Practice and Evidence of Scholarship of Teaching and Learning in Higher Education
Vol. 1, No. 2, October 2006, pp. 94-106

Entrepreneurship for Bioscience Students – "Be a Biotech Buddy"

Anne Margaret Tierney*
Institute of Biomedical & Life Sciences,
University of Glasgow
a.tierney@bio.gla.ac.uk
Tel: 0141 330 8480
Greig Sinclair
Glasgow Student Enterprise
University of Glasgow
greig.sinclair@admin.gla.ac.uk
Tel: 0141 330 2625

Abstract

"Be a Biotech Buddy" is an online competition run by colleagues in the Institute of Biomedical & Life Sciences and Student Enterprise at Glasgow University. The object of the competition is to introduce bioscience students to the world of business, enterprise and entrepreneurship. Students volunteer to take part in the competition, which is run for one week. Each day, students are sent a scenario with three possible solutions, each of which has a weighting according to its business or scientific merit. Students have to choose their solution, then justify their choice in 100 words or less.

Topics for the scenarios are taken from current news stories. They are written in an entertaining fashion, but there is a serious scientific dilemma behind each one. Students return their answers to staff to be marked, and feedback is given on the business and scientific content of the answers. The winner and two runners up are given a cash prize at the end of the competition.

Keywords: business, bioscience, enquiry-based learning, extra-curricular

* Corresponding author

ISSN 1750-8428 (online) www.pestlhe.org.uk

Introduction

Universities are being encouraged to promote “entrepreneurship” within institutions. This includes the development of educational programmes, and strengthening links between universities and partner organisations. This trend is seen worldwide, as countries strive to create an enterprise culture, which will allow them to compete in the global arena (Gibb, 2005, p10). In the main, entrepreneurial education has been taken on by Business Schools, who have promoted the traditional “business plan” model, which may in fact constrain entrepreneurial thinking and practice (Gibb, 2005, p2).

Binks (2005, p2) proposes a model of “integrative learning…characterised by the individual student’s ability to make deep level connections between the processes of academic learning, reflective self-awareness / personal development and experiential learning in a range of practical contexts.” This alternative moves away from the traditional business plan model and emphasises the importance of acknowledging experience from a wide range of sources. Gibb (2005, p4) acknowledges that entrepreneurial thinking has the need to “cope with, enjoy and perhaps create uncertainty and complexity” and suggests that entrepreneurs “focus strongly upon processes of opportunity seeking, evaluation and opportunity grasping in different contexts, including business.”

The numbers of graduate entrepreneurs in the UK is low in comparison to the US. While graduate entrepreneurs exist, there are a number of perceived barriers: “attitudes to risk and debt; access to resources and opportunities; self-confidence and self-efficacy; time to incubate viable ideas; learning to manage the uncertainty and ambiguity of the entrepreneurial life world.” (The Institute for Small Business Affairs Consortium, 2004, p11). Entrepreneurial education attempts to introduce students to strategies, which will enable them to overcome these barriers and increase self-confidence.

One particularly successful example of integrative learning is the Bachelor of Biotechnology Innovation (BBI) course run at the Queensland University of Technology (Collett & Wyatt, 2005). In this example, undergraduate students are taught “hard science” along with the opportunity to develop entrepreneurial skills in a formal setting. Students participate in entrepreneurial projects throughout the whole of the degree course, gaining skills in many areas. They are constantly referencing their “science”

skills to their "business" skills, building up an experience, which gives them an advantage in the commercial world, compared to students with a more traditional background.

Students studying Bioscience at the University of Glasgow Institute of Biomedical & Life Sciences (IBLS) have few opportunities to develop entrepreneurship skills at all levels of their degree courses. What opportunities are available are usually towards the final year of the degree. IBLS runs a highly successful Work Placement Scheme (IBLS[1]) which allows students to work in an industrial setting for a year, between junior and senior honours (Years 3 & 4). Successful completion of the placement results in the award of MSci. The Work Placement Scheme is highly competitive and open to the top performing students each year. From 2006, final year students also have the opportunity to take as one of their four options, a course entitled Business & the Biosciences, either on its own or in conjunction with a commercial project with a local biotech company (IBLS[2]).

It was hoped that new opportunities could be generated for Bioscience students to become engaged in entrepreneurial activities, or at least become aware of the possibilities of alternative careers. In 2003, a one-hour workshop was established for Level One students to explore how business ideas could be developed. This workshop was opened up to Level 2 students the following year. However, something more challenging was needed to grasp the imagination and the interest of the students, and to awaken their competitive side. "Biotech Buddy" was developed to challenge Bioscience students, and was open to students at every undergraduate level, whatever their experience.

