

The Future Ready Ideas Lab: future-proofing Bioscience students' enterprise skills

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Abstract

Given the pace of technological change, today's students need to be prepared for changing employment roles in an ever-evolving world. Increasingly, employers require graduates to be innovative, adaptable and resilient and to have an enterprising mindset. Enterprise education supports students to develop these key attributes and skills, enabling them to engage with the pace of change. As enterprise educators, in the School of Medical Sciences and the Centre for Academic Development at the University of Aberdeen and externally, at the Scottish Institute for Enterprise, we have collaborated to develop students' formal enterprise learning. With a shared interest in building our students' enterprise skills, we recognised the need to address the challenge of developing enterprising behaviours in our 300 life sciences students and to do that at an early stage of their degree programme. As a starting point, we created a bespoke enterprise workshop called the 'Future Ready Ideas Lab'. To assess the effectiveness of the workshop a Kirkpatrick evaluation-based survey was then used to investigate the following themes: 1) students' reaction to the enterprise session; 2) students' ability to articulate their skills; 3) participants' behaviour post session and 4) benefits derived from the session. The data collected reveal students' awareness of their skills and their understanding of what may be required of future employers and their employees. However, it is also clear from the data that broadening the horizons and the enterprise engagement of all students is challenging. The next step is to conduct a longitudinal study to gather a time-perspective view of this cohort's enterprise knowledge and learning.

Keywords: enterprise education; employability; skills; employers

Introduction

Employability in higher education (HE) is a key strategic priority of most, if not all United Kingdom (UK) universities (Wilson, 2012; Universities Scotland, 2018; CMI, 2018). To help address and embed employability in universities' curricula, HE institutions have increasingly focused on the development of students' attributes, skills and competencies in taught modules and degree programmes. This approach is designed to complement discipline-specific curricula knowledge, helping to ensure graduate readiness for and transition to work (García-Aracil *et al.*, 2018). Despite these curricula developments, recent studies indicate that further focus on skills and competencies and more support for students are both required if graduates are to transition successfully into the complex and evolving labour market (World Economic Forum, 2018).

The 'Fourth Industrial Revolution' (also referred to as 4IR or Industry 4.0) is a term coined to depict how the adoption of automation and technology (Marr, 2018) has rapidly altered the way individuals live and how they work with and relate to each other. Given the pace of technological change, today's graduates need to be flexible, prepared for changes to job roles and the impact of artificial intelligence (AI) as well as to develop their understanding of robotics and of how the evolving employment landscape demands commensurate modification of skills. Higher education institutions must respond and adapt teaching, learning and assessment to make them relevant to such a dynamic transformation of the working world if graduates are to be prepared and 'future-proofed' to deal with these new employment environments and able to take advantage of their opportunities (World Economic Forum, 2016). The recent Deloitte report, 'Preparing Tomorrow's Workforce for the Fourth Industrial Revolution' (2018), makes it clear that soft skills, such as communication, complex problem solving and critical thinking, are essential; it also acknowledges the importance of creativity, innovation and enterprise skills to businesses, if they are to flourish.

The UK Quality Assurance Agency (QAA) provides guidance to help educators to embed enterprise in the academic curriculum and to enhance and promote it across institutions. The QAA publication 'Enterprise and Entrepreneurship Education' defines enterprise education as "*the process of developing students with an enhanced capacity to generate ideas and equip students with the behaviours, attributes and competences to enhance their employability prospects*" (QAA, 2018). In view of this, and to meet employer expectations, universities therefore have a clear responsibility for – and a significant role to play in – supporting students to develop their practical enterprise and employability skills – a priority, considering that NESTA found in its 2018 study that growth is expected in employer need for graduate creativity. If students are to succeed in their learning and their future careers, both staff and student awareness of and engagement with enterprise skills in the classroom are critical (QAA, 2018).

This case study explores the interplay between enterprise skills, students and employers; it highlights the importance of academic staff, learner developers and external organisations in championing creativity, design thinking and innovation in the bioscience curriculum; it investigates how bespoke interdisciplinary learning activities have helped to support first-year bioscience undergraduates to future-proof their skills. Using Kirkpatrick's evaluation model, we investigate students' enterprise learning and behaviours alongside their boundary-crossing skills (Akkerman and Bakker, 2011).

