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Students writing their own feedback; self-assessment mediated by video mark schemes

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Abstract

Incoming undergraduates appear to be increasingly reliant on memorisation, which is in part due to their previous educational experiences. Such an approach is ineffective at degree level where a deep synoptic understanding is essential to success. The transition to university presents students with a number of significant challenges, particularly the increased pace of content delivery relative to that encountered at school/college. Many students therefore encounter difficulties in assimilating new knowledge, and applying it to the solution of problems posed in workshops and tutorials. These problems are compounded by the fact that university presents students with fewer opportunities for one-on-one interactions with teaching staff than they may have had previously. We have trialled and evaluated the use of video mark schemes to support self-assessment and help students develop deeper understanding of fundamental concepts. The presentation will describe our approach to the design and delivery of video mark schemes and will give details of our evaluation of the usage of the resources, and the response of students to the use of self-assessment activities in our degree programmes. In particular, we were surprised at the positive response of students to a) the requirement to complete extra 'homework' exercises in their own time and b) the requirement to complete self-assessment of their own work. We probed the views of both students and staff to inform the design and implementation of future resources which will build on what has already been achieved and will enhance student learning.

Keywords

Formative assessment, feedback, educational video, blended learning

1. Introduction

University teachers are increasingly using video resources to complement 'face-to-face' provision. The availability of accessible technology means that high quality educational video can be produced without the need for extensive technical expertise, with consumer-level equipment giving results that are suitable for use in teaching. Software packages (e.g. Camtasia) allow the addition of interactivity to videos, enhancing their educational potential as demonstrated by Lancaster and Read (2011). Other work by O'Malley (2010) shows the value of using tablet PCs in combination with screen capture software to facilitate the delivery of lectures in chemistry.

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Our interest in this area began with the recording of lectures in the academic year 2009/10. We carried out an investigation to identify how students made use of the recordings (Andrews et al., 2010), which encouraged us to continue recording lectures in semester one of year one to support students in making the transition to university. There are now a number of software solutions available which allow lecture capture on a campus-wide scale (e.g. Harrison, 2011), with limited staff input (Association for Learning Technology, 2011), freeing up time for other teaching and learning activities.

While entire lectures can be presented in the format of a 50 minute video, there is great scope for producing shorter, focused videos which are designed to support the teaching of particular concepts. Lancaster has produced a range of 'Vignettes', which are short, annotated and interactive highlights from screencasts of chemistry lectures. These have been well received by students (Lancaster, 2011) and are available as open educational resources.¹ At Southampton, we have produced short, focused video clips for use in different educational contexts, ranging from preparing students for laboratory work to developing mechanistic/arrow-pushing skills in organic chemistry. This paper outlines the use of such clips as video mark schemes to support students in completing self-assessment of an exercise in inorganic chemistry. Our approach is adaptable for use in any discipline, being particularly effective when diagrams need to be drawn, or complex mathematical operations are performed.

2. Methodology

The exercise had 10 questions, which students completed independently in their own time. The work was collected in to ensure that all students had completed it prior to the release of the video mark scheme *via* Blackboard. The work was not marked by staff, but instead returned to the students for them to complete self-assessment. The video mark scheme itself was designed in the format of a tutorial, using the same format previously employed in the recording of lectures (Andrews et al., 2010). The video mark schemes were put together by the tutor, and uploaded to Blackboard as package files for viewing within the standard interface. The layout of the screen, incorporating 'screen captured' content alongside a 'talking head', is shown below (see Figure 1).

An index can be added to aid navigation

This part of the video is a Camtasia screen capture taken on a Tablet PC

Q9 Q10

Q9 Draw the following unit cells using labels to show the relationship between the axes and state how many lattice points are present per unit cell in each case:
i) Face centred cubic
ii) body-centred tetragonal
iii) Primitive hexagonal
(4 marks)

Handwritten notes for Face centred cubic:
 $(1,0)$
 $(\frac{1}{2})$
 $8 \times \frac{1}{8} = 1$
 $6 \times \frac{1}{2} = 3$
 $4 \text{ lattice points.}$
 $a = b = c$
 $\alpha = \beta = \gamma$

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Video controls allow the student to manage the pace

The tutor outlines the thinking behind the answer.

The tutor is captured using a camcorder.

Figure 1: Presentation layout of the video mark scheme

¹ The complete set of Vignettes are available here: <http://www.chemistryvignettes.net/> (Accessed 15th March 2012).

