Transitions to HE: CBL for non-traditional students

Robert Ellis and Tim Gabriel
School of Applied Sciences
University of Huddersfield
Queensgate
Huddersfield HD1 3DH
r.j.ellis@hud.ac.uk
t.gabriel@hud.ac.uk

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Abstract

The aim of this paper is to describe the development of contextual based learning resources appropriate to Science Foundation students at the University of Huddersfield. In developing new resources the authors consulted with key stakeholders in the science community. A world class glass manufacturer and an industrially focused research and development unit based in the University of Huddersfield provided input into how industry based scenarios could be developed for use in the curriculum. Teachers from one of the country's leading sixth form colleges provided examples of effective context based learning in an FE environment. This paper charts how an effective teaching and learning strategy has been tailored for use with Science Foundation students. It provides key examples of how context based learning (CBL) has been adapted for use with students of mixed abilities and backgrounds. The paper also highlights some of the problems encountered in developing appropriate resources and presents initial findings of the impact on students.

Introduction

Research into learning styles at the University of Huddersfield's School of Applied Sciences was the catalyst for this project. The School offers a Science Foundation year for those who lack the necessary qualifications, skills or experience to enrol on first year science or science related undergraduate programmes. This year zero option is a popular choice for mature students returning to education and younger students who may have recently underperformed at A-level. Intuitively, an understanding of learning styles may offer one way of making the transition to HE smoother for these non-traditional students. However, a recent influential research report has all but dismissed the use of learning styles questionnaires citing concerns about both reliability and validity[1]. While there is still plenty of debate concerning how or whether learning styles questionnaires should be used, the report recommend that lecturers should consider the learning strategies employed by their students. Much of the research in this field has led to the development of a framework capturing the personal dimension behind student learning[2]. The dichotomy here is that of 'intrinsic' motivation where students have an inherent interest in a subject, and 'extrinsic' motivation where the value placed on study is related to the qualification it confers or the employment it secures[3]. For most students, their motivation, or lack of motivation in some cases, is likely to be a based on a complex mix of personal factors, as well as other factors such as curriculum design[4]. As Science Foundation represents a potential first step on a longer programme of university study, these issues are highly relevant. In the past, successful Science Foundation students have gone on to study Chemistry, Forensic Sciences, Biomedical Sciences, Pharmacy, Midwifery, Podiatry, Radiography and Nutrition and Health. The connections between Science Foundation modules such as chemistry, biology and physics, and students' longer term study and career aspirations are not always immediately obvious. Nevertheless, each student must successfully complete each module if they are to progress. Initial research with previous cohorts of Science Foundation students has shown that some can have difficulty engaging with a topic, especially where they may only require a 40% pass mark or where that topic is not necessarily relevant to their future education or career. One way of addressing this might be through the development of bespoke context-based learning (CBL) sessions. This is a topic that has been covered in *New Directions* before[5] but discussions of its use and value often focus on undergraduate students. The aim of this short paper is to report on the first steps in the development of CBL sessions for a chemistry module. In the longer term it is hoped that this work will contribute to the research in the areas of enrolment choice in the sciences[6] and how mature students contend with the transition process[7]. The immediate challenge, however, was to develop CBL sessions that were appropriate for this level of study, without compromising existing budgets, resources and contact time.

Developing Resources

Since 2006, Pilkington has supported the University in events such as the RSC's outreach initiative 'Chemistry at Work' and has also provided educational materials for public lectures on materials science. It was hoped that this relationship might lead to the development of CBL sessions that could help students understand the science of glass manufacture. Initial meetings were encouraging, but factors, such as the cost of materials and equipment, limited the portability of the ideas generated. This experience highlighted some of the difficulties inherent in producing laboratory-based CBL sessions, but the input was useful in providing ideas and suggestions for laboratory sessions and projects for undergraduate chemistry students. More relevant industrial support and advice came from Innovative Physical Organic Solutions (IPOS), a chemical research consultancy service based at the University. IPOS specialises in analytical chemistry and they suggested the use of UV and IR spectrometers in a forensic based scenario for the first session. These instruments have the advantage of being effective and easy to use, as well as providing data instantaneously. Crucially this meant that experiments could be conducted and results could be produced within the one hour timetabled for each session. The second session was based on the contextualisation of polymers in the film and TV industry. A series of short experiments were devised for the session, with varying parameters for students to explore, showing how the materials could be used in the industry.

In terms of the delivery of the sessions, help and advice came from Greenhead College, a 'nationally acclaimed' local sixth form college. Here, CBL has been used successfully for a numbers of years, in the form of the Salter's Chemistry course. Salter's courses are built around contextualised science, which emphasises industrial and real-life applications of chemistry[8] and as part of the development process, a number of classes were observed. The teachers at Greenhead felt that the Salter's Chemistry pathway was a way of obtaining a more rounded science qualification and the students recognised both its complexity and value when compared to traditional A-level teaching. Both teachers and students enjoyed these sessions and there were high levels of activity and interaction throughout. Further discussions with staff suggested that this style of teaching offered an appropriate model that could be transferred to the Science Foundation laboratory sessions. Staff at the college suggested interactive materials and advice on teaching techniques. However, this was not just a question of simply transposing Salter's Chemistry on to the Science Foundation course. With the help of Dave Newton, a Chemistry teacher at Greenhead, resources were developed and adapted for use at the University. These adaptations had to take into account the plethora of external commitments that some students face and the impact this has on attendance. As a result one of the major changes was to produce shorter stand alone scenarios, rather than longer storyboards delivered over the course of an academic year. As a starting point two sessions were developed and delivered with a view to increasing the number of sessions in the longer-term.