Methodology

We used an online SNAP survey to gather both quantitative and qualitative data, in order to find out first-year students' perceptions of, attitudes to and understanding of enterprise education following the two-hour, 'Future Ready Ideas Lab' workshop. The survey comprised compulsory open and closed questions and was distributed to 300 life science undergraduates at the end of the session. Based on Kirkpatrick's evaluation model (Kirkpatrick, 1996) the survey collected information under the following fields: 1) students' reaction to the enterprise session; 2) students' ability to articulate their skills; 3) participants' behaviour post session; and 4) benefits derived from the session. We analysed quantitative data with SNAP software and qualitative data via thematic analysis to code student

responses into specific categories. The survey was anonymous and any data collected treated confidentially, in accordance with the Data Protection Act 2018 (DPA, 2018).

All pedagogic research conducted followed the quantitative and qualitative survey guidance and practice provided in the Higher Education Academy (HEA) publication 'Getting Started in Pedagogical Research in the STEM Disciplines' (2014).

Implementation

Our 'Future Ready Ideas Lab' workshop is designed to help students engage systematically with the pace of change and to develop strong, actionable insights to develop their enterprise and innovation skills. Following the usual laboratory class teaching pattern, which split the large class of 300 students into three separate groups of 90-110 students, we formed sub-groups of a maximum of twelve students to enable them to work through the defined structure of the workshop in four linked stages (figure 1).

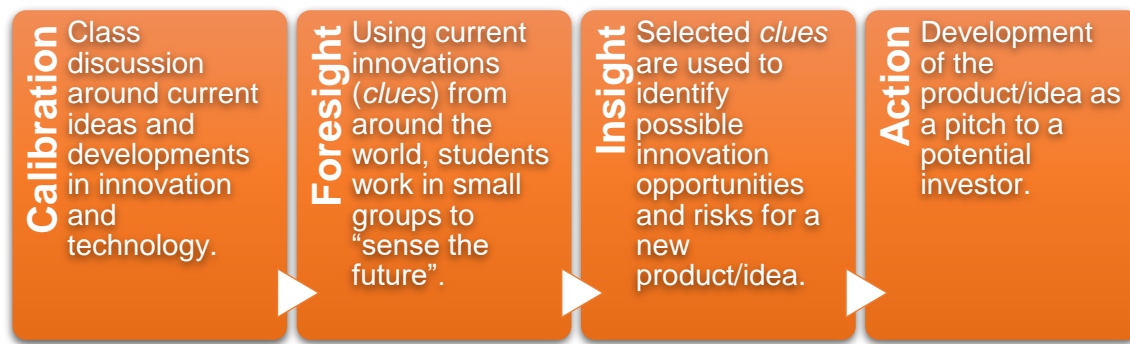


Figure 1: The 'Future Ready Ideas Lab' workshop structure

The workshop session lasted three hours, with approximately forty minutes allocated to each stage, and was co-delivered by two members of SIE staff and the two module co-ordinators (both discipline experts in the life sciences). This co-delivery provided students with both the familiarity of core teaching staff and the opportunity to draw upon external expertise for information and inspiration.

Results and discussion

181 students from a class of 300 completed the survey. Given the large cohort, the practical class was offered in three sittings. Analysis of the respondents was as follows: first-year students studying a life sciences degree; aged mainly between eighteen and twenty-four; sixty-three per cent female. The age range for the students taking the first-year module is characteristic of most UK universities. Typically, Scottish degrees take four years to complete – rather than the three years normal in other areas of the UK – and it was encouraging to secure the high response rate of fifty-seven per cent of the cohort.

To analyse and evaluate the 'Future Ready Ideas Lab' workshop, we used the Kirkpatrick evaluation model, which consists of the following four defined levels, as described in the methodology.

