accessible and its ‘discipline-ness’ must be somewhat masked. This ability to communicate complex ideas to different audiences is highly sought in terms of graduate employment (Archer & Davidson, 2008). It also corresponds to the drive for university graduates to be able to discuss and demonstrate their graduate attributes, much like in the Distinctive Keele Curriculum (Keele University, 2016) with its focus on the articulation of ‘graduate-ness’.

Benefits of UR

Enabling UG students to enact the complete research cycle and to pursue opportunities to disseminate research findings has been found to have significant benefits for the students and staff that...
enable them. The following benefits for students and staff have been found across much of the published literature.

**Benefits of UR for students**

Conferences can bridge the gap between research, theory and practice for learners by giving time to question, debrief and explore what they have seen (Hall, 2015). Additionally, UR offers undergraduates the opportunity to practise and develop discipline-specific skills, such as writing abstracts, as well as more generic interpersonal and communication skills (Beckman & Hensel, 2009; McGuinness & Simm, 2003; Spronken-Smith et al, 2013). The development of these skills can often help to demonstrate graduate attributes to employers beyond higher education (Caprio, 2014). Enabling students to learn through and about research enables them “as producers, not just consumers of knowledge” (Healey & Jenkins, 2009: 7) by including them in the research culture of the institution.

Hill et al (2013) studied the impact of enabling students as active participants in the research process by co-authoring a conference paper and academic article. They found that in addition to the above benefits, attending conferences and authoring papers allowed students to see the other aspects of being a lecturer and afforded them greater insight into the world of academia. Furthermore, it may then allow students to mirror, and more fully appreciate the processes staff enact (Lopatto, 2003; Walkington & Jenkins, 2008). UR can introduce students to the concept of selectivity and exclusivity in being chosen to be published (Walkington & Jenkins, 2008). This may lead to an increased appreciation of the academic texts which they use in their studies.

**Benefits of UR for staff**

Willison and O’Regan (2007) discussed student research as “a continuum of knowledge production” (2007: 394). Progression along this knowledge production continuum would benefit both the students developing the skills required to produce good quality research and the staff guiding and instructing this development. Encouraging participation in UR can raise the profile of the department hosting the conference and to give students an experience that will demonstrate the value added by a university degree by encouraging the exhibition of a range of skills developed during study (McGuiness & Simm, 2003).
place. Once it was explained to students that neither of these was a possibility due to a conflict of interests for myself as the organiser, and researcher in this case, they understood and used the expected means. Additionally, students could not see why their abstracts needed to be so concise (100 words in this case) or why they should submit in February for a conference in June. These are familiar processes to staff who frequently attend conference and were designed to give students the somewhat frustrating experiences that some staff members have when submitting for consideration at conferences.

It may be worth considering the mentoring which undergraduate students, particularly those new to higher education, may require. Future incarnations of this conference may look to implement a developmental mentoring or supervisory scheme, noted to be a key facet of undergraduate research by Lopatto (2003). While this project offered support and developmental opportunities once students were accepted to present, it may be that this same support is required prior to submitting an abstract for consideration, which for many students will be the first time they have enacted this process.

The conference intends to investigate the experience of participating in UR for the students by exploring the following questions:

• Why do students choose to take part in this UR opportunity?
• What do the students hope to gain from taking part?
• Do students pursue research areas not covered in their programme or simply modify, or present parts of, previous assessments?
• What are the experiences of the planning, writing and delivery process?

It is currently expected that surveys and focus groups would gather sufficient data to answer many of the above questions in this instance. However, there are different approaches in use across other examples of UR. In order to gain a richer insight into the learning development of students in relation to participation in conferences, Hall (2015) utilised reflective journals to demonstrate that students gained a deeper understanding of research and their own social work practices. This approach, while potentially time-consuming, can allow participants to draw links between personal, professional and cultural practices (Cutforth, 2013; Hall, 2015). In addition to possibly pursuing reflective learning journals, there may be some scope to utilise or develop an undergraduate research skill development framework, similar to that of Willison and O’Regan’s (2007). Measures such as the above may afford a richer and more longitudinal analysis of the impact of conducting undergraduate research, and may be considered in future iterations of the project.

Conclusions - Next Steps

The conference project has so far made encouraging progress. Keynote speakers are confirmed and the process of confirming the running order of undergraduate presenters will be completed by the middle of March. Several development opportunities are available to those selected to present at the conference. The Student Learning team is offering informal coaching and mentoring, as well as more formal workshops to develop academic and presentation practices. The undergraduate student body will be made aware, over the coming months, of how they can sign up to attend this conference. Once it has been held, all conference abstracts will be published in JADE detailing the conference proceedings and we then expect to see a gradual stream of publications arising from the event from both the students who took part and the team delivering it.