Figure 1: Science Foundation students develop their practical skills

Figure 2: Student engagement and collaboration in the laboratory

Delivering the sessions and assessing their impact

The structure of the new sessions included a problem or a question that might be faced by an applied scientist but delivered in a framework that was provided by Greenhead. This meant that the real world importance of scientific manufacture or application could be highlighted to the students and they could carry out a series of laboratory experiments to develop their own understanding. These sessions were designed with Science Foundation students in mind many of whom lack key laboratory skills. The information portrayed in the laboratory sessions was fully contextualised, and directly linked to the week's lecture topic. After the laboratory session, students were also asked to carry out brief independent research and subsequently answer questions to consolidate their learning and to build further on their understanding.

A selection of students were given the opportunity to participate in laboratory based sessions which replaced the traditional tutorial session held in a classroom. All students received the same two lectures in that week; however for half the Science Foundation cohort the usual question sheet based tutorial was replaced with a practical laboratory session. In total, three groups comprising 42 students in total took part in both sessions. Groups were chosen on their longer term career aspirations. The first group comprised students predominantly wanting to progress onto a pharmaceutical sciences degree. The second comprised a high number of students hoping to study pharmacy and who were achieving higher than average grades in chemistry. The final group consisted of students hoping to pursue the vocational health degrees such as midwifery, podiatry, dietetics, nutrition and health. In choosing the groups to take part, other factors, such as the availability of resources and laboratories, and timetabling, also played a part. Nevertheless, it was hoped that the differences among these groups in terms of the longer term relevance of chemistry to their aspirations would allow a test of the impact of this teaching methodology across a wider audience.

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Preliminary Conclusions
Early anecdotal evidence strongly suggested that students enjoyed participating in these sessions. One student talked of a 'buzz' among the group as they left the (sessions) while another expressed concern that his group had missed out on the opportunity to participate. While the primary purpose of this project was to explore whether CBL could be adapted for Science Foundation, given existing logistical and resource limitations, the authors were keen to analyse this evidence in more detail. Questionnaires were distributed to all 42 students who had taken part in either one or both of the new sessions. Of those, 21 were returned ranging from those who had longer term study and career aspirations in chemistry, to those who had little experience or no longer term interest in the subject. Given this relatively small sample, it is not possible to extrapolate any firm conclusions about the impact on the sessions on chemists and non-chemists. Nevertheless, the findings below provide important indicative data about how the sessions were received by the students, which will be useful for longer term curriculum development.

The feedback was encouraging. 86% of respondents agreed or strongly agreed that the CBL sessions were 'interesting' compared to 76% for existing tutorials delivered by the same tutor. Students commented that the CBL format was 'excellent', 'interesting' and one stated that she 'absolutely loved [it]'. In other areas too, student responses to the sessions proved to be positive. Participants were asked to comment on whether CBL provided more opportunity than normal tutorials to work collaboratively, to share ideas and to develop numeracy, practical and analytical skills. Across all these areas positive responses were received. For example, 90% of students agreed or strongly agreed that CBL offered more opportunity to develop practical skills. These results are encouraging and seem to suggest more engagement and participation. Figure 1 shows the development of practical skills which would not be possible in the normal classroom environment. The survey results, and photographs, such as figure 2, are encouraging and seem to suggest more engagement and participation. However, other factors played a part. Some students drew a link between CBL and information provided in the lecture. One student wrote that CBL 'brought elements being covered in the lectures to life' while another felt that the sessions were better because 'you could actually see polymers and how they reacted'. These comments are significant because they highlight the importance of consistency or alignment across different elements of the curriculum[9]. For other students it is clear that CBL was preferable to existing tutorial methods because it was 'enjoyable, not boring.' Similarly, another student commented that 'the CBL session was more enjoyable….than classroom stuff'. Despite these comments, other students placed value on the traditional tutorials because they provided a relaxed environment to ask questions and discuss problems. One commented that 'they are useful and you can speak up to receive help with difficult areas'.

From the outset, these CBL sessions represented a starting point. One of the main criteria for the success of this project was the production of re-usable resources within a limited budget. This has been achieved with input from partners in industry and FE. While discussions with Pilkington did not provide anything concrete for this particular group of students, IPOS were able to provide some focus to the early stages of this project. Similarly, building a relationship with colleagues in the FE sector helped put these sessions into context. Overall, the responses of the students who took part in these sessions were positive, and in part, this was because of their views about existing methods of teaching in tutorials. Science Foundation students see a value in existing teaching and learning methods even if they are 'boring' or not as interesting as the new CBL sessions. This strongly suggests that for this group of students the introduction of CBL sessions has to be part of a blended approach to curriculum delivery.

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