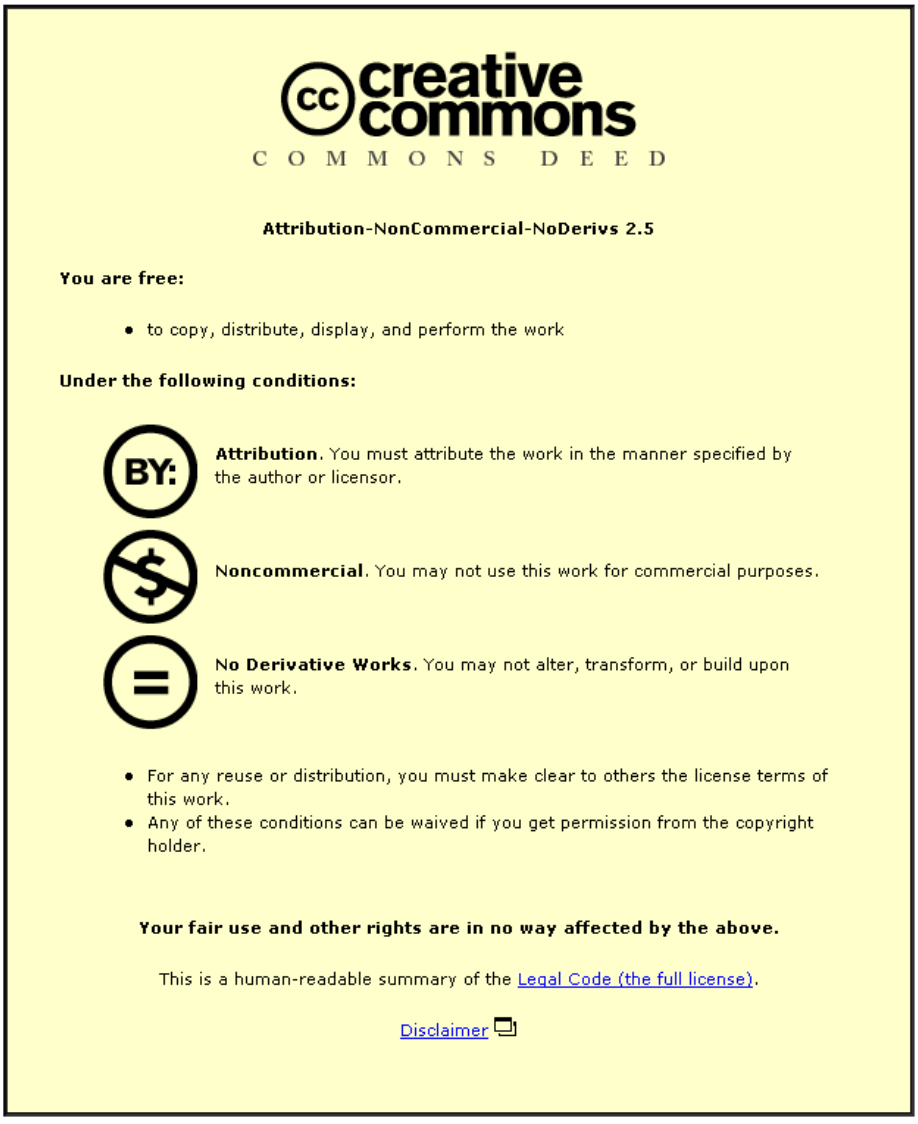

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Introducing audio-visual media for inspirational learning and positive engagement

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ABSTRACT

Student engagement and retention are issues that many of us are currently trying to address. Making learning challenging and more inspirational for students is perhaps one way of addressing this.

Introduced here, is a novel and innovative method of reporting undergraduate project work through the process of digital video production. The authors provide qualitative and quantitative evidence from two UK institutions that students from several disciplines undertaking a wide variety of project work become better motivated to learn both the subject matter and essential transferable skills.

The paper also reports on a Royal Academy of Engineering sponsored project which is now underway to create an easily accessible 'toolkit' resource that addresses the issues faced by a new adopter based on the experience of the project team and feedback from participating staff and students.

