A Walk Down the Red Carpet: Students as Producers of Digital Video-Based Knowledge.

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Biography.

Dr. Ryan is an applied biochemist and currently lectures on biotechnological, biochemical, chemical, quality and other ancillary aspects of the food and (bio)pharmaceutical Sciences. His pedagogic research focuses on the integration of novel technology into the teaching and learning environment and the effect of assessment, feedback and blended learning on undergraduate learning.

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Abstract
Disengaged and apathetic students are common in many undergraduate classrooms. Learning to these students is a passive process, typified by a consumer-like attitude. One approach to engage students, and enhance the learning experience, is to integrate active learning into the curriculum. The purpose of the pedagogical evaluative study described here was to investigate if student researched, designed and created digital video could act as a viable reusable peer learning resource. Although the use and integration of technology was central to the scope of this project, other ideas such as threshold concepts, the requirement for both active and authentic social constructivist learning, and student empowerment are pivotal to the rationalisation of this research. Overall, students appreciated an alternative method of learning; however, they were more reserved about their perceived learning and the usefulness of the peer generated videos as learning resources. This pedagogical evaluative study suggests that practitioners can introduce student produced digital media as an alternative student centred learning approach whilst simultaneously developing student soft skills.

Key Words:
Student generated content, digital video, storytelling, student as producer, student as scholar, authentic learning environment, active learning, learner-generated, engagement, pedagogical evaluation, technology, undergraduate, biochemistry.

Introduction

Student engagement and true understanding

In tertiary education many students exist as knowledge consumers; they expect knowledge to be passively transferred to them from their teacher with little engagement in the process, subsequently resulting in shallow understanding (Scharle and Szabo, 2000; Harrison-Hill, 2001). Several reasons are cited for this ranging from adhering to the perceived social norms (Yonn, 2011), under-preparedness (Astin, 1984) or simple insecurity (Weintraub, 1970). Enhanced student engagement and deeper understanding can be achieved by integrating active learning into the curriculum (Prince, 2004). At its most basic level, active learning can be defined as "*anything course-related that all students in a class session are called upon to do other than simply watching, listening and taking notes*" (Felder & Brent, 2009). The role of the academic changes to activity facilitator and the students actively construct their knowledge through engagement with the activity. Student activities should be specific and aligned to the learning outcomes of the curriculum (Stappenbelt, 2010). Biggs (2003, p.12) notes that meaning, and subsequent understanding, "*cannot be transmitted by direct instruction, but is created by the student's learning activities".* Through carrying out these learning activities (either inside or outside the classroom) students can deepen their understanding; however, in this process of knowledge construction students often struggle with the context and content of the activities. As a student works their way through these struggles, (s)he begins to develop a true understanding of the concept. This struggle is akin to overcoming a threshold concept of a particular subject (Cousin, 2006); which chimes with Bruners' '*Spiral Curriculum'* (1966) wherein the student returns to a concept a number of times, each time probing deeper. Eventually, through struggling with the concept and many journeys to and fro-, the student overcomes the overarching concept threshold and releases the knowledge within.

Students as producers of knowledge

Echoing these ideologies, and on a more practical level, Neary and Winn (2009) have suggested the positive effect on students learning through the inclusion of real-life, complex and unstructured research-like activities at the core of the undergraduate curriculum; following this paradigm the students act as '*producers*' of knowledge. Students are encouraged to develop their understanding of a topic by carrying out research, or research-like, activities. However, it is crucial that the research activities are aligned to the curriculum and as authentic as possible in order to enhance the student learning experience (Schuck and Kearney, 2008). Integrating research-like activities into the undergraduate classroom can develop skills that prepare students for life-long learning and enhance their future employability. The type of research carried out by students can vary from research led, wherein the student learns about current research and is thus lecturer centred; to research based, where the student is central to the process and undertakes research and enquiry (Healy and Jenkins, 2009). A subtle blend of this research spectrum would provide appropriate structure and support for students, whilst simultaneously allowing students to develop as autonomous learners.

Technology integration to enhance learning

Finally, students are becoming ever more aware and comfortable with technology (Sharples et al, 2010). It is part of their everyday life, and as such, integration of technology into the classroom is a *'fait accompli'*. Students demand the most interesting and up-to-date technology as part of their learning (Skiba and Barton, 2006). Outside the classroom students exist in a digital world; social media outlets allow for instantaneous collection and sharing of text and multimedia data. These '*digital natives*' who grew up during the digital era intuitively create, modify and publish digital media to their online community and in return they receive feedback in the guise of "*likes*" and comments; however, they are restricted from using these innate skills in the classroom (Richardson, 2008). '*Digital migrants*', students who did not grow up in a digital era, are alternative '*digital citizens'* that comprise part of the student populous. These students were not exposed to the digital explosion for various reasons including socio-economic background, age, and gender (Mattisson, & Schamp-Bjerede, 2012). As such technology competency is not homogeneous amongst the student cohort, even the digital natives may not be so technology savvy when confronted with unfamiliar, specialised software (Thompson, 2013). However, one of the key graduates attributes most valued by employers is technological aptitude. Perhaps, embracing the potential power of technology in the classroom requires a certain bravery on behalf of the both the student and academic. Even more courage is required by the academic to release control and allow the students to become active '*producers*' of their own knowledge in a novel way? In this research, students actively researched and produced their own digital video resource as part of their engaged learning experience.