UR presents an opportunity to engage students as consumer and creators of knowledge. The following quote sums up the pedagogical potential of UR in allowing students to enact the full cycle of a complete research cycle leading to further areas of inquiry:

“To research, we embark on a voyage of discovery launched by curiosity or need...The education of students should lead them to ask research questions of increasing sophistication, specificity, depth and breadth which set them on a journey towards making the unknown known”. (Willison & O’Regan, 2007: 400)

As well as the significant skills and knowledge benefits for those students taking part, this is a growing field of research that allows us, as staff members, to potentially understand the motivations behind students to learn and produce once we remove the carrot - or stick, depending on your perspective - of assessments and summative grading.

Acknowledgements

The JADE Student Learning Undergraduate Conference is part of a funded Teaching Innovation Project (TIP), funded by Keele’s Learning and Professional Development Centre (LPDC). I would like to thank colleagues in the Student Learning team for their support in this project as well as Jo Lea for her help in promoting the conference to learners in her role as Vice-President for Education with Keele University Student’s Union.
UNDERGRADUATE RESEARCH (UR): CONTEXT, BENEFITS AND UR IN ACTION

References


Introducing the Babel Fish:

The aim of this paper is to begin to explore and locate possible future guises, roles, locations and methodologies of the 21st Century teacher within a technological matrix, physical and virtual. Three themes will be used to locate the ‘Babel Fish’; these are Facilitation, Instruction and Analytic Meaning. The metaphor of the Babel Fish will be used to bring into focus the relationship between teaching and the compound nature of disambiguation through translation, linking the reverse metaphor of translation in computer science to the metaphorical discourse that bounds research and discovery.

“Metaphor performs essential functions in orienting and guiding thought; it connects abstraction and embodiment; it allows us to discover regularities between what we perceive and what exists outside of ourselves; and it entwines cultural presuppositions with scientific frameworks.” (Hayles, 2001, p.144)

Introducing the teacher (or lecturer) as a translator of knowledge into learning within an analogue and digital context, I define translator or translation as disambiguation to deliver a semantic interpretation, a communication of meaning for learning to take place. The metaphor of translation can also be seen to be echoed in computing, defined by ‘the analysis of source text without human intervention’, with disambiguation in computing being defined as a set of possible techniques to eliminate name ambiguity, and as terminology that defines machine memory access instructions.

Knowledge ➔ Translator ➔ Learning | Machine Code ➔ Translator ➔ Execution

I will now (briefly) visualise the context of the analogue teacher or lecturer as a translator of knowledge to deliver meaning in learning, and juxtapose that analogue interpretation of translation with ubiquitous computing, defined by Crang and Graham (2007, p. 789) as “a world of ambient intelligence”, thus beginning to illuminate what the future may hold for the 21st Century teacher. It is widely accepted that the analogue teacher is bound by the constraints of the industrial revolution, a production-line methodology where the product, the learner, is assembled and then classified (by examination) on departure from the factory (Robinson, RSA, 2010) (a). The generation of the analogue learner is carried out mostly within the classroom (or lecture theatre) by one or more teachers (or translators). Here the analogue teacher is the sole arbiter of knowledge, drowning in the entropy of chalk and talk, as echoed by Mark Twain; “College is a place where a professor’s lecture notes go straight to the students’ lecture notes, without passing through the brains of either”. This brief (possibly simplistic) visualisation of an industrial model of education and analogue teaching begins to define a lens through which it is possible to locate a digital, post-industrial, ambient representation of teaching in education (Enriquez, 2010), highlighting the inequalities of a Victorian industrial era (Robinson, RSA, 2010) (a), leading to a post-industrial reformation of education, free from the academic/non-academic discriminatory chasm.

On the Trail of the Babel Fish

How will the birth of a post-industrial 21st Century reformation of education change the agency and meaning of the word teacher? What guises, roles, locations and methodologies will define a teacher? I would suggest that to answer these questions it is important to firstly locate the embryonic Babel Fish by focusing on ‘your own’ educational paradigm viewed through the lens of an industrial model of education, by engaging three themes, Facilitation, Instruction and Analytic Meaning, reflecting Hayles’ method of constrained constructivism(1). Using the aforementioned three themes as a semantic tool kit to develop a narrative discourse to begin to analyse teaching and learning in digital environments(2), it will be possible to highlight the presence of any ambient digital artefacts used in the delivery of teaching and learning, and locate change in the meaning and/or agency of the word teacher, towards
translator. Thus we can assign insight and form to digital futures for teaching and learning, uncovering the future and acknowledging the possible impact of the posthuman trope as defined by Hayles (2001; 2004), on education for the 21st Century.

**Catching the Babel Fish**

By using the semantic tool kit; the conjoined lenses of Facilitation, Instruction and Analytic Meaning, I will now begin to locate simple or complex digital artefacts, ‘working or abandoned’, ‘theoretical or practical’ that point towards a ubiquitous future for teaching and learning within a physical and virtual digital matrix.