Level 1: Students' reaction to the enterprise session

Quantitative data was analysed from the post-workshop survey to identify students' overall satisfaction with multiple aspects of the class, as well as to ascertain their reactions to what they liked best and least about the session. Students had mainly positive views of the class (figure 2).

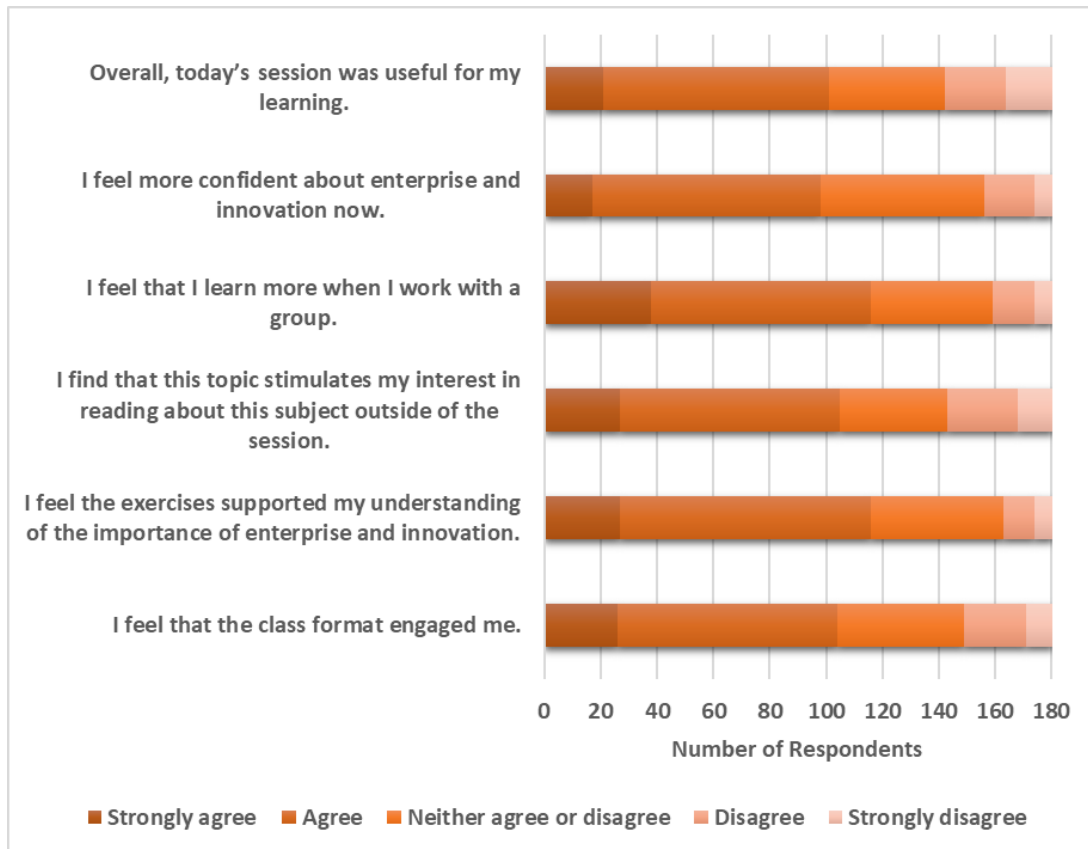


Figure 2: Quantitative responses showing student reaction to the workshop
 (Data are presented as number of respondents answering on a five-point Likert scale from 'strongly agree' to 'strongly disagree'.)

Free-text data were collated and thematically analysed for the questions which asked what students liked best and least in the workshop session. The proportion of positive answers was far greater, with 113 positive and 68 negative reactions. From these two classes of response, three clear themes arose that linked responses to students' learning, student interactions in the workshop and workshop engagement (figure 3).

One comment is representative of the positive attitudes to the session:

“As a student of biological sciences, I'm not used to learning through discussion, so this was new, and I think it engaged my imagination.”

There were negative comments about the length of the session, the workshop structure and the non-biological nature of the topic, as illustrated by this comment:

“It did not relate directly to The Cell module.”