The production of video mark schemes like the one illustrated above is relatively straightforward and was completed using a standard consumer HD camcorder, a tablet PC and a combination of software packages which were available on relatively inexpensive educational licences. All filming, editing and processing was carried out by the academic team involved, none of whom had received any specialist technical training in this area. It should be noted that those participating did have experience of video and audio editing in other contexts, but none of them could be classified as an expert. The method used in the production of our video mark schemes is outlined in Figure 2 below:

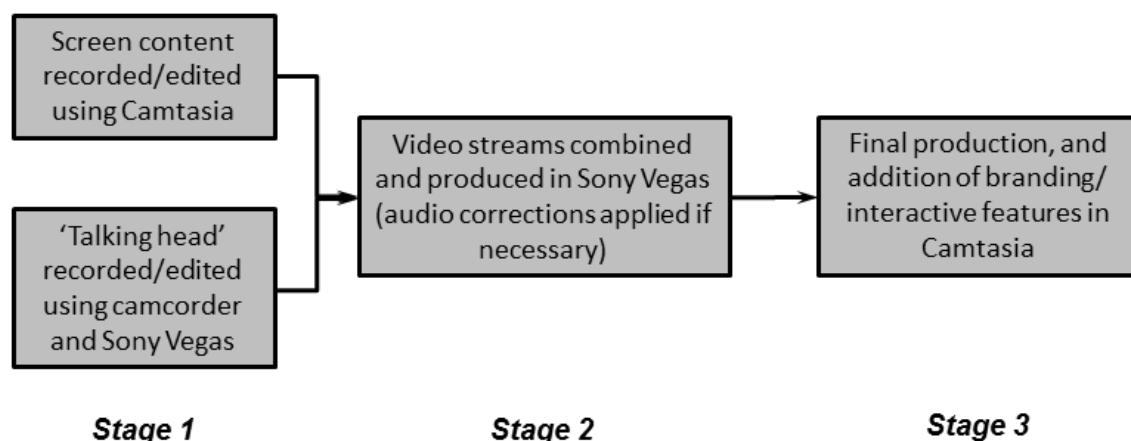


Figure 2: Production process for our video mark schemes

The approach outlined above is the same as that used in our original 'recorded lectures' trial (Andrews et al., 2010), and was designed to give control over the formatting of the video, and the positioning of the two different video streams. The process used is admittedly a little complex, and if one is willing to make some small compromises regarding presentation, it is possible to produce equally good results in a two-step process utilising Camtasia's 'Picture-in-Picture' feature to record the 'talking head'. This alternative approach removes the requirement to use a camcorder and the need to carry out processing in a second piece of software. This is a much more user-friendly approach, which we have shared with colleagues locally and at other institutions with some success.²

The video mark schemes were shared with students by hosting them on a Blackboard course, along with the other documentation associated with the exercise. After they had marked their work, students were instructed to submit their marks via a Blackboard survey. They were also asked to reflect on their performance in the exercise, and to suggest how they might maximise their performance in their future studies. The fact that the survey responses can easily be exported into Excel spread sheets facilitated the analysis of the vast amount of qualitative feedback obtained from students with a near 100% return rate.

3. The impact of video mark schemes and self-assessment

There has been a great deal of research into the value of different types of formative assessment, much of it pointing to the multitude of positive impacts arising from its implementation (Black and Wiliam, 1998). There are also many examples of self- and peer-assessment strategies being employed in science teaching (for examples see Black and Harrison, 2001; Bedford and Legg, 2007). In order to benefit fully from self-assessment exercises, it is vital that students are given the opportunity to reflect on their performance, and that they formulate their own strategies for improving their understanding, and consequently their future performance. In this exercise, students were required to complete a survey in Blackboard, as described in section 2. All students completed the survey, and examples of their reflections and comments are given (see conclusion for further discussion).

² We have received funding from the HE STEM Programme to support colleagues elsewhere in developing similar approaches to the production of video resources under the 'Practice Transfer Adopter' initiative.

3.1 Evidence of student reflection

In answer to the question "How do you feel about your performance on this exercise? What did you do well on? What did you find difficult?", answers included:

"Overall, I got 35/50 (70% - which would be the equivalent of a First), so I am pleased with my performance; however, there is room to iron out silly errors. I hope this will be possible once I get into the business end of Year Two."

"I didn't do so well on the transition metals, mainly because I didn't draw enough diagrams and/or didn't label them, however the understanding of the question was there, I just didn't go into enough detail. Overall, though, I am happy with my performance."

"I feel that I have done well on this exercise. I spent a lot of time on the exercise and revising the material from last year, which helped me to make the majority of points required for marks."