Facilitation:

(activities for others that are assisted or made easier, teaching)

Rather than facilitating learning, it could be argued that the industrial model of teaching and learning could be seen to frustrate learning by means of limiting the agency of the learner (Robinson, RSA, 2010). I define agency as the capacity of (in this case) the learner (and/or facilitator) to act in the world, resonating with the location of agency within digital artefacts that set out to facilitate learning, reflecting the ubiquity of computing, the internet of things and on to cognitive environments, categorised by Crang and Graham (2007, p.792) as ‘Augmenting space’, ‘Enacting space’ or ‘Transducting space’. The significance of agency within digital artefacts (to facilitate the uncovering of knowledge and ability to make transparent) is thrown into stark relief by a physical representation of landscape by Swiss architects Herzog & de Meuron and Artist Ai Weiwei. The Serpentine Gallery Pavilion 2012, described by Herzog (2012, 01:38) (b) as “to reveal what is invisible, being a leading energy”, attempts to open up landscape to facilitate access to the meaning of what previously existed or exists in that location, while visually interacting with environment around, conceptually opening up “Augmented space” (Crang & Graham, 2007, p.792). Likewise the simplicity of video learning (c), attempts to make complex meaning transparent through narrative and metaphor, on to technically complex digital artefacts such as ‘environmental sensor packages’ that transmit live data that describe environments (d), described by Crang and Graham (2007, p.793) as a Transducting space; all digital artefacts that are taking on the role of facilitation of knowledge towards mean-making. This hypothesis extends the notion of teacher within a 21st Century educational paradigm, the guise of the teacher begins to change, the teacher becomes ubiquitous through not only embedded digital artefacts, physical and virtual, but within change in agency of and meaning of the word teacher itself. Thus challenging educational methodologies and pedagogy, summed up by Herbert Thomas (2010, p.502) as “In short, our difficulty in understanding and articulating the nature of learning is partly brought about by our inability to articulate where learning takes place”. If this is the case, what will the role of the teacher be under this new regime? How will educational theory and teaching methodologies change? How will the answers to these questions begin to facilitate a future in which our physical and virtual environments translate a binary understanding of their existence into analogue meaning? If an object or environment can describe its form and function in every detail, so rendering knowledge ubiquitous and superseding what Knox (2012, p.2) sees as “The archival tendencies within the OER movement (that) emphasise this relationship, in which technology is positioned as a prosthetic to the learning process; an instrument considered only in its capacity for enhancement” by making content indistinguishable from technology, will the agency of that object (or digital artefact) render the word teacher meaningless?

Instruction:

(the process or act of imparting knowledge, design of learning)

Is the act of imparting knowledge linear or nonlinear? It could be argued that the industrial model of education is linear, but do we learn in a linear way? I would argue not (Robinson, RSA, 2010) (a). I would suggest that the challenge to instruction, the process or act of imparting knowledge, lies in the accommodation and acceptance of nonlinear progression towards learning objectives. For instance, in the digital domain, it is now possible to travel to Edinburgh stopping off in Hong Kong, Ursa Major and Uncle Fred’s garage (not to mention the restaurant at the end of the universe!). What are the questions that need to be asked to begin to deal...
with the topic of instruction within a future non-linear educational vortex (subject dependent)? What are the controlling factors that limit or facilitate instruction in the digital domain? Is the ‘teacher as instructor’ redundant? Or is instruction better facilitated in the digital domain via digital learning artefacts? An industrial model of instruction delivers instruction verbally or via chalk and talk, relying on the learner to take note while assimilation of information is in progress. In contrast, instruction via digital artefacts can be seen to be specifically designed into the learning process, using a wider range of delivery mechanisms, including Multimodal design (Kress & Selander, 2011; Lakovic, 2010, p.123). For example, take an existing digital learning artefact, a TED-ED video flip (c). Here we can witness instructional design in a real time online learning environment using multi-modal delivery techniques to deliver complex meaning, as well as a basic instructional framework to deliver practical progression through a learning matrix, linear or nonlinear, defined by the user. This suggests that instruction will be better facilitated by good instructional design in a digital environment, raising the question, to what extent will the teacher be responsible (as instructor) for the creation of digital artefacts for learning?

“In our inevitable emplacements, emergent identities and online teaching practices demand that we are always, inevitably, making spaces and places, that shape our identities of becoming (Massey, 2005: 175).”
(Reem Al-Mahmood, 2008, p.19)

Analytic Meaning:
(division into elements or principles to uncover meaning)