Keywords

Projects; video; inspiration; engagement

1. INTRODUCTION

The characteristics of an autonomous learner are critical reflection, self-awareness, taking responsibility for one's own learning and working creatively with complex situations. The majority of students, however, arrive at university, increasingly driven by marks and with the expectation of 'teaching' not 'learning'. A survey of first year students' expectations by Cook and Lackey [1] found that freshers generally expected their learning experience would not differ greatly from secondary school. Furthermore, today's students are quick to submit an unwelcome request for a course transfer after even a short spell of disenchantment. When students fail to respond to lecturers' expectation of 'reading around the subject', traditionalists are tempted to associate this with a lack of dedication or ability.

Most recent research agrees that autonomy is a developmental process, which cannot be taught or learnt [2]. However, the models that have now been adopted by Sheffield Hallam (SHU) and Loughborough (LU) Universities with regular interactions in different pedagogic learning environments helps to develop desirable learner autonomy characteristics and achieving 'pedagogic resonance' with students [3]. While the two approaches are not the same, they both focus heavily on self-directed learning through the use of projects, competitions and teamwork, drawing upon constructivist theories of learning, particularly experiential learning [4,5] and also the central idea of a learner-led curriculum [6] that is increasingly made possible through the appropriate use of technology. Constructivism is based on the premise that knowledge is constructed by each learner through processes of social interaction.

Centres for Excellence in Teaching and Learning were established in both institutions in 2005 under a UK government initiative. At Sheffield, there was a multidisciplinary Centre for Promoting Learner Autonomy (CPLA) to empower students to take responsibility for their learning and work in partnership with tutors and other students. Another centre was created at Loughborough to support innovative learning experiences that are specifically aimed at engineering students (engCETL); in particular, to promote links between academia and industry. Both organisations have actively supported change and innovation.

This paper concentrates on just one innovation that the two universities have developed separately. The two teams have found success in engaging and motivating students to learn while creating their own audio-visual media. Student teams are engaged in a variety of different tasks, but in each case, they are required to prepare and edit a short video documentary as a replacement for the more conventional written or oral report. Through these means, students appear to take greater ownership for their work and can expand on what they have learned by following their own lines of enquiry and research interests. The majorities perceive this learning as being more relevant to their needs and are generally enthusiastic and ready to learn.

Twenty first century students have an in-built expectation of communication technologies. "These students, many of whom have never known a world without personal access to information technologies, often take them for granted and integrate them seamlessly into their daily lives. These technologies also represent an opportunity for making changes in higher education instruction."[7]. Easy creation, distribution and instantaneous uploading and downloading of digital media are the norm. 'Face Book' and 'YouTube' are just two examples of free user-generated on-line video sharing that today's students are universally familiar with during their recreation time.

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Making learning fun and more interesting for students is perhaps one way of addressing the apparent lack of motivation. We shall see how digital media reporting as an assessment method appears to inspire students to look deeper into their subject matter.

Of course, traditionalists, highly steeped in mathematics and formal examinations, may regale at the horrific thought that students might actually enjoy their studies and be inspired by the world of engineering; but it is a wise academic who remembers that even the best lecturer cannot effectively teach a student who, for whatever reason, does not pay attention. In any case, there is no suggestion that media production should become the norm for all university work; simply that it is useful to complement and empower traditional learning and teaching methods. At the present institutions, the new developments sit alongside a largely unchanged engineering science curriculum and embrace the idea that the most effective learning takes place when students are well motivated. In 'When Teaching becomes Learning', [8] Sotto wrote that motivation is already present in learners but that it is a matter of creating situations that enable learners to become actively engaged, and to use these experiences to reinforce the necessary fundamental knowledge and skills to support the science.