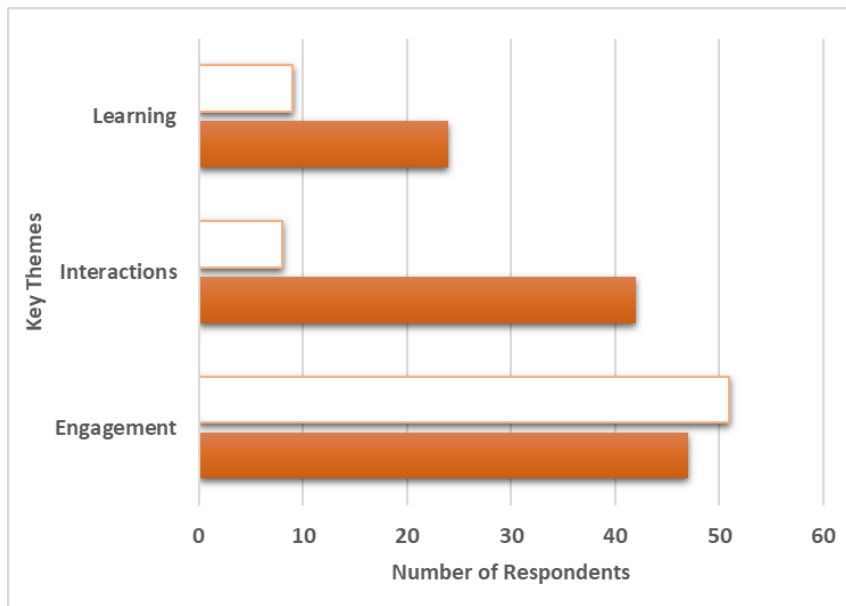


Figure 3: Thematic analysis of free text questions asking students what they liked best and least from the workshop session

(White bars, negative comments; orange bars, positive comments.)

Level 2: Students' ability to articulate skills

To assess the impact of the workshop session on participants' learning and skills, students were asked for responses to the following:

"Before participating in today's session, what did 'enterprise' mean to you?"

"What have you learnt from today's workshop session?"

"List three skills you used in today's workshop session."

When asked what the word 'enterprise' meant to them, most responses (54% of 173 respondents) linked the term to business, with 35% linking the term to entrepreneurship or innovation (figure 4), highlighting that life sciences students' views of enterprise are often firmly anchored to the business world.

Students noted points about skills and ideation, as illustrated by the following comments:

"The development of new ideas."

"Ability to make ideas into real things."

However, there were many more comments which referred to business-related terminology, as this one does:

"A car rental place and business."

These comments make a valuable and important contribution to the design, content and terminology of future enterprise workshops. Given recent reports about the importance of interdisciplinary learning (Stentoft, 2017), it is vital that opportunities are provided to encourage students to be outward-looking beyond a single discipline. Sufficient disciplinary

knowledge and understanding, that are also transferable into different learning contexts, are therefore key to supporting contemporary student enterprise learning.