Where can a division into elements or principles, to make and uncover meaning, be located in an industrial model of education? Maybe the pupil register, or logging of homework and exam results? These elements could be seen to reveal a limited level of analytic meaning; the register reveals the presence of student within a lecture (or class), homework may determine commitment or effort, and an exam could test if a student has been paying attention, or in real terms, how good an individual’s memory is or how free from stress a student’s life is. Is this 19th century manifestation of analytics simply guesswork, a best attempt at assessment of learning? And could this 19th century model of assessment (or analytic meaning) be seen to be exclusive rather than inclusive, extending the concept of capitalism through a model of education born out of the industrial revolution (Robinson, RSA, 2010)? In contrast consider Daphne Koller (e) (2012, 14:55); here we can see a visualisation of data (a graph) that plots answers to questions from many students deviating from the mean. Daphne Koller indicates that a high percentage of the course cohort answered one particular question wrongly, and asks how this type of analysis of data in a real time learning environment can be used to good effect to personalise learning. Furthermore, how will a future learning scenario based on real time auto assessment and personalised learning environments change our existing educational environment? And how will the agency of the teacher change when the delivery (or translation) of knowledge can be continually assessed by online digital artefacts? Will the teacher become an analyst, an interpreter of data to direct learning, or engineer (or maker) creating digital artefacts for subject specific learning, plugging into an ever increasing cloud of knowledge. ‘The Cognisphere’ described by Hayles (2006, p.161) as giving “a name and shape to the globally interconnected cognitive systems in which humans are increasingly embedded”.

Babel Fish or Schmagelfish?

This investigation has located a plethora of epic themes, the Ubiquitous Teacher, The Cognisphere, The Posthuman Debate, Learning Design, Teacher as Engineer, Cognitive Environments, to mention a few. These themes, I would suggest, have foundations firmly in science fact, but what will be lost and what will be gained, and what will be possible and what will be impossible in a post modern, post industrial manifestation of education?

What will be lost and gained, possible or not possible within education through digital networks I would argue is located within the dichotomy that lies between the analogue and the digital. The human condition is (currently) located in the analogue domain, and any digital experience is translated by design. As Lakovic (2010, p.128) points out; “a definition formation originates in human experience and imagining: a concept exists in the world – humans experience the concept – humans create concept images in their minds – humans create concept definitions – humans operate with concepts”. In this context learning and computing are diametrically opposed, so extending the need for translation of the digital domain in all contexts through semiotic frameworks towards analogue understanding. I would argue that the dichotomy that exists between the analogue and the digital is at the heart of any tensions that may exist within the continuing reformation of education through digital networks. To define analogue and binary; analogue is ‘a measurable physical quantity’ (what you see is what you get), and digital is ‘a conversion of analogue understanding into binary or vice versa’, binary being defined as a representation of information by the use of two symbols 0 and 1. As stated by Hayles (2004, p.75), the operating system installed on a computer is an
analogue representation of binary, allowing access to the power of computing through semantic interpretation. If this argument is accepted, the dichotomy that exists between the analogue and the digital could be used as a lens to gather further, more complex, evidence to interpret and facilitate future understanding of teaching and learning within digital environments, so influencing further, more complex, development of digital artefacts as learning aids.

Taking the notion of the ubiquitous teacher and using the metaphor of the Bable Fish to its logical conclusion would require the relocation of the human condition from the analogue domain to the digital domain. This notion begins to blur the boundaries between the philosophy of meaning and computing science by entering the realm of Nanocomputing, computing that is indistinguishable from human form and function. If it becomes possible for Nanocomputing or Nanodevices to interact directly with thought and digitally translate analogue mean-making, the concept of ubiquitous knowledge and understanding of that knowledge becomes a reality, relocating the human condition firmly within the digital domain to further extend the concept of cognisophere.

Conclusion

By using a semantic tool kit, the conjoined lenses of Facilitation, Instruction and Analytic Meaning, I have attempted to locate possible future guises, roles, locations and methodologies of the teacher within a 21st Century technological matrix, physical and virtual. As would be expected, my investigation has raised more questions than answers by attempting to unpack the future. But what is evident is that the meaning and location of the word ‘teacher’ is changing, and that the educational landscape, virtual and physical, will need to further adapt if it is to move beyond the industrial era, by harnessing the future potential of ubiquitous computing, openness and the identity and agency of the student/teacher relationship. Furthermore I would like to suggest that the dichotomy that exists within the analogue representation of digital information is key in realising the full potential of ubiquitous computing, with relation to the translation of data into analogue mean-making to achieve disambiguation through the metaphorical discourse that bounds research and discovery.

References:

(1) Constrained Constructivism: “is that reality is never present to us as such; rather, our sense perceptions are self-organising processes that construct the world we know from the unmediated flux, unknowable in itself” (Hayles 2001, p.145).


This short article brings together two of my concerns. First, I suppose I am not alone as an academic in receiving well over 2,000 e-mails a year – and that, as a researcher rather than a teacher, I get fewer than many of my colleagues. Indeed, some of my teaching colleagues receive many more (Hartley & Rowley, submitted). Second, in the 1970s, I did a considerable amount of research with my colleague and typographic designer, Peter Burnhill, studying the use of space to clarify instructional text (Hartley, 1994; Hartley & Burnhill, 1977).

In May of this year I began to worry for some reason about how all of these e-mails that I received (or a good proportion of them) could be made easier to read. And the answer that struck me was simple: get the authors to apply the rules of spacing developed by Peter Burnhill.