2. DIVERSITY AND TRANSFERABILITY

The potential for transferability is vast and the inspirational audio visual methods have already been used in other subject disciplines with students of all ages. The Sheffield Hallam team have wide experience across a diverse range of disciplines, from fashion design to information management and from nursing to materials engineering. At Loughborough, academics in the history department and in the business school are starting to experiment with the ideas that have now reached maturity in mechanical engineering.

While the idea may sound attractive, to many lecturers, it appears as a leap into the unknown. A current Royal Academy of Engineering sponsored project hopes to address this problem by creating an easily accessible 'toolkit' resource that focuses on the issues faced by a new adopter based on the experience of the authors and feedback from participating staff and students. The 'toolkit' will be tested and evaluated prior to launch amongst the STEM community and will incorporate appropriate resources, including teaching and assessment materials, with example projects taken from the science and engineering subject areas.

3. EXAMPLE ASSIGNMENTS WITHIN ENGINEERING MODULES

3.1 Year-1 (LU) 'Engineering Principles and Professional Skills'

Loughborough's engineering intake is predominantly traditional, typically three high grade GCE-A (Advanced) level passes including mathematics and physics. The vast majority are young school leavers aged 18 or 19 and despite many attempts to encourage more women, most are male. Sadly, contemporary students also arrive at university with the widespread belief that "the first year doesn't matter" which is the apparently logical but over-simplistic conclusion they draw because few UK universities carry first year marks into the final degree classification. Many have also observed that this university intake is also typically short of practical skills and has little perception of how things work or what a career in engineering actually entails. It seems budding engineers no longer make their first associations with engineering at a young age by building models or repairing bicycles; processes that can help to sow the seeds of an enquiring mind and enable students to better understand the engineering world they have entered.

Following a curriculum review, chaired by the lead author, a new year-long module was introduced alongside existing traditional engineering modules to exemplify fundamental engineering principles in a practical environment and assist freshers to acquire the necessary skills to become autonomous learners. A new module called 'Engineering Principles and Professional Skills' (EPPS) was introduced in 2008 to address these issues. It is delivered throughout the first academic year to account for 20 UK credits (10 ECTS). Approximately 150 BEng/MEng mechanical engineering students take this module each year.

The module is based around four varied Enquiry Based Learning (EBL) assignments together with a programme of appropriate skills workshops. There is one lecture per week to provide connectivity and, in some cases, give information. The digital media reporting method is currently only used in one of the four EBL assignments, which accounts for 20% of the total module marks.

The (EBL3) assignment starts immediately after the Christmas Vacation and lasts three weeks; that is, the student teams have three weeks to complete the work even though there are few timetabled events. This is the third scheduled group assignment of the year and by this time; the students are well rehearsed in working as a team and regularly reporting to their 'personal tutor'. This project has been run successfully for three academic years and undergone a little refinement in that time.

The intended learning outcomes for this particular assignment are:

- The ability to apply engineering principles in a practical situation through examples.
- Enhanced research, communication and team-working skills.
- Improved learner autonomy.

We needed a group of topics that were potentially interesting to mechanical engineers, complex enough to require significant understanding and with examples in abundant supply: the decision to focus on vehicle systems was, therefore, a simple one as many students share an interest in cars and the School has several associated laboratory environments available. A list of distinct 'systems' such as emission control, power brakes and active suspension were easily identified. Teams are challenged to thoroughly research their chosen topic and prepare a video documentary film, up to 10 minutes duration, that explains the composition and inner workings of an exemplar system. The video files were directly uploaded to the Virtual Learning Environment (VLE) for review and assessment.

During the introduction, students are taught to plan and schedule their own work: they are told that self-reliance ingenuity and innovation will be rewarded. Teams are encouraged by using examples of how to be creative (past work) when designing their screenplay and sourcing props and locations for their shoot.

A low key approach was taken to video production and the staff initially had limited expectations of video quality. The university

VLE was used extensively as a self-teach resource for the project, and in particular for instruction on the use of audio-video equipment. Many teams vastly exceeded expectations in their ability to use the unfamiliar equipment as they soon discovered the versatility of the medium. They used a mixture of outside broadcasts diagrams and laboratory demonstrations. Figure 1 shows a screenshot of a transition between a shot-to-camera and an explanatory diagram.