Research Context

Tertiary education, particularly in the early years of a degree programme, often involves co-teaching large, mixed classes and this pedagogical evaluative study focuses on a typical second year foundation biochemistry module. The class comprised three large honours degree courses (100 students in total) each specialising in different scientific areas; pharmaceuticals, nutraceuticals and food innovation. The module was delivered as an equal mix of theoretical lectures and practical based labs (24 hours each per semester) and a concurrent period of self-study (a minimum of 52 hours per semester) to supplement class and lab time learning. The module descriptors define that each class must be assessed based on class specific and specialised projects. Typically assessment took the form of laboratory skills and scientific report writing for the practical element of the module, and a written essay and terminal written exam for the theoretical part of the module. The pedagogical evaluative study described here replaced the traditional essay with a student produced digital video within the assessment strategy; the effect(s) on student engagement and perceived learning of this modification were investigated.

The research focussed on a class of second year undergraduate biochemistry students over the course of one semester (12 weeks). These students successfully completed first year modules in both fundamental chemistry and biology, and as such had a basic understanding of the biological building blocks ('*biomolecules'*) and concepts of biochemistry. Student groups (four per group) investigated a biochemical area of interest to them and designed, developed and presented an educational digital video to their peers. Upon completion, all digital videos produced were showcased to peers and academic staff and formed the basis of an in-class discussion. The students work was assessed and the module and assessment breakdown is outlined in Tables One and Two.

Pedagogy of this study

The implementation of the 'student as producer' philosophy took a scaffolded and structured approach, see Figure One. Initially groups of four students (n= 25 in this study) self-assembled and this led to self-selected student groups brainstorming and researching ideas of interest to the group. Each student group was provided with resources to assist in brainstorming and storyboarding their ideas. Each group attended a review meeting with the academic to discuss their project and video plan, focussing mainly on the underpinning science and the theme of the video production. The academic was involved initially during the students brainstorming and topic selection; however as the project progressed the academic involvement decreased dramatically as the students took ownership of their project. Once the student groups decided on a topic the academic facilitated deeper student learning by accommodating peer review sessions, termed '*speed reviewing*'. In these peer review sessions students circled the classroom and spoke to peers from another group describing their project for three minutes. The peers then provided feedback through the '*two stars and a wish approach*'. This is a feedback/feedforward approach based on the reviewer commenting on two things they like (the stars) and one idea they think would make the video better (the wish; Atkinson and Black, 2007). Each peer review took five minutes in total and then the students moved around the classroom to discuss their project with another classmate. Once each group was satisfied they had considered all sources of constructive feedback/feedforward, they progressed to video shooting and editing. The majority of groups

(>80%, n=25) used their personal mobile phones as hand held recording devices; the other groups used standalone cameras with video recording capabilities. Only one group used a specialised video camera. Free to download (e.g. trial versions of *Camtasia*) or free online editing software (e.g. *www.wevideo.com*) were used in all cases by students during the video editing phase. Final submissions were uploaded by a nominated member from each group onto a private class YouTube channel where students could watch (and re-watch) peer produced videos at any time. Videos were streamed from the YouTube channel during the '*show-and-tell*' class. Students were asked to keep a reflective diary (ungraded and not reviewed by the academic) during their project; this was used by the students as they completed their end of project reflective essay, which was uploaded to the Institutes virtual learning platform, *Blackboard*, for academic review.