Of course it is easy to suggest this – but would it work? And how could I test it?

Stage 1: Two rules for clarifying space

So in late May I began to reply to those e-mails I received that I thought could profit from a clearer layout. I suggested two rules for clarifying the text:

1. Start each sentence on a new line (unless it is very short).
2. Give one line-space between paragraphs.

I replied to the authors of dense e-mails suggesting that their mails would be easier to read if they applied these rules. Initially I just sent them a re-spaced version of their texts for comment but, later on, I began to send copies of their originals together with re-spaced versions. Sometimes I gave their original version first, and sometimes I did this second, because reading the first version of a text has a profound effect on reading a second one (Hartley & Ganier, 2000).

One of the first e-mails that I received in this study was posted to the School of Psychology and it read - somewhat enigmatically:

Might be of interest to some of you. Please see below and forward to others who might be interested. More information on support for students with caring responsibilities can be found here: (web address)
This I changed to:
Might be of interest so some of you.
Please see below and forward to others who might be interested.
More information on support for students with caring responsibilities can be found here:
(web address)

And I explained my rules to the author and asked for comments.
She replied:
Hi Jim,
Thanks for this.
I might use it for some e-mails (but not for all).
It does look neater and easier to read but…
… by giving each sentence a new line it is hard to distinguish (especially for more complex exchanges) which sentences are part of the same thread.
Let me know what you find from others’ comments too – that will be very interesting!

I proceeded to repeat this routine with 12 more authors, mostly in the UK, and 8 of the total of 13 replied. Overall, 1 of these was critical, 2 were lukewarm, 1 said he did it already, 1 said that she would try it, and 8 were positive. In short 10 out of the 13 respondents were positive.

**Stage 2: Three rules for clarifying space**

More rumination on my part led me to change the rules. It became apparent that many people rattle out e-mails without much thought about their presentation. It would be simpler, therefore, to suggest that they continue to do this first, and then insert the spacing. So my rules became:

1. Write the text as usual.
2. Edit the text so that each new sentence starts on a new line (unless it is very short).
3. Edit the text to insert a one-line space between paragraphs.

I then wrote to the authors of a further 22 e-mails that I then received suggesting that they applied these rules. The first of these replied:
Hi Jim,
I think that these are sound and sensible suggestions! Your version is much easier to read and means that you could grasp whether email is likely to be relevant or not much more quickly!
Thanks!

Similar comments were received from others:
I think this is a really good system for short e-mails.
I will try to adopt these principles. It can be hard under time pressure though.
Thanks Jim – that does help legibility.

but 7 did not reply.

All in all I judged 9 of these 15 respondents to be positive and 6 to be critical. Indeed, one wrote:
Where does a pedant go to get more water?

The main criticisms were that the revised text could look disjointed and again two respondents said that the rules were obvious and that they did this anyway. One preferred a new line-space for paragraphs only – without separating sentences within paragraphs.

What was particularly interesting was that there were few, if any, replies from university administrators (or their assistants) at Keele that produce e-mail text like this:

```
Late submission of assessed work submitted at the first attempt (or for re-assessment at the first attempt), and received within seven calendar days after the submission deadline without valid extenuating circumstances, will be limited to the module pass mark (typically 40% for an undergraduate programme and 50% for a postgraduate programme) or qualifying mark if higher. This clause does not apply to re-assessment.
```

Here we need re-writing as well as re-spacing...

**A snag**

Finally, it became apparent through discussions with respondents that some of the layouts of the e-mails that we send and receive depend upon which system(s) we are using to send and download
them. Indeed, this is particularly true when texting using i-phones and tablets, especially those with zoom capabilities. Word, for instance, allows the author to set the line-spacing, etc., but simpler editors such as Gmail do not. So, as one of my correspondents put it, ‘We are not in full control of how things display to participants’.

All I can suggest here is that authors space their e-mails along the lines I have suggested and then just pray that the layouts remain unchanged when the texts are posted!

Acknowledgements

I am indebted to my correspondents for their helpful comments and in particular to Alastair Gemmill and Nick Garnett for exploring with me how different systems use different procedures for sending and returning e-mails.

References


Hartley, J., Rowley, M. Two men and their e-mail (paper submitted for publication).
Ella Tennant (Perspectives of the 2016 Annual Teaching Symposium)

Keynote - Prof. Paul Kleiman
Creativity: choices, challenges (and a bit of chaos)

Prof. Kleiman began his talk with a series of vignettes, each one demonstrating that whatever creativity may be, it is often to be found beyond the confines of the standard structures in Higher Education. Using quotations from Martha Graham, Boden and Knight, the audience followed Prof. Kleiman in his search for an understanding of what creativity actually is and the challenge we face in attempting to develop a creative curriculum in Higher Education.