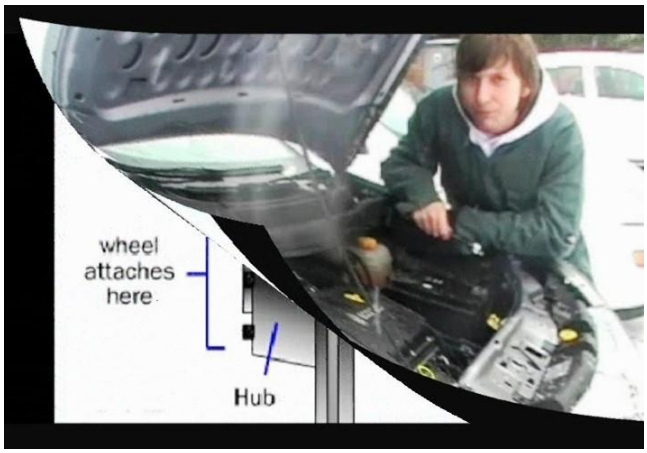

Figure 1: A student shows the flexibility of the medium.

Students were encouraged to ask for assistance in finding their own location and props through their personal tutors, the project leaders or laboratory staff. A resident audio-visual technician could also assist with some technical issues.

3.2 Year-1 (SHU) 'Materials, Manufacturing and Environmental Engineering'

Sheffield Hallam's intake is less homogeneous and the university offers a wider variety of academic and vocational courses. It caters for a higher proportion of 'mature' students. Nevertheless, in Science and Engineering, most students are school leavers and suffer from the same acclimatisation problems as those from Loughborough.

The first year module, 'Materials, Manufacturing and Environmental Engineering', (60 students) was traditionally taught through a series of keynote lectures, followed by seminars, laboratory classes and case studies. Two student groups take this module, BSc Automotive Technology and BSc Engineering Design and Innovation. In an attempt to improve student engagement through experiential and inspirational learning, student groups undertaking investigations that incorporate the use of video media have now replaced the semester 2 case study work. The cohort was split into two sections, and both sections were asked to produce short video clips; in this case, of less than 2 minutes duration.

The first student section related to materials, manufacturing or environmental processes. Students produced videos of various manufacturing processes for embedding into a PowerPoint presentation. The second student section looked at 'Engineering Disaster Management'. They did research on the background to a topical disaster related to materials and/or environmental engineering and reviewed preventative solutions. In their research they were asked to find video and media material for use in their final presentations.

At Sheffield Hallam University, unlike Loughborough, media and television vocational courses are taught and the engineering students were formally introduced to camera skills, the language of television, interview techniques and editing skills through an initiative known as 'Users as Producers'.

Each project team was required to produce a unique video asset, which was either embedded within a PowerPoint presentation, or placed into the Blackboard VLE for peer review. As well as developing skills in media production there was also an opportunity for students to develop key skills such as presentation techniques, project management skills and conflict resolution, whilst working together in teams. The result was an end of module 'student conference', where each group presented a technical paper including their video report.

Although developed entirely separately, the main objectives of the project had much in common with the project discussed in 4.1 above: to develop learner autonomy; to link individual critical review of knowledge and skill development of the students and relate this to their Personal Development Planning (progress files) through enquiry based learning.

It was thought that the social interaction of group experiential learning enhanced by the use of technology would help to develop learner autonomy and more interest in the subject.

4.3 Year-3 (SHU) 'Polymers and Composites.'

The final year module, 'Polymers and Composites', has also replaced case study work with student production of a DVD video

In the second year of development work with engineering and media staff, the project was extended to final year students on a Polymers and Composites module. Students were given the task of researching a topic concerning relevant engineering materials and the end production was a digital video case study handed in on a CD or DVD for assessment. This assessment task replaced a traditional 6 week case study that would have covered the same technical syllabus, but would have resulted in a written group report and PowerPoint presentation. The students were supported in a similar way to the SHU first year students, with an initial seminar on video production, followed by weekly drop-in sessions for technical support on filming and editing.