In addition to developing entrepreneurial skills, the Biotech Buddy competition is a form of enquiry-based learning (EBL). Kahn and O'Rourke (2005) have summarised the characteristics of EBL:

- Engagement with a complex problem or scenario, that is sufficiently open-ended to allow a variety of responses or solutions
- Students direct the lines of enquiry and the methods employed
- The enquiry requires students to draw on existing knowledge and identify their required learning needs

- Tasks simulate curiosity in the students, encouraging them to actively explore and seek out new evidence
- Responsibility falls to the student for analysing and presenting that evidence in appropriate ways and in support of their own response to the problem “

Biotech Buddy addresses these considerations, as students are left to decide how they will answer questions, staff have no input or influence over source material, students can find out about topics from various sources; the daily press, magazines, journal articles, websites etc., students delve into the subjects and research them further than expected by staff, and students form arguments which justify their choice of answer.

Background to the competition

“Be a Biotech Buddy” is a week long competition which is designed to encourage enterprise and innovative thinking in bioscience undergraduates. It was started as a collaboration between colleagues in the Institute of Biomedical & Life Sciences and Glasgow Student Enterprises in November 2004, and has run successfully for the past two years.

The idea was generated following an international summer school involving institutions from the Universitas 21 grouping. Students from Glasgow University (GU) undertook workshops in commercialisation and business planning before delivering a commercialisation plan for a biomedical process developed by researchers at the university. During the summer school the GU students met fellow bioscientists from around the world and realised that having business knowledge as well as their scientific background would aid their employability in the global economy. The Biotech Buddy competition was developed to offer a wider number of students this support.

Students undertaking any bioscience undergraduate course in years 1-4 are contacted about two weeks prior to the start of the competition with an invitation to participate. Those interested apply online, and the first forty respondents on a first come first served basis become the participants in the competition. The competition runs from Friday to Friday, which allows the weekend for the students to get to grips with the first scenario, and twenty-four hours for each subsequent one. Over the course of the week, the students are emailed a daily scenario with a topical bioscience theme taken from the

news. The students are given three multiple-choice answers, and they have to choose one answer, justifying why they have given this reply. Each of the answers has some level of biological/business merit and has an associated "reward" of up to £10,000. The accompanying justification is then marked by "Mr Business" and "Dr Boffin" who give it a mark out of £25,000, giving a potential daily total of £60,000 for each scenario. "*Mr Business looks for sound business reason and creativity in [your] answers. To gain marks from [Mr Business] students have to ensure their reply is commercially viable, will boost profits and also be original and creative. Dr Boffin is the science guru who marks with a bioscience hat on (or at least a white coat) and gives points for biology knowledge and scientific reasoning behind the answers*." (Glasgow Student Enterprise) The leaders' board is published online each day along with the next day's scenario, which is also emailed to participants.

Students who enter the competition gain experience in working to tight deadlines and working with a range of subjects that they might not normally come across. Subjects tackled over the past two years have ranged from eco-tourism and Avian 'flu to genetically modified (GM) crops and ethical drug research. The advantage of the competition is that any subject that appears in the news can quickly be written into a scenario. As well as being topical and up to date, there is never a shortage of new material, so there is no need to repeat scenarios from year to year.

By participating students use business and enterprise skills they did not even know they had and learn more about business and its association with biology from the feedback they receive. Students who submit an answer for each of the scenarios have the opportunity to win a cash prize, which is announced at the end of the year.

Example scenarios

Scenarios are taken from topics in the news. These range from environmental issues, to ethical and moral issues within bioscience, for example within the GM debate, or the pharmaceutical industry.

Example 1. Hebridean Hedgehogs

Hedgehogs introduced to the Hebrides in the 1970's have become a major pest, threatening the extinction of several seabirds, as they eat the birds' eggs. You have been approached by the local council who desperately want to solve the problem without causing outrage to hedgehog conservationists. What advice do you give them?

a) The most effective way to get rid of vermin is to put down poison, mixed in food. Of course, the local cat population might suffer a bit.

b) Get the conservationists to do a bit of volunteering work, catching the hedgehogs and relocating them elsewhere.

c) Encourage local restaurants to start serving hedgehog. Mrs Beeton has a great recipe!

In this scenario, there is a dilemma. Hedgehogs are not normally seen as a pest. However, since their introduction to the Hebrides they have become particularly destructive towards native birds, driving the populations to the point of extinction. Students have to weigh up the pros and cons of the situation in making their decision as to the fate of the hedgehogs.

Example 2. Drugs for Profit

You are in charge of a leading pharmaceutical company. Patents for many of your drugs are coming to an end, which will mean lower profits that will make your shareholders unhappy. What do you now spend money researching?

a) Viagra style drugs, which have a huge market and will make you £10 billion a year.

b) Malaria drugs for third world countries, which will only make you £2 billion as the countries can't afford to pay for them.

c) Drugs for leprosy sufferers, which are needed and will make you £12

billion but cause terrible side effects.