The answer appeared to come in the form of questioning the value of evidence-based work and designing open curricula to match a variety of imagined student journeys. Examples of how this might be achieved were mostly from the contexts of business and creative arts institutes. In Higher Education, Prof. Kleiman stated the importance of talking with students and allowing them to be “agents in their own assessments”. There were no details or examples of provided as to how this might work in practice, and how these ideas could be effectively transferred to disciplines which are heavily dependent on evidence-based content was not addressed. It would be difficult to argue with the statement that creativity does need to be recognised and rewarded. Innovations in approaches to teaching and learning do assist in providing ideas and the means for educators to ask their own questions and explore the best to creatively develop curricula for students in their particular discipline. Prof. Kleiman concluded that a creative curriculum is one which is designed for learning, and left us with 10 design principles on which this could be based. The resulting “elegant curriculum” would also contain empty space, which would then presumably allow flexibility to move content to suit students on different journeys. The title for the talk: “Creativity, choices, challenges (and a bit of chaos)”, was appropriate.

Frank Rutten (Perspectives of the 2016 Annual Teaching Symposium)

Presentations – Fiona Cownie, Katie Maddock, Kate Baker and Pete Lonsdale

Fiona Cownie, Keele Universities Pro-Vice Chancellor (PVC) for Education and Student Experience gave the official welcome to a very good-sized audience, filling most of the seats in the ornate Salvin room of Keele Hall. The theme of the event was clearly especially close to Fiona’s heart, as both an educator and to her role as PVC. Creativity forms a fundamental part of excellent teaching: whilst this is perhaps not always obvious and may be hidden “behind the scenes”, it is nonetheless crucial for a vibrant and informative student experience. New ideas are introduced at the Keele symposium every year, this year more rooms than previously allowed more intimate and hands-on exploration of a wide range of perspectives on creativity in teaching. As Fiona stated before handing over to the first plenary speaker: “Most importantly, carry on being creative!”.

Katie Maddock from Keele University School of Pharmacy had the hard task, which she grasped with gusto, to follow this excellent presentation, introducing us to the synoptic exercise forming the final (pass/fail) assessment at the end of the first year of the Masters in Pharmacy (MPharm) programme. She briefly introduced the audience to the single module format of the MPharm course, designed to encourage integrated thinking and combining practice with science, a format which allowed her to present a fun and effective example of creativity in assessment. The synoptic task, covering skills and knowledge developed throughout the academic year, brings together collective learning in self-selected groups of 4. It is designed to be fun and offer a great degree of free choice. Students are tasked to select one of a supplied list of drugs, not covered in detail in the course, but related to key themes. As part of the assessment they hand in, in which members are asked questions to explore their mastery of the material. Guidelines are given regarding the material that needs to be covered in the submission in terms of specified learning outcomes, such as production of pharmaceuticals, important chemistry concepts (pKa, logP), pharmacology of the chosen drug, its clinical use and potential side effects. Katie briefly described the viva voce aspect and indicated that group dynamics tended to prevent or make obvious driver-passenger issues that could then
readily be addressed. She then concentrated on the creative aspect, namely the submitted work, which the students were introduced to by means of a day-spanning exercise to produce a (men's or women's) magazine article on aspirin. After this the students are given two weeks to produce the actual submission, of which Kate then showed a number of examples from past years. A Monopoly game had all the usual aspects, including an adapted board and cards with question, which if not answered correctly did not lead to “jail”, but rather to “PR scandal”. And a crazy golf game came with its own club. Other submissions were inspired by Star Wars (incorporating all required aspects is no mean feat and requires a lot of creativity!), Who Wants To Be A Millionaire (a much easier option as the template is available from the ITV website...), a diary from a patient’s perspective, a novel on balsalazide, a menu “Gastro Pharmacie” and even included edible components such as cupcakes.

A superb if rather bizarre submission involved interpretative dance filmed at the lakes near Keele Hall – surely the epitome of creativeness!

The assessment is generally liked by students, apart from the viva aspect which some consider too unexpected in nature – rather missing the point of that component of the exercise...

As Katie summed-up, if given free reign, even scientists can be creative, have fun and learn a lot in the process!

After this fun and informative talk a lively discussion touched upon assessment and remedial work, which involves a “re-viva” as submitted work has always of sufficient standard. Introduction of an informal prize is under consideration to specifically encourage creativity, perhaps using a formal show akin to “Britain’s Got Talent”. Assessment of creativity is being developed for a final year exercise, using creative writing cues. The assessment criteria along with the assessment instructions are supplied to students in advance, so that they know what they are working to. International students can sometimes struggle with the creative aspects and if initial encouragement is not sufficient are supplied with a list of options, allowing them to meet the ILOs. Some submissions were actually transformative for the academics involved!

Kate Baker from Keele University's School of Life Sciences presented on work carried out in her previous post at Aberdeen University on personal development planning for international PG students. This scheme abbreviated as PIPS originated in Aberdeen, with a view of implementing it across Scotland.