A further development has seen students of the final year in Forensic engineering producing video material for assessment. However, instead of using a DVD or CD for hand in we have asked them to use web based video-drop sites. The potential use of YouTube was considered but it was decided to go for a secure web based site that uses usernames and passwords for access.

4. UNEXPECTED OUTCOMES

Students are providing us with a great deal of evidence to suggest that they gain inspiration and motivation which leads to an enhanced learning experience. This initiative also offers alternative ways of assessing student work that are equally valid but tend to be more appealing than reading reports.

The submitted student movies have been successfully used at both institutions as an additional teaching resource. The vehicle systems project, for example, covers a wide variety of topics (16 titles are offered) and it has been found both instructional and entertaining to showcase a selected student-made 'documentary'

at the start of each subsequent EPPS lecture that follows the project. This acts as both a hook to boost attendance and broadens the knowledge-base of a range of 'systems' in a way that is both economical on time and presented in a way that is very accessible to the students, often making use of the medium to show and describe practical laboratory experiences that they self-generate for the project.

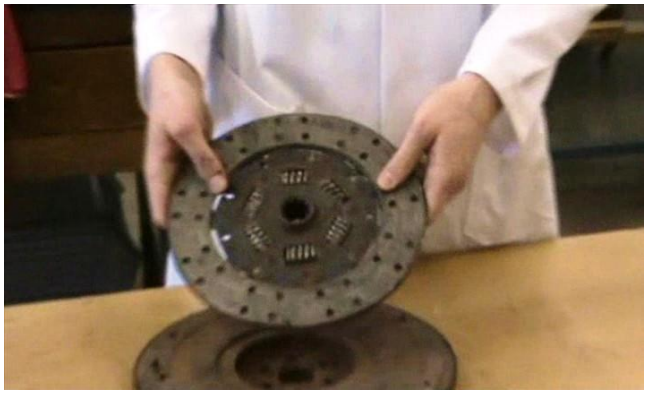

Figure 2: Screenshot - the presenter examines a component in the laboratory.

A variety of staff members have been loosely rather than directly associated with this work, often, simply through discussion with their tutor groups or being asked to respond to a query. Some were clearly hesitant at the start as this was unfamiliar territory, but it has been gratifying to see clear signs of increased enthusiasm from the staff for the idea. This appears to have been passed on infectiously from the obvious intensity and desire to achieve shown by many of the student groups. It is probably a consequence of this that early years students often appear more willing to engage with their lecturers on a day-to-day basis on a wide range of matters.

A final learning outcome that was not originally envisaged is knowledge of copyright law: a topic of considerable professional importance but one that traditionally fails to resonate with technologically minded students through normal didactic instruction. In addition to creating original video footage in laboratories, in the classroom and on location, the students who first tackled these projects wanted to incorporate downloaded video clips into their work. With hindsight, this is not at all surprising; nevertheless, it had not been anticipated. While we were initially alarmed with the potential for the use of unlicensed and unreferenced materials and possible litigation, we have now successfully turned this problem on its head.

In the LU project, students are given brief, up-front information about copyright law from a subject expert. Project teams must discover and declare the copyright status of any externally sourced material they use, by submitting a written reference note to this effect along with their video file using a standard template. Current UK law provides for use of most materials for study and research purposes but students also discover royalty free audio tracks and the developing world of open licensed materials such as 'Creative Commons' enabling output to be potentially used with a wider audience. This topic thereby becomes a secondary focus of the experiential learning process and a question about it was included in the most recent online survey, described in section 7.1, below. 84% of the respondents answered positively to the question "Did you learn and understand copyright law?"

5. ASSESSMENT PROCESSES

The Sheffield finalists and the Loughborough first year students submit their work in much the same way as they would normally submit written reports for marking. The similarities do not end there: both styles would be double-marked by two academics and both would be assessed for quality and content in much the same way. At both institutions and in many others, live oral reports in groups are also part of the normal assessment process.