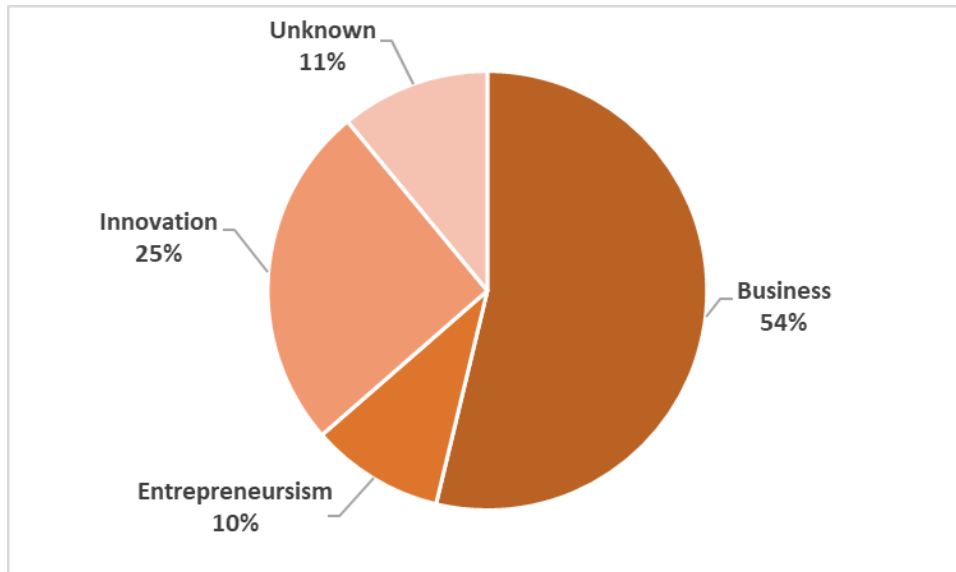


Figure 4: Students' understanding of the term 'enterprise' before the workshop session

Students also highlighted that they had learnt about innovation and technology (figure 5) and had used communication, creativity and teamworking skills during the session (figure 6).

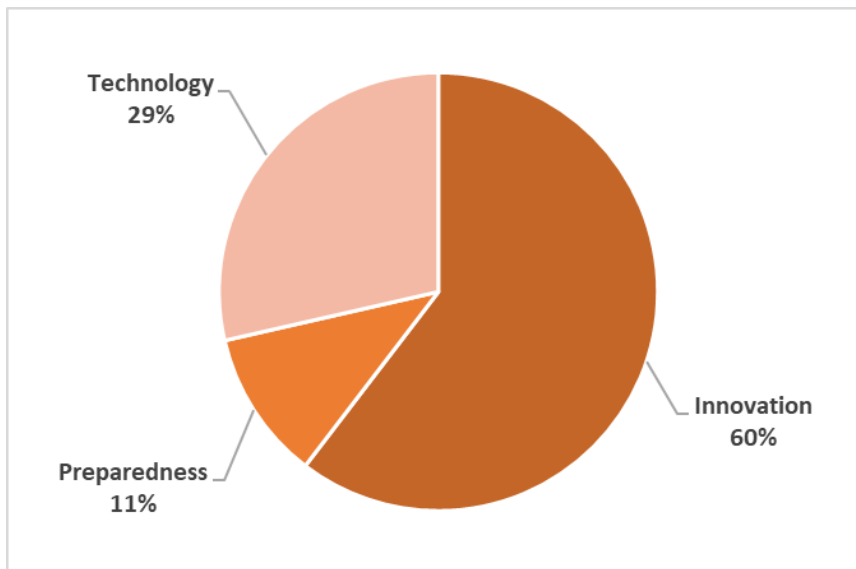


Figure 5: Key learning points students identified from the enterprise workshop

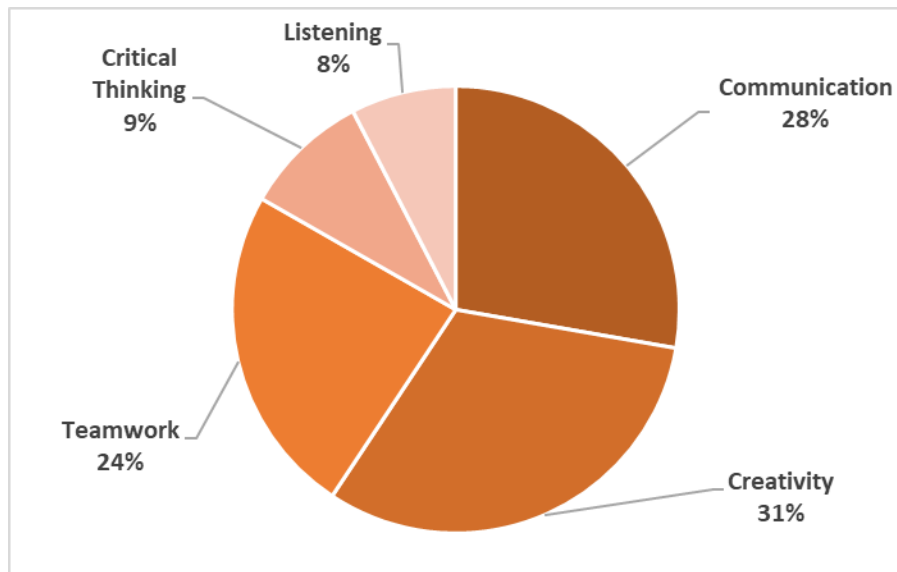


Figure 6: The key skills students identified as developing in the enterprise workshop

Skills are now the global currency of the twenty-first century (CMI, 2018) and it is vital that students can identify and evidence their key skills (such as creativity, communication and teamwork) to help them to work successfully within the growing technology-driven employment landscape (Marr, 2018). It is particularly encouraging that early-year students were clearly able to do this in their survey responses.