Pedagogical Evaluation Methodology

Pedagogical evaluation followed best ethical practices, and conformed to the Institutes Research Ethics Guidelines. The data collected took several forms; an anonymous multiple choice questionnaire (n=43), an independent academic facilitated discussion forum before (n=8) and after (n=8) the research, an anonymous standard institute module review form (n=80), personal student reflections (n=100) and a personal reflective researcher diary (n=1). Personal student reflections (n=100) were short essays (approximately 2000 words) written by each student reflecting on their learning journey. The students were guided in the layout of this reflective essay; however, the content was not prescribed by the lecturer (Orland-Barak, 2005). All data were collected once the students had completed the module with the exception of the reflective diary, which was recorded by the researcher on an on-going basis, and the pre-research project discussion forum. The reflective diary recorded 'informal' discussions with students, personal researcher observations and comments. Students were asked for verbal consent to allow the researcher to record an interesting or relevant point raised during an informal discussion. Qualitative data were coded using into several key themes and sub-themes based on researcher interpretation influenced by Strauss and Corbin's (1990) Method of Constant Comparison. Additional analysis of the personal student reflections (n=100) was carried out by coding emotional words based on a -10 to +10 arbitrary scale. On this scale -10 were the words describing the most negative emotions (e.g. *really stressed* and *fear*) and +10 being the words describing the most positive emotions (e.g. *elated* and *proud*). Non-emotive descriptors of the project/process were coded with a 0 value. The emotions associated with section of the project (e.g. brainstorming, editing) were plotted against the number of mentions in the student reflections thus indicating when most -10 scaled emotions were noted (for example, in the editing phase), the most +10 scaled emotions (for example, in the post 'show and tell' phase) and so on. This approach was based on Fischer and co-workers' (1990) and Kort and colleagues (2001) prior research on emotional hierarchy research and emotional descriptor scaling. Data saturation was observed, as per the qualitative coding method employed. Subsequent data triangulation was utilised to ensure only valid themes were investigated and that the examples and findings are based on feedback from as broad a student base as possible.

Pedagogical Evaluation Results

The data collected were classified into themes, below, and included positive and negative aspects of the student learning experience (see Table Three).

Emotions

A theme woven into all forms of data collection was the common emotions felt by students throughout the different stages of the video production. In their personal reflective essays written after project completion, the majority (>90%, n=100) students initially described their emotional sense as "*daunted*" and "*terrified*" as they approached what they considered an "*adventure into the unknown*". The project did push the students out of their comfort zone, and this was mentioned consistently through all forms for post-data evaluation; however, this was less an issue for those students who took part in the pre-project discussion forum. At this point the students were aware of the project type; but perhaps students were unwilling to comment on their insecurities regarding the project in front of their peers during the group discussion forum. Safety to reflect openly was observed in the individual reflective essay, and the vast majority of students (>90%, n=100) recorded feelings of fear and unease during the initial part of the project. As the students moved through the project, most noted feelings of excitement and enjoyment as they began brainstorming and researching areas of interest to them and their group. The direction of the independent learning was decided by the students themselves and this empowerment was well received by the students. The learning boundary (Thomas and Brown, 2011) was large; the students could choose any topic which had a biochemical underpinning, and this did result in some students becoming over-awed by their perceived freedom. The constructive feedback received from the academic and peers during dedicated feedback sessions further enhanced the students' positive emotions that also continued through their video-shooting phase. Some student groups (38%, n=43) digitally captured their learning experience through photographs and the sense of fun and enjoyment was readily observed in these images. However, the student emotional profile dropped when they entered the editing phase of video production. Many students (85%, n=100) commented how this was "*frustrating and very time consuming*" and resulted in many students having a poor experience overall. Negative emotions continued through the time leading up to submission and prior to the 'show and tell' day. These negative emotions mainly centred on the student fears of what their peers would think of their work. After the 'show and tell' event almost all students (>95%, n=100) returned to a positive emotional stance with feelings of pride highlighted in both the post-project discussion forum and the majority of the reflective essays. Figure one schematically outlines the students 'emotional rollercoaster' as they journeyed through the project and is based on the post-hoc analysis of the student reflections.

Active Learning.

In this pedagogical evaluative study students were tasked with producing a video detailing a biochemical concept that they researched. The video was intended to be a reusable learning object, so far as their peers could watch (and re-watch) the video to enhance their understanding of the topic of the video. Overall the students derived most learning from their brainstorming, independent research and group based discussions on their own topic. The results of the anonymous multiple choice survey, which mirrored both the opinion focus groups and reflective essays, noted that the majority of respondents (61%, n=43) learnt a little from watching peer generated resources. A more positive outlook on learning was noted when asked about their own video, with 84% (n=43) citing they learnt some or a lot on the topic of their video. Interestingly, students learning patterns were not influenced by the use of multimedia in their assessment, with 44% (n=43) of students claiming no change in their learning approach and another 44% (n=43) noting only a small change. This was most likely due to the fact that this group of students had been exposed to multimedia based learning, in the form of playing relevant short videos in class, by the researcher in a previous year. Furthermore, students noted that they spent much more time researching their individual sections of their video than they would have done for an individual essay. This motivation came from the desire to not let their group mates down and also the end-product was seen as important to their classmates learning. Aligned to the ideas of Threshold Concepts (Cousin, 2006) and the Spiral Curriculum (Bruner, 1966), several students (45%, n=100) described how their group had to "*rethink*" their plans a number of times and to "*take a different approach*" after personal research, group discussions and peer and lecturer feedback. This discussion-based, directed independent research enhanced the student learning experience as the students became more confident as autonomous learners: '*by teaching others I also taught myself*'. One student comment, noted in a personal reflection, summarised this succinctly: "*It proved to me that I don't always need the lecturer to explain things, I can do it on my own*".