This scenario was developed, as it came to the attention of staff that students, especially in Level One have a somewhat altruistic attitude towards science, and tend to ignore the fact that drug companies are obliged to make money and are accountable to their shareholders.

Example 3. A Case of Avian Flu

After a disastrous foray into GM crops a few years ago Farmer Giles decided to turn to organic farming and stocked up on organic chickens. Now with the possibility of Avian Flu hitting the UK he is left with a dilemma, what should he do.

a) Keep farming organically, allowing the chickens a free reign. After all the impact on humans is minimal and people pay a lot more for organic foods.

b) You're better being safe than sorry but on the other hand you've a business to run - lock the chickens up to ensure they won't be in contact with wild birds and sell them as non organic.

c) You can't take any risks with human health. Slaughter the flock and move into something else, you owe it to your staff.

This example was written when the warnings regarding Avian 'Flu were at their peak, although no cases had yet been confirmed in the UK. Students were asked to assess the actual risk against the perceived risk and the media hype of the time.

Evaluation

After the completion of the competition in 2005, students who participated in either 2004 or 2005 were emailed a questionnaire to gauge their response to the competition. A total of twenty students replied to the questionnaire. Although this is not a large sample, it does show that students appreciate the format of the competition as a supplementary exercise to their more usual curriculum.

As the competition has a cash prize, the more cynical observer would state that students enter the competition to win the money. This is probably true, in part, however, it does take organisation and perseverance on the part of the students to reply to every scenario, given the short deadlines and clashes with other assignments. In 2005, from the forty participants who registered for the competition, the following numbers completed each scenario:

Table 1 Student completion of each scenario

Scenario completed	Number of students
Scenario 1	28
Scenario 2	21
Scenario 3	23
Scenario 4	18
Scenario 5	15

We can see from Table 1 that the numbers completing the scenarios is fairly stable between scenarios 1-3, dropping off for the last two, as students find that other work takes priority, or that they are way behind in the Leader Board.

Students who responded to the questionnaire were asked if they had completed all five scenarios (Table 2). They were then asked the reason for non-completion (Table 3).

Did you complete all five scenarios?

Table 2 Students surveyed who completed all five scenarios.

	Yes	No
In 2004	7	7
In 2005	10	6

If "no", why not?

Table 3 Reasons for non-completion of scenarios

	Number of students
Too busy	4
Forgot	0
Other	2

If "other", what were your reasons?

"I didn't take part in 2004."

"I stopped attending Glasgow University to start my education in London instead."

"Essay deadline and examinations."

Participants were then asked a series of questions relating to how they felt about the competition.

We can see from the results in Table 4 that the students were very enthusiastic about the competition, with questions 2,3 and 7 scoring 100% in the positive (strongly agree/agree) categories.

Table 4 Students' opinions of the competition

	Strongly agree	Agree	Disagree	Strongly disagree	Not sure
1. I looked forward to seeing the scenarios every day	4	12	0	0	0
2. I enjoyed finding out about the topics	9	8	0	0	0
3. I enjoyed working out reasons to justify my answer	9	8	0	0	0
4. I found the feedback at the end of each scenario helpful	8	8	1	0	0
5. It brought out a competitive streak in me	7	5	3	0	1
6. It is a useful way to learn about subjects outwith my curriculum	8	8	0	0	1
7. I would like to participate in this type of competition again	9	8	0	0	0

(Question 1) Only 4 students (25%) strongly agreed with this question. The reasons for this are many: the answer deadlines are tight (<24hours), there is a scenario to be answered every day for a week, and students have other priorities, or students may not be sure what was being asked of them, especially in the early days of the competition.

> "*Surprisingly I really quite enjoyed taking part in the game. It just happened to occur at a time when I was signing up to do a variety of different things I wouldn't normally do, so I really didn't know what to expect from Be a Biotech Buddy. But I have to say the scenarios were very well thought out, as were the three options available to pick*."

(Question 2) Students were enthusiastic about finding out about the topics. 53% students strongly agreed, with the remainder of students (47%) agreeing. As the scenarios came from any sector of bioscience, it was often not a subject that would be covered in the curriculum, so students' knowledge of the topic might come from personal experience, or what they had seen on the news, or from personal research.

(Question 3) Students enjoyed working out the justification of their answers, with 53% of students strongly agreeing and the remainder (47%) agreeing. It was noted by staff

marking the students' answers that they had put in a greater effort than had been anticipated. Many of the answers came back with detailed background figures and statistics, quotes from sources and URLs where the original material could be found.