Level 3: Participants' behaviour post session

A single question was used to ascertain if participants' behaviour or thinking had changed because of the enterprise session. Students were asked to list three skills that they planned to develop following the workshop. Skills listed in their responses were quantified, the top five being future-thinking, creativity, communication, teamwork and innovation (figure 7). As, according to the World Economic Forum (2016), employers from different employment sectors and sizes are expecting graduates to have these creative and innovatory skills, embedding these skills into the student experience is crucial.

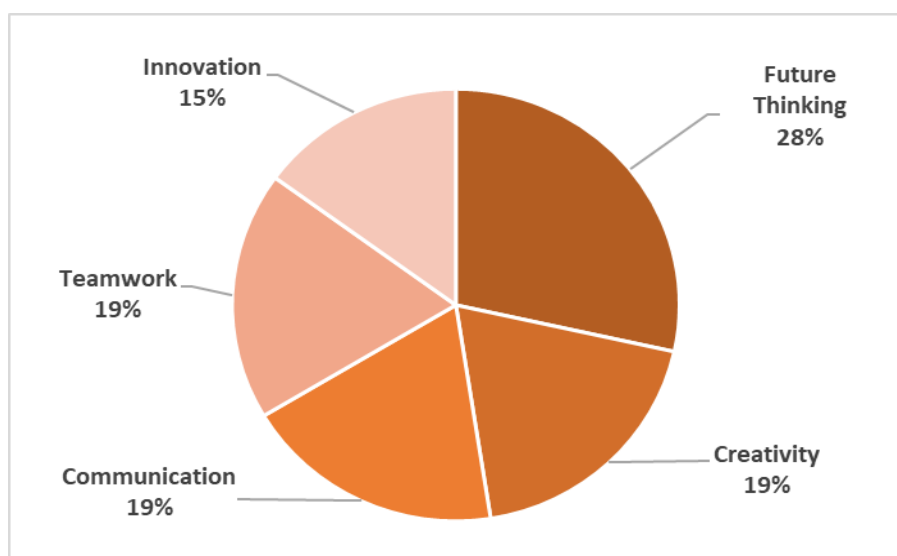


Figure 7: Top five skills students identified to develop following the workshop session

Level 4: Benefits derived from the session

The fourth level of Kirkpatrick’s model focuses on the student benefits derived from the enterprise session. To explore this, the students were asked about how they considered enterprise skills fit within the workplace and with employability via the following three questions:

“How do enterprise skills help support your academic studies?”

“How do enterprise skills help develop your employability?”

“Why do you think enterprise skills are valued by graduate employers?”

Thematic analysis of student responses to these questions reveal that students had a clear view about how enterprise skills provide them with self-awareness, enhance their study skills and make them more future-ready to support their studies (figure 8). When asked how enterprise skills could benefit their employability, most students thought it enhanced their awareness of careers and gave them an improved skill set for their own employability (figure 9). Overall, the students were able to highlight, as the key benefits employers would value, adaptability and – linked to that – a diverse set of skills (figure 10).

