Embedding Employability into the Curriculum: An Enterprise Based Module for the Biosciences

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ABSTRACT

Leeds Beckett University identified three interlinking graduate attributes which, during a curriculum redesign, were embedded into every course at all levels. This paper describes how a final year module was designed to develop enterprise and employability skills. The students worked in self-selected small groups to devise a new biotechnology product or social enterprise scheme. The assessment comprised a group presentation (which was peer reviewed), an individual report and a written reflection of the process.

Keywords: graduate attribute; employability; group working; peer assessment.

Introduction

In the current economic climate, there has never been a more important time for universities to produce graduates who can demonstrate their employability. This is one of the reasons Leeds Beckett University identified enterprise as one of their three graduate attributes which should be included when designing a new curriculum. A graduate attribute in this case is "an amalgam of skills, knowledge and attitudes, built up through a student's time at university, which they are capable of articulating and demonstrating to the wider world" (Centre for Learning & Teaching, 2014a).

In the STEM areas, skills shortages are a particular problem. A report carried out by the Sector Skills Council for Science Engineering and Manufacturing Technologies in 2008 stated that skills shortages are higher in the bioscience sector than in any other area, and there is a push to develop graduates who are "fit for purpose" (Science, Engineering, Manufacturing and Technologies Alliance [SEMTA], 2008). A further study from a CBI/ NUS survey (CBI/NUS 2011) indicated that 82% of businesses regard employability skills as the most important consideration when recruiting graduates, and 70% said university students need to do more to prepare themselves to be effective in the workplace.

Interpretations of what is meant by employability vary, from the Understanding, Skills, Efficacy, and Metacognition (USEM) approach (Yorke & Knight, 2006), to the more practical approach of Hillage and Pollard (1998), who state "employability is the ability to gain and retain fulfilling work". The DOTS model (Law & Watts, 1977) uses planned experiences designed to facilitate the development of employability skills such as Decision Making, Opportunity Awareness (knowing what work opportunities exist and what their requirements are), Transition Learning (including job searching skills), and Self-awareness (in terms of interests, abilities and values). This model has been further developed by Dacre Pool and Sewell (2007) to produce a straightforward, practical model of employability that can be used as a framework for working with students. While there is no doubt that work placements prepare students for the world of work (Alcott, 2011), there are many other ways of developing graduate employability skills, such as volunteering, participation in societies, or embedding skills teaching into courses.

The Biomedical Sciences programme at Leeds Beckett University has a skills module embedded at each level of the course. In the first year, the students complete a module designed to develop transferable skills such as group work, creativity and reflection. In the second year, the emphasis is on specific professional skills such as keeping laboratory records, preparing a good CV, and job applications. In the final year, we develop enterprise as well as employability skills. In its broadest sense enterprise involves creative thinking, problem solving, collaboration, communication and entrepreneurial skills (Centre for Learning & Teaching, 2014b).

With this in mind, the module 'Enterprise in Biomedical Sciences' was devised for final year Biomedical Science undergraduates. The aim of the module was to provide the chance for students to develop their group working and communication skills.

As employers regard the ability to work in teams as one of the most desirable graduate attributes (Prospects, 2015), it is up to universities to provide graduates who can demonstrate this. Students with experience of group working are thought to be better prepared for the workplace (Hall & Buzwell, 2012; Chapman, Meuter, Toy, & Wright, 2006), and if the student has had the experience of group working, and a chance to reflect on their contribution, they are well placed to provide what the employer wants in a new employee. One of the major concerns of students when doing group work is the prospect of 'free-riders' doing less work but obtaining the same mark as the other members of the group (Walker, 2001; Hall & Buzwell, 2012), so for this reason in this module

the group work mark was adjusted according to peer review by the other group members, ensuring the group members did not all obtain the same mark.

The data used to evaluate the module was gathered from module evaluations distributed at the end of the module, student reflections, and comments made by students during online group discussions.

Design of the module

The students worked in small groups of up to five members, which they selected themselves, and were asked to develop a novel biotechnology product or a social enterprise from inception to completion. Each person in the group had to have a specific role, e.g. research, marketing, etc. After eight weeks the groups were required to present their work to a small panel of academics, explaining the product or scheme.