In academia, although we universally accept the validity of written reports and oral presentations, there appears to be a natural resistance amongst academics to accepting the validity of assessment of a video report. Close examination by comparing a book to a written report and a movie film to a video report suggests this view is flawed. We are quite familiar with and accepting of professional reviews of both films and books where critical judgements are made. The criteria for assessment are similar, if slightly modified to suit the medium. Table 1 shows a set of criteria used to mark video reports. It can be seen that these headings could well be applied to the more familiar oral presentation or by simply swapping the 'Audience Engagement' heading for the equivalent 'Report presentation' we would have criteria suitable for a typical written report.

Table 1: An example of assessment criteria for a video report.

Structural	**(20%)**	i. Documentary programme structure ii. Demonstration of teamwork
Technical Content	**(40%)**	i. breadth/scope ii. variety and appropriateness of source material iii. depth iv. accuracy
Audience engagement	**(20%)**	i. visual Impact ii. verbal clarity
Professionalism	**(20%)**	i. innovative reporting and use of original materials ii. declaration of references and copyright status

Video assets are equally able to portray identifiably strong or weak features such as; a large or small amount of content, a structured or haphazard narrative; be well presented or ungainly and depicting quality research or otherwise. These and more are elements about which a judgement is made in exactly the same way as they are for traditional reports.

To exemplify this, we provide here, a short objective description for the assessment of a video report and ask the reader to consider whether or not this is equally valid for the more familiar group reports in either text or oral formats.

Structural: *the work should tell a planned story that has a start/middle and end and be demonstrably the result of a managed team effort.*

Technical Content *should be selected from a variety of sources, using a variety of enquiry methods in describing and analysing an example system. The work must cover significant aspects of engineering, quoting facts and figures and demonstrate real understanding of how the system and its component parts work.*

Audience Engagement and professionalism: *the work should be entertaining and well edited, but not flippant; fluent and avoiding repetition; appropriate for the target audience and making good use of the media.*

Referencing: *any content included by other authors/creators should be referenced using the Harvard system where appropriate. Use of captions at the end of the movie sequence is recommended. The copyright status of such material must be declared.*

6. EVALUATION

The results of the earlier elements of the work at Loughborough and Sheffield were previously reported by the present authors [9,10] but for the first time we are now able to compare findings from the two separate initiatives, update them with the latest developments and bring together the collective conclusions. Clearly, as the two projects have different origins, the initial evaluation methodologies were also different so direct comparisons are not easy. The present joint RAEng project will seek to correct this and publish comparable results as soon as they become available.

6.1 Video Reports Submitted for Direct Assessment.

This type of assessment was used for LU first year projects and with SHU finalists. Both were team tasks; however, the topics and the level of study differed considerably.

Immediately after the LU project, an online survey attracted 76 responses in 2010 and 57 responses in 2011, with most strongly supporting the initiative. There were a number of specific questions for participants to rate on a 5.0 point Lickert Scale; 5.0 indicates ultimate agreement and 1.0 shows ultimate disagreement.

Table 2: Online Survey results (LU)

Academic year **Number of respondents**	**2009-10** **76** **Ave (+%)**	**2010-11** **57** **Ave (+%)**
Did you enjoy the task?	3.9 (77%)	4.2 (84%)
Did you learn or consolidate knowledge of Engineering Principles by completing the task?	4.3 (89%)	4.2 (86%)
Was the project effective for improving researching, communication or IT skills?	4.2 (82%)	4.2 (82%)
Has this project has made you more interested in Engineering?	3.9 (45%)	4.2 (65%)

Table 2 shows a breakdown of pertinent results from the survey over two year groups giving the average score (neutral =3.0) and also the percentage of students who gave a positive response (score 4 or 5). The summary results indicate that the incremental changes made for the most recent cohort were well received. In terms of the prime objective (course engagement), it is hard to imagine another substantive coursework exercise that would solicit feedback from over 80% that it had been enjoyed, and with similarly positive perceptions that the task had been an effective learning tool. Of those that didn't respond positively, the vast majority were neutral and this is confirmed by the high average scores for all questions.