Group Work

Overall the students enjoyed working in groups on this project. Of the students that responded to the anonymous survey, the vast majority had an overwhelmingly positive view, with 93% (n=43) enjoying the experience of working in groups. Furthermore, 72% (n=43) of students surveyed noted that there was no conflict within the group. This trend was also observed in the other forms of evaluation. Interestingly, several student comments in the personal reflective essay highlighted how many enhanved their personal friendships with peers as a result of working together on the video project. Although the project was assessed, the type of group work in this study allowed the students to be more creative in comparison to the group work tasks they had previously been exposed to (e.g. group report writing) and prompted one student to reflect: "*I liked this assessment, it didn't feel like an assessment, but I still learnt lots, had some fun and made new friends in my class"*. Students also developed their core communication, collaboration and project management skills, oftentimes citing the experience of group members positively influencing their personal development in these areas.

Over half of the students commented that they felt '*safer*' working with peers on this project as they could work together to figure out issues that arose. Furthermore, other students (15%, n=100) commented that the project was too big for one person to do alone and thus the group had to work together to complete. In previous group assignments this cohort of students struggled with group work activities; they questioned the need to work in groups when the task could be more effectively carried out individually. In this pedagogical evaluative study the opposite was noted; students worked together in almost every aspect of the project. Student groups assisted other groups with peer feedback and helped with the more technologically challenging aspects of video recording. One aspect in which the group effort was reduced was the editing phase, and this aligned to the most stressful time for students. In most cases the editing task fell to the most technology competent individual within the group, placing additional pressure on this student. In many cases the editing phase was not given sufficient time as students prioritised the brainstorming, researching and shooting components. During the discussion forum one group of students (n=8) reflected that division of editing duties supplemented with a supporting student community of practice could have reduced the negative emotions noted towards this phase of the project.

Use of digital video technologies

Students oftentimes grapple with the seemingly polar worlds of the instant gratification and contact of their social media driven, technology enhanced worlds compared to the slower paced world of scholarly activity and deep understanding (Welton, 2011). This case study aimed to better align these two worlds by providing a space to both carry out scholarly activity and utilise the power of prevalent modern technology. Prensky (2001) described students of this era as '*digital natives'*; students who a confident and capable with technology. However, in this study many students struggled with the technological aspects of the project. In over three quarters of the personal reflections, students commented that they were not '*confident with technology*'. These students noted that they could use common software (e.g. MS Office) and social media based technologies (e.g. Facebook and Twitter being the most cited); however, the prospect of applying their knowledge to a new task (e.g. editing software) resulted in fear and anxiety. The interchangeable skills associated with the digital native were not apparent in the majority of the student populous in this case study. Indeed, initially a small number of students (<10%, n=100) students questioned the need to learn these new skills, citing that they could not imagine using them again in their future careers (e.g. laboratory based scientists). The majority of students (72%, n=43) that responded to the anonymous survey concluded that their computer skills improved over the course of this project; however, many of these commented that this improvement was mainly noted in the use of video editing software. In the discussion forum, students reflected that those with more experience in computer based technologies found it easier to adapt to the new technologies experienced in this project; and thus they saw the benefit of being exposed to new and alternative technologies that may not be directly linked to their perceived future careers. In general, students reflected that this exposure helped to remove their personal fear of using new technologies.

Reflection on Learning

The student written personal reflections on learning were the first time this cohort of students were exposed to reflective writing. Although the students were provided with resources and trigger questions to encourage deep reflection; many reverted to descriptive writing with no analysis of, or reflection on, their learning. However, those that did reflect deeply commented that they found this a useful method to cement their learning as it gave them a time to '*look back and think about what and why* [the student] *learnt*'. Students that did not engage in deep reflection questioned the reason for the reflective essay: '*I don't see why I need to write a reflective essay on the video when it has nothing to do with biochemistry*', suggesting alternatives of '*summary presentations or another essay'*. These student comments chimed with previous student comments regarding the direct relevance video integration into a biochemistry course. This requirement for only the information required to pass the subject exam may be a hangover from the second-level educational system which most of these students experienced. In this education system many students are 'spoon-fed' information from their teacher based directly on the expected terminal examination topics with little time provided for epistemological development, peer-discussion or constructive learning (Scharle and Szabo, 2000). This is a reoccurring problem in Irish Higher Education Institutes, in particular early year undergraduate students (Keane, 2011). These students have simply not experienced the social constructivism pedagogical paradigm and may be unwilling, or unwanting, to try it. Typically, these students did not take responsibility for their deep learning; instead they were passively relying on the academic to provide only the relevant information to pass the terminal subject exam. Conversely, those students that engaged with the process reflected positively on the learning experience: '*Looking back, the topic we choose was interesting to me and relevant to the real world; through brainstorming, researching and making the video we made biochemistry come to life'*.