In answer to the question "What are you going to do to maximise your future performance in inorganic chemistry?", answers included:

"I will work on explaining and defining processes more clearly and showing all of the thought process and working out when reaching an answer."

"I need to ensure that I go over the lecture material covered every week, and if I don't understand something to email the lecturer straight away. Also, keep working hard throughout the semester!"

"I think I will have to do a lot more reading other than just what is taught in lectures. This will help me to grasp a greater understanding of the concepts and will enable me to go into much more detail in my answers."

"This assignment has shown me that I need to include a lot more detail in my answers and to include relevant diagrams to reinforce my understanding of the relevant topics in the question. I need to include structures when given a molecule and include orbital diagrams when discussing electron transfer. I also need to read over my notes at the end of each week to make sure I understand the content of the lectures."

3.2 Feedback from students on the exercise and resources

In answer to the question: "Has this been a useful exercise for you? Please explain your view.", answers included:

"It has been useful as I now know what I need to work on to achieve my full potential."

"It has been a useful exercise as i think it has shown me that I'm not as horribly terrible at inorganic chem as I thought I was, which helps...as it keeps you positive."

"Most definitely, more of these would be good!"

"I found this exercise very useful particularly the video answers which far outdid what a paper mark scheme could achieve in solidifying an understanding of certain topics that i lacked before completing the exercise."

3.3 Insight into the self-assessment process

Students were required to hand their marked work back in for inspection by staff after completion of self-assessment. Unexpectedly, a significant number of students had added extensive annotations and comments to their work, some of which would be regarded as high quality feedback had they been written by staff. No formal guidance on self-assessment had been given to the students, so this behaviour appears to have been influenced by previous experience. Self-assessment is commonly employed by teachers in schools and colleges, and students are likely to have encountered it previously. It is also conceivable that they may have been mimicking what they have considered to be good practice in written feedback that they have received in the past. It should be noted that a

considerable number students added very few annotations, and some had added no comments or ticks at all. However, variation in student approach wasn't unexpected as we hadn't provided formal guidance on the self-assessment process, beyond the basic mechanics of operating the video mark schemes and the survey in Blackboard.

3.4 Staff experience

Although there was some trial and error in the process of 'delivery', and multiple takes required during the process, the recording of the mark-scheme was found to be far less time consuming than providing feedback for each individual piece of work. Also, the recording took place during the summer vacation period, which freed up staff time during the busy student-induction period when the work would have been traditionally marked. This was seen as a considerable benefit given the number of students in the incoming year group. The evident success of the approach, and the positive feedback garnered from students, has led to an increase in interest among other staff, and other opportunities for the use of self-assessment as an integral part of our course delivery are being explored.

4. Conclusions

A very small sample of student responses has been included here, but these are largely representative of the whole cohort. It is clear that most students feel that they benefited hugely from the exercise, and the depth and quality of their reflections was both surprising and gratifying for the staff involved. The key message which came back time and time again was the fact that a dynamic video mark scheme, which explains the thinking behind the answers, is far more valuable in developing understanding than a static, paper-based mark scheme or model answer. There is clearly great scope for future development, including an investigation into the pedagogic benefits of this approach and extension to other disciplines.

5. References

- Association for Learning Technology (2011), Conference: Lecture capture - doing it well and at scale, <http://www.alt.ac.uk/events/lecture-capture-conference> (accessed 15th March 2012).
- Andrews, C. J., Brown, R.C.D., Harrison, C. K., Read, D and Roach, P.L. (2010), Lecture capture: early lessons learned and experiences shared, *New Directions in the Teaching of Physical Sciences*, 6, pp. 56-60.
- Bedford, S. & Legg, S. (2007), Formative peer and self feedback as a catalyst for change within science teaching, *Chemistry Education Research and Practice*, 2007, 8 (1), pp. 80-92
- Black, P. & Wiliam, D. (1998), Inside the Black Box: raising standards through classroom assessment, King's College, London.
- Black, P. & Harrison, C. (2001), Self- and peer-assessment and taking responsibility: the science student's role in formative assessment, *School Science Review*, 83 (302), pp. 43-49.
- Harrison, C. K (2011), Techniques for overcoming filming & sound recording issues when recording lectures, <http://www.panopto.com/blog/techniques-overcoming-filming-sound-recording-issues-when-recording-lectures> (accessed 15th March 2012).
- Lancaster, S. J. and Read, D. (2011), Screencasts and vignettes, *Wavelength*, 7 (1), pp. 40-41.
- O'Malley (2010), Combining a Tablet personal computer and screencasting for chemistry teaching, *New Directions in the Teaching of Physical Sciences*, 6, pp. 64-67.