The module learning outcomes and assessment tasks were constructively aligned (Biggs & Tang, 2011), allowing the student to see clearly how each assessment task was linked to a particular learning outcome (Table 1). Teaching sessions were designed to be more workshop-based, allowing the tutor to act more as a facilitator rather than a didactic teacher, and the students to be more in control of their own learning, using problem-solving activities. The assessment tasks consisted of a group presentation and other group-related tasks (worth 40% of the module total) and an individual report and reflection of the group process (worth 60%).

Learning outcome	Evidence
Analyse and critically evaluate a new idea generated by the group work process	Written report, group tasks, presentation
Collect and collate primary research information on a complex issue from multiple sources	The group work will involve extensive use of the library, and the internet. The report will involve gathering of information from various sources. Evidenced in report and presentation
Demonstrate the ability to investigate a new topic and produce a concise, reasoned report on a new idea or topic	Evidence that this learning outcome has been met will be gathered from the group work investigation/presentation and the structure of the final report
Understand the process of development of new ideas in biotechnology or social enterprise and how these are taken forward	Evidence that this learning outcome has been met will be gathered from the group work investigation/presentation and the structure of the final report
Analyse and reflect on group roles during the process	Evidence that this learning outcome has been met will be gathered from the group work tasks, and the reflection

Table 1: Alignment of learning outcomes with assessment tasks (from student module handbook)

Assessment tasks

Group tasks

The group presentation (35% of the module) was assessed by at least two members of the course team according to the following criteria: structure of the presentation, timing, communication of the idea (verbal and visual), enthusiasm and answers to questions. The presentation mark was adjusted by peer review from the other members of the team. The groups were also given tasks to do which counted for 5% of the module mark.

Individual tasks

Reflection (25%) required the student to reflect on their personal competencies and aptitude towards group and team work and project planning and management, and also to analyse the roles of other members of the group. They were also required to complete one of the online enterprise skills modules run by the University Student Enterprise Academy.

Report (35%). The individual report was based on the student's area of research within the project. An overview of the idea was required for the introduction, then analysis and evaluation of their contribution, and a final conclusion/recommendation.

Delivery of the module

The module is a core level 6 module, running in semester 1 over 12 weeks. The number of students has increased over the four years it has been running: in the first year there were 65 students, divided into 17 groups: by 2015, it counted 116 students divided into 29 groups. Group numbers varied from three to five members per group (five was the maximum number allowed). Formal teaching

sessions took place for the first six weeks of the module: these sessions covered group work activities, analysis of group roles, formal minute taking, and report writing. There was also a session on business planning given by the University Student Enterprise team. Outside the module, the enterprise team also ran extra workshops on specific topics such as marketing, which the students were encouraged to attend. Online skills development modules were also available, and the students were required to complete at least one of these, and submit the completion certificate along with their reflection. The various enterprise activities were designed to make the students think about their roles, but also to encourage them to develop a 'company' ethos and associated aims. There were also drop in sessions organised by the module tutor where the students could come and discuss ideas and any problems which may have arisen within the group.

The students were required to show they were working as a group by completing group tasks such as posting formal minutes of their meetings on to a group discussion board of the Virtual Learning Environment (VLE) set up by the module tutor – these were areas which could only be seen by the module tutor and the group. The discussion boards were a way for the module tutor to check how the group was working, but also to offer feedback and advice. The group tasks were worth 5% of the module total and again could be adjusted if one member of the group was, for instance, not attending meetings, so the students in one group did not all get the same mark for this component.

Presentations took place in week 10 of the module, and the students were given fifteen minutes plus five minutes for questions. It was up to the group how they pitched the presentation: some asked for money for further development of their project, others for means to sell or market their product. Each person from the group had to present their area of research. Although this was a group presentation, the group was allowed to peer assess each other's contributions, so that those students who were perceived to have made less of a contribution received a lower mark. The module tutor used the peer assessment, and the group contribution (see below) to adjust the marks, so each member of the group did not receive the same mark unless it was clear they had been working well together. This prevented the group fixing marks by giving each other 100% or targeting one member of the group by giving them low marks.