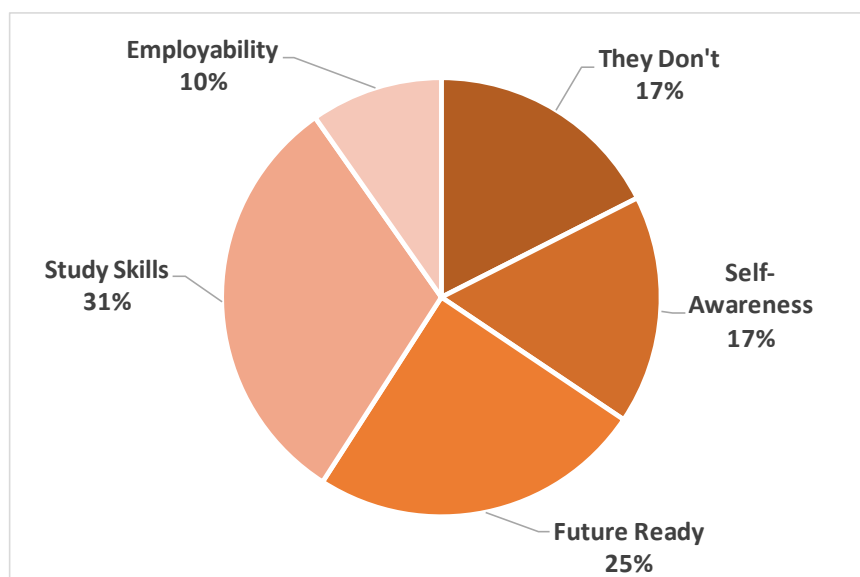


Figure 8: Analysis of survey data: how enterprise skills supports students’ studies

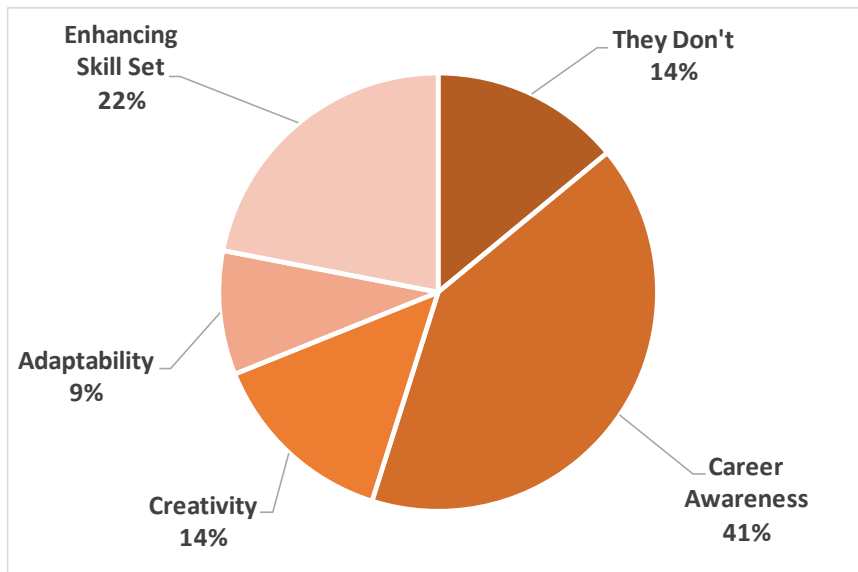


Figure 9: Analysis of survey data: how enterprise skills develop students' employability

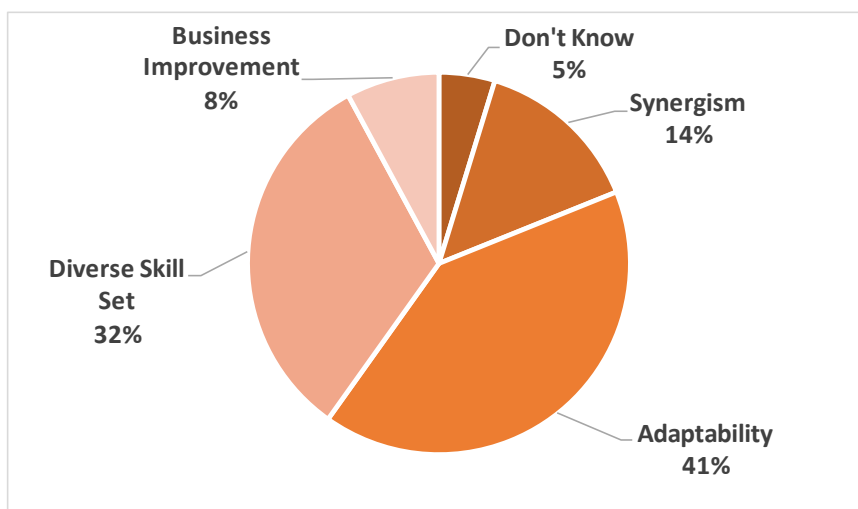


Figure 10: Analysis of survey data: why employers value enterprise skills

Students demonstrated their attitudes and intentions through free-text comments that showed a variety of opinions and viewpoints within the themes listed below.