Kate first explored aspects of personal development planning (PDP), highlighting the importance of structure and support as well as reflection on learning. Crucially it should support personal and career development and encompass a range of transferable skills, such as flexibility, self-awareness and communication skills. Prior to her project, PDP had mainly been focused on undergraduate students. This project was aimed at expanding that to a widely diverging postgraduate student population, with locally more than 50% of students originating from outside the UK. Taught Masters especially had been neglected. These programmes mostly comprise 1 year and are often vocational in nature. Students are from varied educational backgrounds and have very different experiences of PDP. Cultural differences can also be significant.

Phase 1 of the project comprised of interviews with international students and staff, compiled into report form. Significantly interviewees only had experience of CDP in previous workplaces, but generally not PDP. Very notable were limited transferable skills and a lack of reflection.

For PDP to be successful, Kate indicated that it is imperative that students recognise that this has the potential to lead to enhanced degree quality, increasing their employability in an ever more competitive environment. Communication with staff and awareness of cultural issues are key points.

Staffs interviewed were likewise not always fully aware of the meaning of PDP. Benefits recognised were increased student self-awareness and enhanced ability to manage and structure studies. To achieve this staff require training, support and above all enthusiasm. Especially challenging aspects identified in these interviews were cultural issues and the wide variety of students in taught PG courses. Kate then summarised the findings of this first phase of the project, identifying crucial aspects that will need to be implemented for PIPS to be successful: language skills; students taking ownership of their own PDP; explicit definition of benefits; avoidance of being patronising (tricky with such varied backgrounds!); managing expectations; encouraging lifelong learning. And staff needs to be well informed and fully engaged in the process.

Phase 2 of the project comprised the development of customisable PDP resources as a resource for the various PG courses. Each of these follow a similar structure, with an introduction setting the scene, followed by sections covering amongst others transferable skills, career planning and work experience. Kate specifically highlighted that facilitator notes and training to aid use of these are absolutely essential and need to include planning.

Beyond the scope of this very informative presentation that no doubt had lots of resonances with a substantial part of the audience, Phase 3 encompassed piloting across a variety of subjects and a variety of courses, followed by Evaluation in Phase 4.

In a lively discussion the need for flexible resources was further explored: these need to be adapted to each cohort and be engaging and fun, with vested interest and tangible outcomes. In the final talk of a fascinating and wide-ranging session, Peter Lonsdale from the School of Nursing and Midwifery at Keele gave...
an early insight in an on-going project using virtual headsets for training of nursing staff.

Five virtual reality headsets (Oculus Rift) were purchased to use with immersive videos in collaboration across the Health faculty, based on underlying earlier work with the School of Pharmacy. In that earlier work, the Keele Active Virtual Environment (KAVE), a full, projector-based virtual reality environment, was found to be very effective, but rather difficult to port across and complex to programme. The premise of this study was that the use of immersive video in a “3D virtual reality” if implemented well can be very compelling – akin being in someone else’s body – meeting the identified training needs without requiring a full virtual reality setup. The objective of the project, which is still very much in progress, is to produce immersive learning experiences such as putting Nursing students in the place of children during hospital submission.

Pete highlighted the potential of this approach by showing a number of demo videos. Whilst of course not nearly as immersive as the VR headsets, it gave the audience a bit of a flavour of what could be possible with this approach.

A first example was filmed from the point of view of a child on a stretcher being wheeled into a hospital, only able to see upwards. The first movie showed good practice, with on-going explanation by the nursing staff so the young patient would be aware of what was happening. Being filmed in a working hospital, it was nonetheless striking how noisy and disconcerting the experience would be for a child. The example of bad practice, in which no explanation was given at all, was truly disconcerting to watch – even on a standard projector screen. During training students would discuss and evaluate these videos, identifying the need for this aspect of their training.

The second example explored the way a child with (relatively high functioning) autism experiences the world around them. This video was made by the National Autistic Society and aims to give an impression of how a child with autism experiences sensory overload in a shopping centre (see “Can you make it to the end” https://youtu.be/Lr4_dOorquQ). The audience clearly agreed with students who found this a very intense, even scary experience. However, feedback from the student nurses was overwhelmingly positive in terms of their reaction to the video as a learning experience. They found it to be a very thought provoking activity and requested more videos to offer similar activities related to other health conditions and experiences.

Pete assured us that using the VR headsets makes this feel even more real. His and Julie Green’s study has found that 3D movies recorded on affordable equipment and displayed in this manner are sufficiently immersive to give the nursing and other healthcare profession students a real feel for the patients’ perspective and hence forms a very valuable addition to their training. Discussion of the experience with and between students is crucial to gain maximum benefit from the exercise. Ideally they should reflect on what they will do, observe an immersive video and use the experience to learn about the validity of their intended practice and modify this accordingly.