Group work

The main focus of this module was to develop group working and communication skills. While opinions on collaborative work agree that it produces more engaged, higher achieving students (Smith & Bath, 2006; Gibbs, 2009) there are many differing opinions of the use of group work for summative assessments.

At the beginning of the module, the students were invited in class to give their opinion on group working. Most students actually liked group working, although a few did not. For those who did not like group work, the concerns were: working with people they don't know, the fact that working with weaker students may lower their mark especially as this would count towards their overall degree classification, and the perceived unfairness of every member of the group getting the same mark, even if group members do not participate equally. The reason given was usually previous bad experiences of group work. These students also tended to be the students who preferred working by themselves, and were the 'high achievers' of the cohort, not trusting other students to produce work of the same high standard as themselves. Over the four cohorts who have taken the module, this trend was repeated each year, with the same reasons given.

For this reason, the benefits and disadvantages of group work were clearly articulated to the students at the start of the module. The advantages include: an increased understanding of the topic, sharing of workload and of ideas, and a way of developing problem-solving skills. The potential problems they should think about were: working with friends, relying on others to produce work, feeling forced to take part. In this way, it was hoped the students would see this as a positive experience as well as authentic workplace experience.

Another consideration was the selection of group members. During the first delivery of the module the groups were selected according to the results of the Belbin role questionnaire. At the end of the module, the students were asked about the group allocation method and 16% would rather have chosen their own groups, although they were not particularly unhappy with the outcome of the group task (overall satisfaction 89%). The second year self-selection was used, in effect trading the authentic workplace scenario for student satisfaction although it can be argued that groups which consisted of friends but also non friends, as was the case in many groups, could be regarded as a more typical workplace scenario (Chapman et al., 2006). In this case, student feedback for the self-selection method showed 90% satisfaction. The issues which may arise from working with friends were also discussed in the first session of the module. The advantages were that they knew the members of the group, how they worked and how reliable they were, but because they were friends (with some even sharing the same house), it was easy to get distracted, and hard to criticise someone if they were not taking part fully in the process. Also the consideration that if the group members disagree it may spoil a friendship. The findings from this study support work done by Chapman et al. (2006) which showed that while self-selected groups enjoy the experience more, and have a greater enthusiasm for the task, they are likely to be worse at time management. This was also reinforced in this module by the reflections submitted by students – comments included:

- *As we all shared a house it was easy to have meetings, but there were too many other things going on, friends coming round, the play station, phone calls so we got distracted and didn't get anything done so then we had to have another meeting, this time in the library.*
- *We were all friends so quite often we just chatted about other things and it was hard to keep focused.*

As mentioned above, when the module was first delivered, the groups were randomly allocated by the tutor, as there was a feeling that if self-selection took place, the more able students would work together and get higher marks than average, while weaker students would tend to get lower marks. This was not the case, as either self-selecting or not, the students achieved higher marks than average (see below). One unexpected but very welcome outcome was watching some of the less academically inclined students blossom during the process – the creativity and flexibility required appeared to appeal to some students, with comments on module evaluations such as:

- *It was nice to do some designing and craft as in science we don't get to do the creative stuff.*
- *I really enjoyed the fact that this module allowed me to use skills I enjoy and feel good at that I don't normally use.*

The standard of work produced by the students was high – the group work component enabled most students to produce a higher mark than their average over the year (on average 5% higher over each cohort), although the individual component marks were still as expected. Topics covered by the students varied greatly, and some of the ideas were good enough to obtain grants from the enterprise academy to enable further research after the module ended, providing the student with more experience of developing a business.

The peer review process was used in order to allay fears of everyone in the group getting the same mark, especially in a final year module. This was a big concern for some students. By making the process anonymous, the students could give their honest opinion without upsetting the rest of the group. By allowing the group to set their own group rules and marking grid for the peer assessment, they had more control over the group work process. The students were also required to justify their marks by adding comments, which would avoid any disagreements within the group affecting the marks given. This system allowed the student to express their views and to be confident the whole group will not all get the same mark, especially if there had been a feeling within the group that one member did not fully participate. Studies have also shown that anonymous peer reviews give a wider range of marks within the group (Lejk & Wyvill, 2001). The peer review process worked very well, even with self-selected groups: members were still marked down for perceived non contributions, even in groups consisting of close friends.