Discussion

Positive emotions yields positive experiences

The emotions experienced by students can affect the learning experienced by a student. On a very basic level, if a person derives pleasure from an activity they are more likely to re-engage with that activity. Walker (2013) describes how enthusiasm is linked to an enhanced learning experience, echoing previous studies which indicate that positive emotional experiences can positively influence learning and academic performance (Artino et al, 2010 and Pekrun, 1992). Lehman and co-workers (2008) note that students experience a myriad of emotions as they move through their learning pathway. For example, confusion and frustration are observed when students meet roadblocks on this pathway; whilst happiness and joy are commonplace upon journey completion. Repeated feelings of failure and rejection can ultimately lead to boredom and disengagement. In this study, post hoc analysis of the student reflections (n=100) revealed a periodical shift in student emotions that correlated with specific sections of the project. In this study, and echoing Peckrun and co-workers (2011), positive student emotions aligned to areas where the students perceived most learning to take place (e.g. during brainstorming and researching). Conversely, negative emotions were associated with areas of lower perceived learning and subsequent relevance (e.g. editing). This emotional journey was not foreseen during the project design and implementation; instead it only became apparent after the project completion. The majority of these crucial emotional time points (e.g. shooting, editing) took place outside the classroom and without the presence of the lecturer. However, rubrics can be used of use to gauge real-time student emotion; for example the '*Emotional States Assessment Technique*' (Walker, 2013). These assessments can be used to ensure the student learning experience is emotionally optimal at all times during the process. Real time statistical documentation of the student emotional state over the course of the project was not carried out and this will form part of the next iteration of this study. The emotive words used in the personal reflections and the group discussion did, however, align to Walkers' four major emotional states; anxiety, enthusiasm, dejection and calmness following post hoc analysis (see Figure One). Understanding the student's emotional learning journey, and the point at which the student is at on this rollercoaster, can allow the academic to provide suitable support at the relevant time and thus improve the students journey and subsequent learning.

Active learning results in productive students

In this pedagogical evaluative study an active learning pedagogy was adopted; the students had to apply their knowledge, synthesize various multimodal sources of information and produce a comprehensible video resource. Active learning is, quite simply, a learning environment in which the student must do something and it is through this action that the learning process is enhanced and leads the learner to deeper understanding. To be most beneficial active learning should require the learner to employ higher order thinking skills such as analysis, synthesis, and evaluation (Bonwell and Eison, 1991). Active learning encourages active student participation and ownership of learning; it accounts for the different skills, levels of understanding and abilities within a student population and has student centered learning as its central dogma. Typical didactic teaching and associated assessment relies on a hierarchical environment where the academic is in control and the source of all information. Structured active learning releases this control and encourages autonomous learners capable of higher order thinking and deeper understanding (Stappenbelt, 2010). An added advantage is the double-loop nature of action learning where the learner not only learns from the experience but also develops the ability change their mind, reframe a problem and identify alternative solutions (Chambers et al., 2011).

Although a key goal of active learning is to encourage the development of independent learners, Pedler and co-workers (2005) describe the need for taught elements within the action learning model. This links to the initial facilitating role of the academic, which decreases with time as the student groups become more comfortable, confident and autonomous in their learning environment. In this pedagogical evaluative study the role of the academic was to provide resources and guidance at the start of the project, followed by a review meeting with each group. After this initial input the student groups became almost entirely autonomous. Furthermore, the role of social constructivism, in which the members of the group (and class) provide learning opportunities for each other, is important. This was observed as groups assisted each other with video shooting, software assistance and peer review. Group based discussions on problem identification, action planning and reflection on completed solutions (or inappropriate solutions) can enhance each members comprehension and may lead the learner to a deeper understanding than if the experience had been solitary (Sheets, 2010).

Group work enhances peer learning

Active and engaged students regularly participate in co-operative peer learning; supporting each other's learning both inside and outside the formal classroom setting to the benefit of all those involved (Topping, 2005). Boud (2001) notes that in everyday life people continually learn from each other, so why should the classroom be any different? Students can learn a lot from explaining their view on a concept or question. Indeed, a student will often ask another classmate for help before seeking academic advice. This intrinsic kinship can be harnessed and directed through appropriate guided group activities, which simultaneously question and engage the participants. Kearney and Schuck (2006) observed that student generated digital resources were most beneficial when time was allocated to the students to allow them *to "discuss and celebrate"* their products with each other and a relevant audience. Additionally, if the digital resource development is an assessment; alignment to in-class activities can help reduce the innate student dislike of assessment. These elements were reflected in this pedagogical evaluative study as, for example, students commented on the beneficial aspects of peer review in class activities. This link between the classroom and independent learning time encourages the student to continue with group discussion, imagination, theorising and, ultimately, development of their own "*production*" space within their personal learning environment. The student becomes more confident in their role as a source of support for others within their group and the progression towards knowledge producer continues (Ryan, 2011).