Unsurprisingly, there was much interest in this exciting application of VR. Pete explained that 3D was not essential for immersive experience, but could actually be quite affordably be recorded using a mobile phone camera. Keeping it simple had significant benefits other than cost of equipment and development time, as some can feel queasy in a full VR environment, but are fine using 3D.
Dear JADE Editor,

September 2016 is a time for Keele students to embrace a new academic year. I am pleased to announce that CHI-9007 Mandarin for Cantonese Speakers at the Language Learning Unit (LLU) has been approved by HumSS and is ready for Semester 1 2016/7.

This module is open to native speakers of Cantonese who wish to express ideas in Mandarin Chinese fluently and improve their ability to interact with native Mandarin speakers; to widen learners’ idiomatic and colloquial Mandarin knowledge; to improve competency in Mandarin sufficiently to be able to take Chinese 6 at Keele University.

Intended learning outcomes are to understand the main points of clear standard speech in Mandarin Chinese on familiar matters and focus on four key speech patterns or set constructions. Students should have some prior knowledge of written simplified Chinese.

Yours sincerely,
Emily Ouyang
Mandarin Chinese Tutor
Language Learning Unit
Keele University

Reference:
e-vision KLE - CHI-9007 at Keele Learning Environment (KLE)
Language Learning Unit Office CBB0.039
Mandarin Tutor Office CBB1.006
his edition might just be our biggest yet, with contributions internal, external, staff and student, events, conferences and research all making an appearance. Whilst as managing editor I am very pleased with this growth in diverse submissions to JADE, I do sometimes reflect on why this might be the case and what I keep coming back to is that good practice takes many forms. It’s easy to see under the current HE system how for example, a peer-reviewed educational research publication might be a solid metric of a person’s scholarship but what about the reflective pieces? What about the creative pieces? What about gamification? I feel the main strength of JADE is that it continually captures good practice in all its forms, sharing these widely and as such, I thought it was about time to share a mini-report of sorts with you to let everyone know how JADE is being perceived beyond Keele.

Selfishly, with this information I’m hoping to convince even more of our readers that they should be contributing to JADE but also to bolster our regular contributors to continue supporting us by giving us their work. Also, I thought I would try my hand at some very simple learner analytics to go with this edition.

So, to get us started…a little trivia for you…did you know that JADE is currently being accessed in over 10 countries right now? Not bad for a small journal, don’t you think?

JADE has been developing year on year since its first edition in 2013 and you are currently reading our sixth normal (“vanilla”) edition (but don’t forget our special international edition earlier this year too). The graph shown in the next page shows the increase in impact and exposure over the last three years, with the Y axis being number of visitors and the X axis showing each year in turn. I like that it starts small but gets big quick and most importantly….stays there.

In terms of individual posts, the small table below shows that we have made 17 posts (6 of these were the journals themselves), that we have had 7815 total views to date with 3516 of these registering as “novel” visits (the remainder being repeat visits) and our best hit count to date over a 24 hour period was 447 views for the 2014 August Edition. Oh, and it seems that nearly a quarter of
you access JADE on a Tuesday...mostly after lunch??

<table>
<thead>
<tr>
<th>Posts</th>
<th>Views</th>
<th>Visitors</th>
<th>Best views ever</th>
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<tbody>
<tr>
<td>17</td>
<td>7,815</td>
<td>3,516</td>
<td>447</td>
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Ok, so I am probably taking the web stats a little far with that last one, but you get my point about the impact of what may be considered a “small” journal.

This edition marks the first time we have had bespoke cover art too. What you can see up front is the first place entry from the Images of Learning and Teaching photo competition which was part of this year’s Annual Teaching Symposium, the winners of this being the Multi-User Laboratory in the Medical School and congratulations to them for a stunning (chilling!) image. Now that the flood-gates are open I can share with you that from this month onwards, JADE will allow submissions of potential cover art and hopefully, we should be able to keep the front cover of JADE a dynamic and exciting space.... announcements on what we are looking for will follow soon but if you just can’t wait, get in touch at JADE@keele.ac.uk to discuss your ideas with us.

Finally, I wanted to share a re-affirmation with you to end this edition as we tirelessly look towards the next. JADE will continue to evolve with each new edition and whilst we will always publish vanilla JADE (but please don’t start calling it that!) biannually, we aim to have another few special themed editions in the near future, the most imminent of which will be a collection of content from the recent successful JADE Student Learning Conference 2016, run by Dr. Chris Little, which will collect the impressive student work that was part of that event.

My main aim moving forward is to continue to carefully grow our impact nationally and internationally. There quite literally has never been a better time to get involved

with JADE as an author or as a reviewer...or ideally, both.

Until next time...writing hats on, keyboards at the ready...... GO!!

Dr. Russell Crawford  
Managing Editor
Open Call for Submissions

The Learning and Professional Development Centre is pleased to announce an open call for submissions on any aspect of teaching, learning or assessment for the next issue of J.A.D.E.

For those interested in publishing their educational research in J.A.D.E there is a short video introduction to the journal and full instructions for authors available at:

http://jadekeele.wordpress.com