Improving student motivation using technology within the STEM disciplines

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Abstract

Getting students motivated within STEM subjects and beyond is essential to ensure that they perform well in their studies and become employable. This paper reports on a study working with students at Coventry University College (CUC). The students were required to consider the technology that appealed to them, and how the use of that would improve their motivation to become successful learners.

209 students responded to the survey, 97 of whom were studying STEM subjects. This group of 97 included 78 students taking Science and Engineering and 19 studying Information Technology (IT). Within STEM, IT students were found to be much more accepting of technology than Science and Engineering students.

89% of students were found to own laptops and 80% owned smartphones, suggesting that delivery of materials using those technologies would be motivating. However, students themselves considered that they would become more motivated when using tablet computers for study. There were devices which only 25% of students said they owned and not reflective of the no frills style of education offered at CUC. Students also reported that they did not feel that the use of social media technology within education would improve their motivation. They wanted to keep their social and academic aspects of life separate.

The paper concludes with recommendations provided by students to improve motivation, including increasing the uptake of materials delivered through the mediums of video and audio mediums. The need to apply these research findings to students on a local level is also noted, due to the unique features of the CUC programme of educational delivery.

Keywords
student motivation, technology, STEM subjects, learning styles, social media
1. Introduction

Inside the changing world of higher education, university tutors and lecturers can struggle to motivate their students. Petty (1998) states that, “motivation is regarded by experienced and inexperienced teachers alike as a prerequisite for effective learning”. This certainly appears to the case in Science, Technology, Engineering and Mathematics (STEM) disciplines. Students working within these disciplines are ingrained in technology within their everyday lives. Hence, these students could be expected to wish to see technology widely used within the classroom.

This paper explores how technology can be used to enhance the educational experience by the stakeholder groups of tutors and students. The focus is on the technologies that students have identified that will increase their own motivation. This will hence allow them to be more active in the classroom, to produce a higher quality of work, and to become more employable upon the completion of their studies.

The need to explore student motivation is well-understood within the academic literature. Maslow (1943) identified five categories of universal human needs; within educational practice, these demonstrate a need for students to feel a sense and worth and achievement from their studies. Dewey (1938) believed that learners were motivated by individually adding personal meaning to the subjects that they studied. Bandura (1982) explored the need for students to develop a sense of self and make personal decisions about the learning activities they participate in. Providing choice and opportunity to meet student learning needs, and adapting this to students preferred use of technologies, would seem to be necessary for modern motivation within the classroom.

The data analysed for the paper was collected from a survey of students at Coventry University College (CUC). The technologies currently used by students and the technologies they would like to use are both considered. Underlying issues, such as the perceived usefulness of web media and aspects of social media are also explored. Recommendations about how these findings can be integrated to improve education are also drawn out from the open answers provided by the student body.

2. Survey Participation

The results given in the paper are based on a survey returned by 209 students enrolled in either Foundation (Level 3) or First Year Undergraduate (Level 4) study at CUC. CUC is a no frills private university college offering courses validated by Coventry University. CUC offers qualifications in seven areas of academic study, with fee levels below typical university prices and primarily attracts students drawn from the area around Coventry. Two of the seven subjects offered by CUC can be classified as STEM disciplines, namely (1) Information Technology and (2) Science and Engineering.

The survey was offered in a two page printed form to all HE students studying at CUC in February 2013, generally in tutorial groups of around 50. Participation was voluntary. With approximately 250 students enrolled at in-person courses at CUC at the time, the 209 surveys represented a return rate of over 80%. Therefore, the results are believed to accurately represent this cohort of students, although they may not be reflective of universities and colleges not offering a no frills study opportunity.

Figure 1 provides demographical information about the students who completed the survey, a total of 132 male and 77 female respondents. The data presented includes both STEM and non-STEM areas to allow parallels to be drawn.
Figure 1 – Demographics of Students Surveyed On Use Of Technology For Motivation At CUC

The remainder of the paper details key findings from the survey.

3. Survey Findings

The survey participants were asked to identify the items of technology that they owned. The results are shown in Figure 2.

Figure 2 – Reported Technologies Owned By Students At CUC

The results showed strong ownership of laptop and smartphone devices, suggesting that delivering learning opportunities through these preferred channels may be appropriate to motivate students. There was much lower take up reported of desktop and tablet devices. In a further question, 83% of all students reported that they accessed the Internet through a mobile device, whether a smart phone, or a standard mobile phone, so mobile Internet access should not be seen as a barrier for academics considering providing learning opportunities through mobile technologies.
Students were also asked to self-classify their perceived socio-economic grouping within society. 12 students out of 209 (5.7%) said that they were lower class, 106 students (50.7%) said they were working class, 88 students (42.1%) said they were middle class and 3 students (1.4%) said they were upper class. This may be reflective of the type of students choosing to study at a no frills institution and may explain what appears to be a relatively low rate of technological ownership.

Students were asked to identify the web-based media they used for educational purposes from a selection of identified answers provided. The results are shown in Figure 3.

Figure 3 – Reported web-based media used for educational purposes by students at CUC

Figure 3 suggests that students relied strongly on information provided through CUC’s Virtual Learning Environment, Moodle, supported by a Google search. Learning through social media environments was not popular. This may perhaps be because students wish to keep their social environments and learning environment separate. A further question asked students to say if they liked using social media to help them with their studies. Only 34% of students agreed with this. This may also mean that re-education is necessary, since Lancaster (2012) identified that professional use of social media is necessary for employability. For motivational purposes, the responses suggest that the university’s own VLE should be used, but this should be supported by YouTube videos for visual learners.

Students were asked to classify if they felt motivated to study when using technology. The number and percentage of responses on a Likert Scale are shown in Figure 4.

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Figure 4 – Responses from students at CUC asking whether or not they felt motivated to study when using technology

Figure 5 further elaborates on this, showing the students who answered Strongly Agree or Agree, classified by academic discipline.
Within STEM, Figure 5 seems to show a keen enthusiasm amongst IT students for using technology, but a much more conservative approach amongst Science and Engineering students. This may suggest that a one-solution fits all approach is not suitable for STEM. Across the whole cohort, 67% of students agreed or strongly agreed that they would like to see more use of technology in class.

4. Recommendations

The study has shown that technology can motivate STEM students, but requirements need to be established on a discipline level and based on the make-up of a student cohort.

The students were provided with open answer space to suggest the technologies that would motivate their learning further. The biggest repeated suggestion was that they would like to review lectures on YouTube, findings also reflective by statements from Wales on the challenge posed to education by Massive Open Online Courses (MOOCs) (Coughlan, 2013). Requests to make lectures available as MP3 files, or podcasts, were also regularly received from students. This seems to suggest that that students would like to have the option to learn in their preferred modality, rather than have this dictated by their tutor.

Students also stated that they would feel more motivated to learn if they had access to a tablet computer, something largely lacking from this student grouping. It may not be possible to deliver and test this within the no frills style of university education offered at CUC, but it would be useful to know if supplying technology to STEM students as part of their course does, indeed, improve motivation. The initial indications from the student cohort who participated in this research suggest that it would.

Acknowledgements

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References


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