Several free text questions were also included to solicit opinion and point the way to further refinements. Some of the most pertinent are reproduced here:

"It was a new, creative way of learning. The fact that you were more physically involved in filming and going to look for information meant that I was more engaged in the project making it more easy for me to learn and understand the topic…"

"It was a novel idea which, at first, I was not very keen on, however having done it I found it quite fun and fulfilling."

"Being able to present your research in a different and interesting way. Producing a video is a much more enjoyable way of presenting a project than producing a written report."

There were negative comments; fewer in number and one student thought we should have specified a written report. Virtually all the others were commenting on administrative or logistical shortcomings rather than on the method.

The year-3 SHU students were considerably fewer in number so opinions were sought through face-to-face interviews both during and after the end of the module. The staff who had been involved were also interviewed using a similar standard question template. These interviews were recorded on video to provide a new resource. Similar interviews will be extended to the other groups and disseminated through the current RAEng project.

Listed below are some of the main outcomes that have been identified by SHU staff and year-3 students:

- Increases student motivation
- Enhances the overall learning experience
- Higher marks are attained
- Develops a potential for a deeper learning of subject
- Develops learner autonomy e.g. research skills
- Relates project work to personal development
- Promotes team working and communication skills
- Provides a source of evidence relating to skills for interviews
- Provides opportunities to develop project management skills
- Creates learning resources for future cohorts to use
- Enables the student learner to produce more effective media
- Provides opportunities for staff development - (CPD)

Staff also report that this approach is not labour intensive and the methodology is flexible, enabling it to be used in a large range of subject areas.

6.2 Student movies incorporated into Presentations.

The assessment of the SHU first year students was on their presentations, with a panel of staff and external industrialists

marking them. There was, therefore, less emphasis on the video production aspects. Copies of the presentations were, however, obtained from the students prior to the conference day in order to formulate the conference programme. These project assignments also gave students the opportunity to reflect on their participation, within their Personal Development Planning (PDP) progress files.

Focus group discussion sessions were held with the first year students and below are some of the student comments:

"….going away and looking for the information for ourselves was quite good, rather than being spoon fed…"

"…by doing this it has boosted my confidence…don't mind doing it again and again…."

"…I've found out much more about manufacturing and materials and how engineering disasters are investigated…..my presentation skills have definitely improved as well…."

"…working as a group is the best option as you get to know who they are and how other people work, what is their strengths plus their weaknesses…"

"…presenting information and ideas to an audience helps with employers…"

These comments show that this type of project work benefits the students, adds realism, aids communication and analysis skills and hence helps with their employability. The student motivation and hence achievement was improved, and demonstrated by the improved pass rate for the module. Overall, the first time pass rate increased from the previous 3 years of 77%, 75% and 80% to 95%. The only referrals were those students that failed to attend the conference. This improvement is believed to be due to the increased attendance and motivation of the students.

7. AUDIO-VISUAL EQUIPMENT AND TRAINING

The high level of sophistication of the student-made video documentaries was unexpected. At the outset, there had been concern that the teams may not be able to write, direct, shoot and edit a watchable video. At Sheffield, we provided professional quality equipment and expert training whereas at Loughborough we had inexpensive amateur kit and simple self-teach materials. The SHU equipment existed within the Media Studies Department but at LU, the equipment was bought specifically for the job. Each 'amateur' kit comprised a video camera, an inexpensive tripod, a hand held microphone and a carry bag, and the total cost per kit was under £300. The equipment was loaned to student teams for 48 hour periods against a returnable deposit. Over three years the two projects have viewed in excess of 100 video reports and the baseline requirement of a filmed live presentation to camera has been exceeded in every case with some ingenious and relatively complicated screenplay.

There are clear advantages in providing at least a minimum level of training in terms of quality, but this can be time consuming and it may not be accessible everywhere. The inexpensive equipment is easy to use and adequate for the task. Where the video material is not aimed at a wide audience and the emphasis of assessment is on technical content, the limited screen resolution, shaky camera work and restricted sound quality can be overlooked.