Appropriate use of technology in an authentic assessment for learning

Learner produced objects used for student and peer learning is not a new concept; examples vary from simple paper based activities created by students for students to digital reusable learning objects such as student produced podcasts (Lee et al., 2008). In recent times the use of student generated digital video has become increasingly popular at all levels of education; recent examples range from primary (Schuck and Kearney, 2008), and secondary (Hiller et al., 2012) to third level, including teacher training (Kearney, 2012), language education (Nikitina, 2010); and marketing and accounting (Greene and Crespi, 2012). The use of student generated video content is gaining some traction in the Sciences also. Current examples span the spectrum from in-house student generated instructional videos for laboratory equipment, accessible through strategically placed QR codes permitting peer 'just-in-time learning' (Shultzginger, 2012) to the international MIT/Khan Academy '*Making Video to Make a Difference*' Initiative (Chandler, 2012). Students in this study noted that the brainstorming, researching and shooting of their own videos enhanced most their perceived learning. However, viewing peer produced resources did not deepen student perceived knowledge, which contradicts previous publications citing positive student learning based on peer produced digital resource (Kearney and Schuck, 2006)).

Alternatively, Greene and Crespi (2012) outline the benefits to the student who produces a video compared to, for example, a once off presentation. During the video production several steps must be articulated and physically carried out; the student must analyse and synthesise several multimodal sources on the subject content, then the student must script, rehearse and shoot the video. Often times this process is repeated several times and each time the student refines not only their resource, but also their understanding of the content. If the digital resource is produced as a group activity additional benefits include; meaningful student interactions, enhanced communication proficiency, project management skills, learner co-operation and autonomy (Robin, 2008). The process becomes a student-orientated, social constructivist activity where the student(s) take ownership of their project and become responsible for the product and, subsequently, their learning (Harel and Papert, 1991). In this case pedagogical evaluative study one of the most positive outcomes was the development of tangible student soft skills such as collaboration, communication and project management. These are key employability traits that employers seek in potential employees (Ju, et al., 2012).

Reflective Students are empowered students

In this case study a student-centred pedagogy was favoured and this allowed students to take ownership and hence responsibility for their knowledge production; this facilitated students interacting with ill-defined and authentic tasks, giving the student a more real-life learning experience (Koehler and Mishra, 2005). Providing the students with time and space to reflect deeply on their learning experience allowed students to appreciate their central role in their learning. Although supported by lecturer scaffolding and facilitation; students worked, to a large degree, autonomously. For example students found autonomy and responsibility in specifying their area of interest, the style of video delivery and determining their own finished product (Nikitina, 2010). Empowering the student with this autonomy resulted in student engagement. Furthermore, the nature of the activity permitted experiential learning and meaningful play, whilst simultaneously enhancing student motivation and media literacy which will serve the student well as they progress in their undergraduate education and into their technology driven careers (Schuck and Kearney, 2008).

Conclusion

A pedagogical paradigm shift

The dynamic use of video, when appropriately timed and aligned to the curriculum to achieve an authentic learning experience, can lead to new directions in pedagogy (Bell and Bull, 2010; Shewbridge and Berge, 2004). To enhance and deepen the learning experience, the technology must employ the highest cognitive category of 'generation', which elevates the resulting digital product from representation or presentation (Hedberg, 2006). Similarly, motivated students will engage in higher order thinking and will autonomously research, synthesise, analyse, create, edit and ultimately '*produce*' their own knowledge. Research centred, student produced knowledge can also give the students an earlier, and more positive, research experience compared to the traditional 'capstone' final year project (Healy and Jenkins, 2009). Those students that engaged with the project were empowered to take ownership of their learning and study effectively and efficiently through a unique approach which is most conducive to their style and will require less guidance (Carver et al., 1999). Empowered students are likely to become engaged students; engaged students are likely to be active "*producing*" students.

Future Work

Several changes will be implanted in the next iteration of this study:

1. Student emotional status will be tracked in real time at the critical points; indicated as peaks and troughs in Figure Two. An adapted version of Walker's (2013) '*Emotional States Assessment Technique*' will be available online for students to electronically recorded their emotional state as they progress through the project. This will allow the lecturer to monitor the general emotional state of the class and provide general assistance in a more time effective manner.
2. To vary the scope of the project and to add additional value to the video making process the digital outputs will be created for, and made available to, selected science classes in partner secondary schools. This Community Based Learning approach will provide the students with real end users for their videos and the partner secondary school students will benefit from dedicated videos based on topics that will help them prepare for their terminal exam.
3. Additional technical support will be provided for the students, particularly in relation to the editing of digital video. This will take the form of screencasts of selected free-to-use software demonstrating the basic functions and methods permitting the students to asynchronously learn and use the editing software. Students can then explore the capabilities of each editing software tool at their own pace, but every student will be confident in carrying out basic editing. This should reduce the negative emotions noted at this time point of the project (see Figure Two).

Limitations

This study was carried out at a single institution, focusing on a single module. Additional studies can be carried out to investigate the applicability of this approach in other education settings and levels.