Study skills:

“It helps me to not only focus on the now, i.e. exams and assessments but also the effect that this will have on my future career.”

Being future-ready:

“They allow me to consider my employment in a world full of different ideas and disciplines. The world encompasses more than pure science.”

Enhancing their skill set:

“Having pointed out my shortcomings, I can now spend time developing them so that they are no longer shortcomings.”

Career awareness:

“Makes me more knowledgeable about current ideas and futures in the scientific field.”

Requirement for a diverse skill set:

“Because they increase the chances that the prospective employee might have skills that add value to the work place.”

Adaptability:

“Because moving forward, things are constantly changing and it’s important to be able to adapt and change to this fast pace.”

Overall, the main focus of the ‘Future Ready Ideas Lab’ workshop is perfectly summarised by this final quotation. Our main aim was for the students to scan their own horizons and acquire the ability to adapt as they move forward in their education and professional lives. That is why this workshop was incorporated into, implemented during and delivered within our first-year curriculum.

Our findings support the QAA publication on enterprise and entrepreneurship education (2018) and the identified synergies between enterprise and employability, which result in employment and entrepreneurship. It is evident from the survey data and students’ comments in class that the enterprise workshop does develop students’ capacity to generate ideas, as well as the behaviours, attributes, and competencies required by employers. Student responses also provide an insight into their understanding of enterprise learning and their ability to identify new learning boundaries through reflection of their experiences during and after the workshop (Akkerman and Bakker, 2011).

Conclusions

It is evident from the survey responses that many students view the early stages of their degree programme through a single discipline lens. Students often focus on how to pass their modules rather than on their enterprise skills and the process of putting ideas into practice. It is also clear from the raft of employer reports (Wilson, 2012; Universities Scotland, 2018; CMI 2018) that combining knowledge and skills coherently across disciplines is crucial for workplace success. Tackling these issues through collaboration with the Scottish Institute for Enterprise (SIE) has helped academic staff to embed the enterprise workshop in the curriculum and has also deepened staff expertise in this area. As engaging disengaged students in enterprise education can be a real challenge, sharing design and delivery responsibility across internal and external stakeholders has been extremely helpful. This approach is certainly transferable to other academic subject areas.

This case study illustrates that enabling students to develop their skills can be more effective if academic learning and the world of work are linked. The survey data indicates that many students enjoyed the enterprise session. A clear message from the recent publication ‘Future Work Skills 2020’, highlights the need for a workforce focused on personal skills

rather than on jobs – new or different – that may exist in the future (Davies *et al.*, 2019). This study clearly illustrates a possible approach to addressing this requirement for students' skills awareness and personal skills development for the complex and evolving labour market. The data also contribute to the under-researched field of embedding enterprise education in the academic curriculum.

It is clear from our survey data that some students may not grasp the learning potential of the enterprise workshop when exposed to these concepts early in their degree programme. Despite this, the rationale for an early-engagement approach is that delivering this workshop in the first year does increase student awareness, so that they set about acquiring the skills they view as important for their future. That said, on account of the limited sample size in this study, further enterprise education research is required to ascertain whether these findings may be generalised to other academic disciplines. While the data presented here indicate a generally positive student attitude to this type of provision, analysis of a larger sample size of first-year students – to explore, say, any differences between student nationalities at a wider range of universities – would help provide further insights into the conclusions drawn through this case study.

The next research step is to conduct a longitudinal study, to gather a time-perspective view of this student cohort's enterprise knowledge and learning across their four-year degree programme.

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