For video editing, again, professional equipment was available in Sheffield but not at Loughborough where we recommended

Figure 3: Students filming on location

Windows Movie Maker, which is included on all Windows lab computers at no cost and self-teach tutorials were provided. In the most recent online survey, we asked a series of questions about the video equipment provided. Most notable from the response, was that teams often preferred to find their own way: while all teams digitally edited their footage, almost all had used their personal computers and over half of the respondents had used some alternative software.

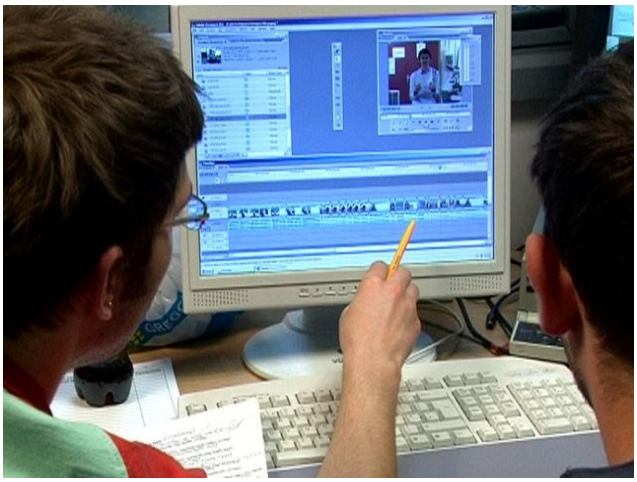

Figure 4: Working with digital media.

8. CONCLUSIONS

The evidence we have amassed to date that the introduction of audio-visual techniques to enquiry based learning approaches increases student engagement is, perhaps, less than would be required for an exhaustive treatise but there is no doubting that both institutions are left with a good feeling about this project. EBL is an approach that is founded on sound pedagogic principles but it is unclear how large the additional effect is of introducing video-media to the project work. In an interview, a year-1 student stated, *"I've realised that for me it's easier to learn if I'm doing it rather than just sitting in a lecture being told how to do it."* This is typical of many comments made and a clear sign of conversion to autonomous learning: could it have been achieved through EBL without introducing video? The answer is almost certainly, yes.

There is, however, strong evidence that film production adds to the challenge and enjoyment and consequently to the motivation to produce good work. This first became obvious to the staff at both institutions when viewing the students' creations, the quality of which generally exceeded expectations. Most of the videos are strong visual records of close teamwork in action. The various surveys and focus group interviews described above add qualitative and quantitative evidence to support these statements. The results also suggest considerable success in achieving the outcomes of improved knowledge and transferable skills.

Although the LU questionnaire did not directly explore changes in attitude to learning, respondents' disclosed positive perceptions of the video project. Most appear to have valued engaging with their tutor; 83%/72% (2011/2010) had arranged appointments with their tutors for guidance, with the majority describing them as helpful or enthusiastically helpful: a strong indicator of engagement with the staff. In addition, many made positive references to working as a tutor group, valuing the opportunity to choose their topic of study and engaging in an assessment method that they perceived to be both fun and a means of broadening their skills. One particular telling comment hints at a positive change in attitude. *"The project was educative and fun at the same time – which is rare and I believe my lab partners and I seized the opportunity to work together better."*

Evaluation has shown that there has been a change in conceptions and upon staff practices. Informal reports from personal tutors who were co-opted into the project work by their tutees were also enthusiastic in the main, and there is a noticeable shift towards the introduction of more student-centered learning approaches across a wider range of modules, thereby enhancing the student experience.

This adventure has proven to be interesting and instructive for both staff and students. An assignment like this will not, in itself, remedy all the problems of engagement and transition to university, but as part of a planned programme of activities, it just might. The survey suggests that, for these assignments, and by implication, the ethos of Enquiry Based Learning has been successful in meeting their objectives.

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