Each group compiled their own peer assessment marking grids; some examples are shown below (Table 2 and 3). However, most of the groups came up with the same or similar criteria, showing their main concern was non participation by group members.

Criteria	1 (poor)	2 (satisfactory)	3 (good)	4 (great)	5 (fantastic)
Attendance					
Positive Contribution					
Time-Keeping					
Follow Through With Ideas					
Motivation/Enthusiasm					
Confidence In Own Ability					
Concentration					
Ability to Work Within a Team					
Organisation					
Leadership					
Patience					
Dependability					
Total / 60					

Table 2: Example of peer assessment marking grid

Criteria	Fail (0- 3.5)	Poor (4-5)	Good (5-6)	Very Good (6.5-7)	Excellent (7.5-8.5)	Faultless (9-10)	Mark /10
Attendance							
Amount of ideas and contribution							
Communication with group members							
Writing of group minutes							
Meeting deadlines set by the group on minor group tasks such as research, planning etc.							
Understanding what is required of each group member							

Table 3: Example of peer assessment marking grid

The marks from the peer reviews were converted to a mark out of 10. This mark was then used to adjust the presentation mark for the student. For instance, if the student scored 10/10 from their peers, the presentation mark stayed the same, but if they scored 4/10, the mark was reduced by 6%. The students offered comments as to why they had scored as they did – more than 90% of the comments had to do with not attending meetings, not producing work on time and generally not being fully engaged in the process. The report and reflection components of the assessment allowed the student to submit some individual work, giving them some control over the module mark. While accepting that the group work is a large part of the module, feedback from students showed that 95% of them would not be happy if the total module mark was from the group work. By asking them to expand on their area of research from the group work, they have the opportunity to improve their mark, and use some of the research they were unable to put into the presentation.

Evaluation and reflection

The module is a core module for biomedical sciences. Despite the fact that embedding the graduate attributes into the curriculum was a University-led initiative, there was some resistance to using one of the six final year modules on something that wasn't subject specific. Employability skills are seen by many as a 'soft' topic that shouldn't be part of the curriculum. This is also a view in other institutions – this work was presented at a Higher Education Academy STEM conference (Fitzgerald, 2012), where many people commented that this would not be possible in their department as the academics would not agree to forfeit their teaching time. This may be because in biosciences we are used to more structured content, and each discipline wants more teaching time with the students, so the idea of giving up some of this for employability was unpopular with some staff. Staff engagement in the process is therefore crucial (Yorke & Knight, 2006). In this instance, the course team was involved throughout the development of the module, and acted as second markers during the presentations, which allowed them to see what the students were doing, and the groups were allowed to ask for advice from the appropriate member of staff if they needed help.

Some of the students also had reservations:

- *I did not like the idea of the grade being dependent on someone else completing their work. This made me anxious but it seemed to work out OK in the end.*
- *I wasn't happy with the group work but I understand why we have to do it. It (the module) would be better in the second year.*

The reflective component allowed them to analyse how the group worked together, how they worked as part of that group, and how they overcame any difficulties. Usually students find this difficult, but over 90% of the students have commented in their reflections that this process has made them think about how they work within groups, and make changes to their behaviour, if appropriate, for future group participation or teamwork.

Despite the reservations mentioned earlier, feedback from students has been positive on the whole – many commented on the fact that it had improved their group working and presentation skills, and enjoyed the chance to do something different. Some students however were unhappy about having group work in their final year, determining their final marks, even though for this module student marks were higher than their average module mark overall. This year the module average mark of 68% was 6% higher than the other final year module averages. However, despite this, for some students the module was so different from anything they had done before, they struggled with the concept.