The researcher was also the lecturer involved in delivering the theoretical element of this module. Pedagogical evaluation data were collected anonymously where possible (e.g. online survey) or by an independent colleague (e.g. discussion forum); however, student and participating researcher bias cannot be totally discounted. Participation in each evaluation data set was voluntary and this may have attracted the extremes of the student group (e.g. those that were really engaged or those that wish to sound off). In order to reduce the likelihood of this, a mixed method of data collection was utilised. Students were aware that participation (or non-participation) would not affect their module grade or lecturer opinion of them.

The researcher was also the designer of the project; however, best pedagogical practice was observed at all times. Colleagues were used as "critical friends' in the design and ethical approval was achieved for the project evaluation design and implementation. Researcher bias during project implementation was unavoidable, as both the researcher and lecturer enthusiasm for the project was evident. In order to reduce this effect, the students were made aware at the start of the process that they were taking part in an alternative learning process. Researcher bias during data analysis also cannot be discounted entirely; however, data triangulation was used to ensure only valid themes were investigated and examples selected were representative of the general student cohort.

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Table One:
Module assessment breakdown, indicating the activities and weightings associated with each assessment element incorporating the video assessment project.

Assessment Element	Activity	Weighting
Lecture based Continual Assessment	Group produced video on a biochemical concept.	20%
Laboratory based Continual Assessment	Group produced laboratory reports (n=4) on weekly experiments.	20%
Terminal Exam	Individual, closed book, written exam. 1.5 hours in duration.	60%

Table Two:
Breakdown of the lecture based, continual assessment, video project into individual components and the weightings associated with each element assessed. The method of submission, and subsequent assessment, is also outlined.

Component	Submission	Details	Total Mark
Multimedia Video	Group	Story board planning and preparation (20%). Pre-video synopsis and final video (55%).	75%
Peer Assessment	Anonymous	Group members individually peer assessed.	5%
Reflective Report	Individual	Personal reflective essay detailing the students learning journey.	20%

Table Three:
Major themes and findings summary of this research.

Theme	Summary
Emotions	Students experienced periodic emotional shifts; positive emotional states correlated with perceived deeper learning.
Active Learning	Students engaged with the brainstorming, researching and video shooting tasks; however, most perceived learning took place within each students group. Inter group learning was not highly rated.
Group work	Students enjoyed working in groups; social and employability skills were developed and enhanced.
Use of Technology	Students, in this case study, were not as digitally literate as expected. Students struggled to adapt their existing technology skill set to new tasks.
Reflection on Learning	Students that reflected deeply appreciated their role, and responsibilities, in their learning.

Figure One:
Schematic representation of the structured and scaffolded 'Student as Producer philosophy'. The 'Student as Producer' activities are noted in the aligned grey boxes. Storyboarding followed the initial brainstorming and research. The academic reviewed and discussed these topics in the first Peer Review (PR) session. Reworking of the storyboard (S/board 2) took place after the initial academic meeting and before the second '*speed peer review*' session (PR 2). Students groups completed any final storyboard adjustments during the 'review/rework' phase prior to shooting their video and subsequent compilation and editing. A nominated member of the group uploaded the final product to a private class YouTube channel and the video was streamed from here during the in-class '*show and tell*' session. The final element of the project was an individual student reflection; this comprised reviewing and reflecting over the course of the project to deepen the students appreciation of their learning. The topics (white boxes) covered during in-class lectures are mapped onto the timeline for indicative reference only.