> "*It's quite hard! But also very good! Lets you think about the important issues in different ways and from different points of views!*"

(Question 4) 47% of students strongly agreed that the general feedback at the end of each scenario was useful, and 47% agreed. Only one student disagreed that the feedback given after each scenario was helpful.

> "*At first I wasn't too sure what kind of answers you were looking for but after the first feedback it was clear and I tried a lot harder. It was difficult to stay within the 100 word limit though!*"

(Question 5) Somewhat surprisingly to the authors, students did not really think that the competition stimulated competitiveness between the participants. 44% strongly agreed, 31% agreed, while 19% disagreed. One student was not sure if the competition brought out their competitiveness or not.

(Question 6) Students were enthusiastic about learning in this way, with 47% strongly agreeing that it was a useful method to learn things and 47% agreeing that it was useful. The format of the competition allows the students to engage in enquiry-based learning, which is to be encouraged, as it promotes deep learning, and engagement in the subject.

> "*It made me realise how up on current scientific events I was which was confidence building for the final exam too. Also it's good to make you think about things from a different perspective- i.e. money not just morals!*"

(Question 7) Students were also very enthusiastic in participating in the competition again. 53% of students strongly agreed that they would participate again, with 47% agreeing that they would participate in the competition again. However, as students progress through their degree, other tasks become prioritised, so it is not always possible to devote enough time and attention to the competition.

"*I thought it was very, very good!! I'd definitely take part in it again!!*"

"*Competition was really good, just wish I had more time to complete the scenarios as I missed one due to deadlines and exams.*"

Future Developments

It can be seen from student feedback that students are enthusiastic about the competition. Staffs, too, are keen to see the competition continue. There is no shortage of material for fresh scenarios, and students can participate in the competition as they wish. Staff have had recent discussions as to the format of the competition. At the moment it is restricted to forty participants. One of the reasons for this is that staff need to be able to mark all the entries, write feedback and return the feedback to students within 24 hours. In order to increase the number of students participating in the competition, the length of time between scenarios would have to be lengthened. However, lengthening the time between scenarios takes away the pressure of short deadlines, a feature of many business problems. One way to tackle this is to have a "best five out of six scenarios" competition, which would allow participants to miss one scenario and still remain in the running, and add a bit of suspense for the final winners' table, as those student who completed all six scenarios would have the lowest scoring scenario discounted.

The competition need not be confined to bioscience. Any topic that can take material from current affairs can use the format of the competition to allow students to explore topics that they might not otherwise engage with. All it needs is a willing staff member, willing students, and a bit of time and patience.

"Be a Biotech Buddy" has allowed bioscience students at all undergraduate levels the opportunity to engage in business problems, expanding their experience of what it is like to be a scientist. It has also allowed staff to see what these students are capable of, given the chance to participate in something a little out of the ordinary.

References

Binks, Martin. (2005) "Entrepreneurial Education and Integrative Learning" National Council for Graduate Entrepreneurship Policy Paper #001, Accessed 15/08/2005 from http://www.ncge.org.uk/communities/files/biblio591.pdf

Collett, C. & Wyatt, D. (2005) "'Bioneering' – teaching biotechnology entrepreneurship at the undergraduate level" *Education and Training* Vol. 47, No. 6, pp. 408-421

Gibb, Allan. (2005) "Towards the Entrepreneurial University – Entrepreneurship Education as a lever for change", National Council for Graduate Entrepreneurship Policy Paper #003, Accessed 15/08/2006 from http://www.ncge.org.uk/communities/files/biblio593.pdf

Glasgow Student Enterprise "Be a Biotech Buddy" Accessed 17/10/06 from http://www.gla.ac.uk/services/glasgowstudententerprise/competitions/beabiotechbuddy/

IBLS[1] Work Placement, (2006) How is it Organised? Accessed 15/08/2006 from http://www.gla.ac.uk/ibls/US/workp/page7.htm

IBLS[2] (2006) Business & the Biosciences Course Information Document. Accessed 17/10/06 from http://www.gla.ac.uk/ibls/US/L4/options/optionsa/busbio.pdf

Kahn, P. & O'Rourke, K. (2005) "Understanding Enquiry-based Learning", Handbook of Enquiry & Problem Based Learning. Barrett, T., Mac Labhrainn, I., Fallon, H. (Eds). Galway: CELT. Accessed 17/10/06 from http://www.nuigalway.ie/celt/pblbook/

The Institute for Small Business Affairs Consortium. (2004) "Making the Journey from Student to Entrepreneur – A Review of the Existing Research into Graduate Entrepreneurship", National Council for Graduate Entrepreneurship Research Paper #001, Accessed 15/08/2006 from http://www.ncge.org.uk/communities/files/biblio589.pdf