Typical comments on the module evaluation were:

- *Overall it was a great experience because it developed various skills – I would love to do it again.*
- *Enjoyed the module but next time I will choose a different team.*
- *Useful preparation for when I graduate and apply for jobs.*
- *Very good. Different from just turning up to lectures.*
- *Well-structured module that helped to improve and provide us with presentation team work and communication skills that employers look for.*

Overall, the module seems to have achieved its purpose in engaging students in developing enterprise and employability skills, especially group work and presentation skills. Even those students who did not appear to enjoy the experience commented that they could see that it had helped them understand what is required by employers, and made them aware of the types of skills they will need to demonstrate when seeking employment.

Evolution

While the concept of the module has not changed in the four years it has been running, it has evolved each year following feedback from students. For the first two years the module was just about biotechnology and bioscience, but some students found it hard to think of ideas or didn't like the idea of being a biotechnology company. Last year the students were allowed to create a social enterprise initiative or a biotechnology product, and this has improved the student experience – over half the groups chose a social enterprise project and, when asked, commented that while they didn't want to be an entrepreneur, they were very enthusiastic about being part of a social enterprise initiative. Perhaps this is because most students studying bioscience 'want to help people' so the social enterprise aspect sits more comfortably with them.

Originally the students just worked on the main task throughout the module, but the reflections showed a lot of the time they were thinking about the end product rather than the process. So an extra group task was introduced, which they worked on over a week, where they were asked to carry out the task, and submit a quick draft of the work, along with a set of group notes as to how they worked together. The emphasis here was on the group rather than the finished product, and allowed the students to focus on what might need to change within the group before the final task was carried out. The reflections are now much more about the group process and not just descriptions of 'who did what and when'.

Getting the students to engage with such a different concept has also meant a change in delivery over each year. The first time through, feedback from students showed that many of them did not understand why they were doing this, with feedback like:

- *I am never going to start my own business so why am I doing this.*
- *Why is this a final year module, it shouldn't count towards my degree.*
- *I am studying bioscience not business.*

The module delivery was then changed for the next year with much more explanation of why the module was useful, what skills it would develop, why those skills were important. For instance, treating the presentation like an interview, as everyone will need interview skills, and pointing out that the group work now gives them an example to use when they are asked in an interview how they work in a team. Taking formal minutes is also something that many of them will be required to do, as well as completing reports on work projects, so emphasising these points throughout the module is crucial to success. Feedback is now much more positive, and even students who say they did not enjoy the module at least acknowledge they understand why they are doing it. Comments from students have included:

- *This module was a great module for our final year, because it has given us several important skills that we may require in the future and definitely for our second semester to come.*
- *I did enjoy the module as I like working in groups. I don't personally like doing presentations but the only way to improve in them and get more confident is to do more of them.*
- *In all honesty, I have not fully appreciated the group work included in past modules. This module however taught me much more in the way of communicating more effectively, both written and oral, giving me more confidence to contribute more hence enjoy working as part of a team.*
- *I really enjoyed the module especially when the group knew what we had to do, it was different as normally we work on our own on individual projects.*

The assessment weightings have also changed during the life of the module. At first the presentation mark was 25%, as it was felt that the students would prefer the bulk of the marks to be on the individual pieces of work, given the concerns over group work and contribution to module marks. However, the positive response to the group work suggested that increasing the weighting to 35% would be acceptable, and this proved to be the case. The reflection was also increased from 20% to 25%. This may be the reason for

increased average module marks over the life of the module from 63% to 68%, as the group work component always scores higher than individual scores for the majority of students.

Conclusions

The module is now well established, but it is vital that each step is clearly explained and linked to employability, otherwise the students begin to question why they are doing it. The module was set up for bioscience students, but could easily be adapted to any subject area as the skills developed are not subject-specific. What is most important is to make plain to the students that the skills developed here are ones which they will use through their working life, allowing them to demonstrate at least one of the graduate attributes underpinning the course.

Biography

Pauline Fitzgerald is a microbiologist, and is a senior lecturer in the Faculty of Health and Social Sciences. Having worked in the NHS before becoming an academic she is particularly enthusiastic about developing employability skills in undergraduates, and she won a University Excellence in Employability Award in 2010.

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