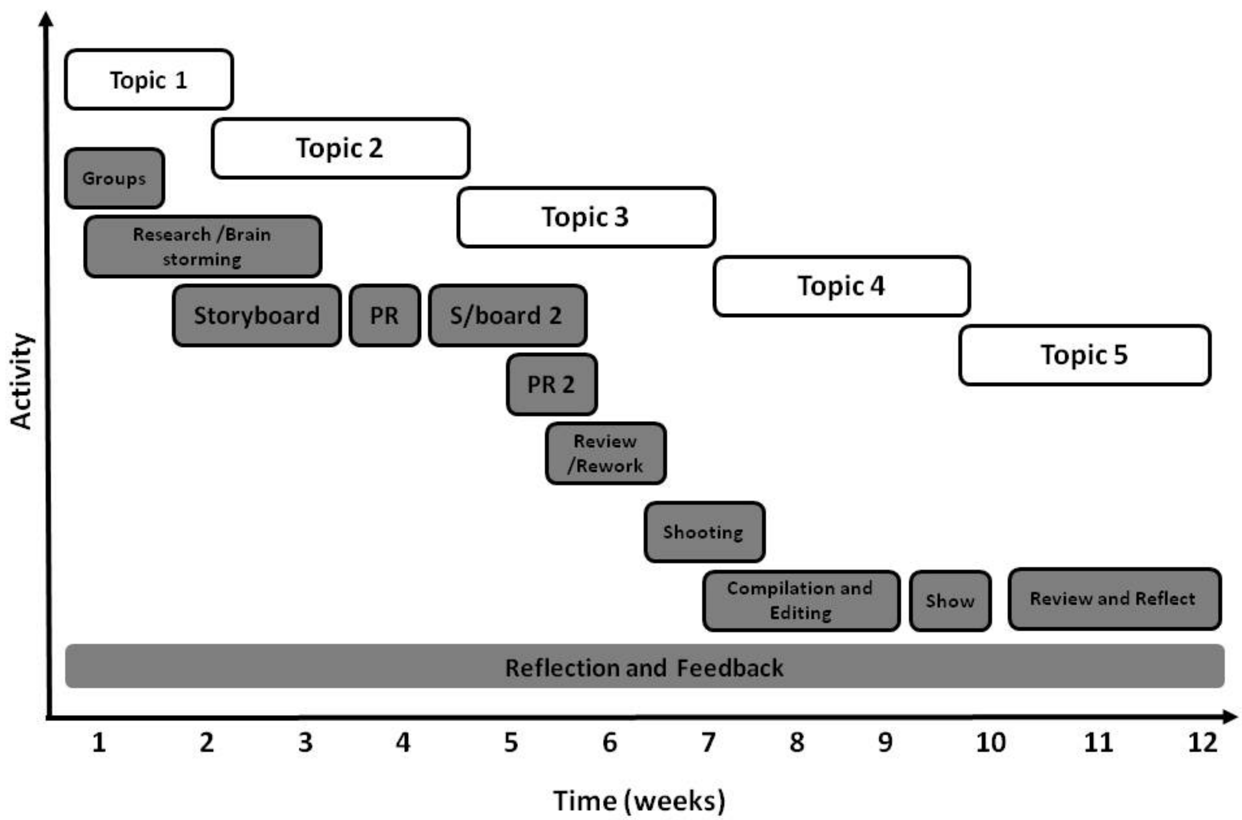
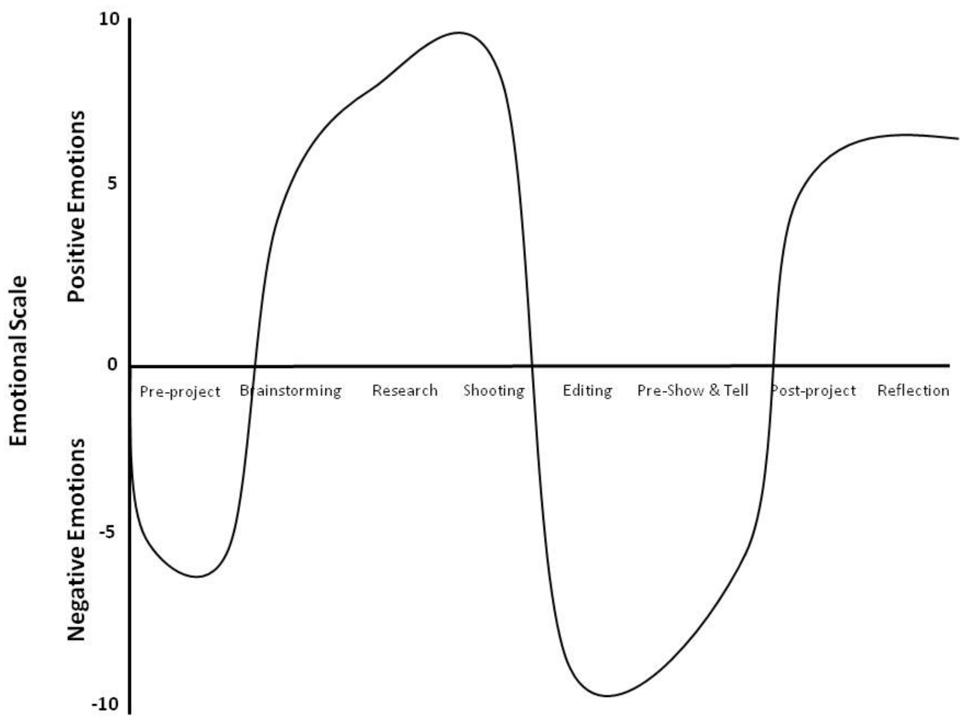


Figure Two:
Schematic representation of students' emotional sense throughout the different stages of the project. The emotional descriptors were rated on an arbitrary scale between zero and ten, either positive or negative based on Fischer and co-workers' (1990) adapted emotion hierarchy. Neutral words describing the project (e.g. descriptive words about the process) were attributed a weighting of zero. Emotions were graded on their perceived positive or negative emotion strength. For example, '*good*' and '*enjoy*' were deemed mid level positive, whilst '*elated and proud*' was recorded as highly positive. Conversely, words and phrases such as '*dislike*' and '*really stressed*' were examples of medium and high negative emotions.



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