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Graduate Employability: Views of Recent Science Graduates and Employers

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Abstract

Graduate employability is an important issue for higher education as the global financial crisis has led to a significant decline in the employment prospects of new graduates over the past few years. This issue is additionally important due to the reported dissatisfaction of many employers with graduates' ability to contribute effectively to the workplace. The Graduate Employability for Monash Science (GEMS) Project seeks to address these problems by exploring the skills needs of recent science graduates and their employers and, importantly, designing interventions that will inculcate such skills and attributes into undergraduate students via the curricula. This paper presents some initial results from the investigation of recent science graduates' and employers' views of employability skills needs. More specifically, this paper will discuss: (a) whether there is a mismatch between the knowledge and skills developed through undergraduate study and those actually required in post-graduation activities, (b) what knowledge and skills employers view as important when employing graduates in the current and future work climate, and (c) what graduates and employers consider universities can do to better support employment for graduates.

Introduction

Employability of graduates is a key issue for higher education as new graduates face a rapidly changing and highly competitive employment sector. To maximise their likelihood of employment, graduates need to be able to demonstrate the skills and qualities most valued by employers. The annual Australian Graduate Survey (AGS) in 2014 revealed that four months following graduation about a third of graduates were unemployed or under-employed, the worst result since the commencement of the AGS in the 1970s (Graduate Careers Australia [GCA], 2014). Employers have long criticised the ability of graduates to contribute effectively to the workplace (e.g., Australian Chamber of Commerce and Industry [ACCI], 2002). More recently, a report from the Office of the Chief Scientist in Australia (Prinsley and Baranyai, 2015) highlighted a mismatch between the skills required by employers and those possessed by job applicants. Employers, for example, reported applicants with an unsatisfactory understanding of business and lacking in workplace experience and laboratory skills. Prinsley and Baranyai concluded that efforts should be made to minimise the mismatch between employers' requirements and job applicants' capabilities. It is, therefore, of increasing importance that higher education institutions respond to promote the employability of their students. This importance has been observed not only in Australia, but also internationally (Boden and Nedeva, 2010; Bridgstock, 2009).

Aligning with the call for promoting graduate employability, the Graduate Employability for Monash Science (GEMS) Project aims to explore the skills needs of recent science graduates and their employers and investigate how these can best be inculcated into undergraduate

students via the curricula. A likely outcome of the project is to develop a programme of work-related activities for undergraduate students that will enhance their work-related skills identified as lacking by this research. As part of the GEMS project, we surveyed four important stakeholder groups: recent Monash science graduates, employers from science-based sectors, current Monash science students and science academics from Monash and beyond, in order to explore their perspectives of employability and underpinning knowledge, skills and capabilities. While we have an understanding of what employers want from graduates, less is known about how current students perceive their workplace readiness and how recent graduates view the usage of knowledge, skills and capabilities in the workplace and how well these were developed at university. Recent graduates, in particular, are in a unique position to comment on whether the knowledge, skills and capabilities important for employment were developed within university degree programmes. These findings should appropriately inform curriculum development and enrichment.

In this paper, we present data from two of these four stakeholder groups – recent graduates and employers – to shed light on their perspectives regarding graduate employability. More specifically, this paper will address three research questions:

a) Is there a mismatch between the knowledge and skills developed in undergraduate study and those actually required in post-graduation activities?
b) What knowledge and skills do employers view as important in employing graduates in the current and future work climate?
c) What do graduates and employers believe that universities can do to better support employment for graduates?

Employability – Conceptual Understanding

As employability is a complex construct there is no unified view of what it comprises (Andrews and Higson 2008), and no clearly agreed definition of the term. Some may argue that employability can be defined via employment rates following graduation, as measured by tools such as the Australian Graduate Destination Survey. Others go beyond this and emphasise the importance of performance, for example through an employee's capacity to contribute successfully to the strategic direction of an enterprise (ACCI 2002). The International Labour Organisation (ILO) provides a broader view of employability:

> Employability involves self-belief and an ability to secure and retain employment. It also means being able to improve productivity and income-earning prospects. This often requires competing effectively in the job market and being able to move between occupations as necessary. It requires 'learning to learn' for new job opportunities. (International Labour Organisation [ILO] 2000, p. 37)

Reflecting upon the ILO's view and considering previous research on employability (Little 2003; Little and Enhancing Student Employability Co-ordination Team 2006; Širca, Nastav, Lesjak, and Sulčič 2006), our research perceives employability as

> …a set of achievements – skills, understandings and personal attributes – that make graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy (Yorke and Knight 2006, p. 3).

This conception defines employability as a complex construct that 'goes well beyond the simplistic notion of key skills, and is evidenced in the application of a mix of personal qualities and beliefs, understandings, skilful practices and the ability to reflect productively on

experience' (Yorke 2006, p. 13). This also suggests that, in addition to the discipline-specific understanding and transferrable skills, an individual's self-belief in their capacity to make a difference and self-awareness of their learning and ability to reflect upon it are also important in conceptualising employability.

As Bridgstock (2009) noted, knowledge and skills important for employability comprise generic skills, career management skills and discipline-specific knowledge required for performance in a work situation. Generic skills, which are also known as 'soft skills' (Andrews and Higson 2008), 'core skills', 'transferable skills' and 'key competencies' (Mayer, 1992), are the key skills and capabilities transferable to a wide range of tasks and contexts beyond the university setting (Gilbert, Balatti, Turner, and Whitehouse 2004; National Skills Task Force [NSTF] 2000). Throughout this paper we will use the term 'generic skills' to describe those key transferable skills and capabilities. Kearns (2001) considered generic skills to be an essential component of employability at some level. These skills may be gained by students through formal and/or informal learning.

The notion of transferability in regard to generic skills is contentious, with debate revolving about whether skills learned in one context can be transferred into another (Clanchy and Ballard, 1995). However, it is argued that if students are provided with opportunities to enhance these skills by using them outside the classroom, for example, on an industry placement, then they are better able to effectively transfer and apply them in other settings (Crebert, Bates, Bell, Patrick, and Cragnolini 2004).

A survey of physics graduates across a number of Australian universities (O'Byrne, Mendez, Sharma, Kirkup, and Scott 2008; O'Byrne and Mendez 2012) revealed that graduates reported considerable gaps between attributes they gained from their undergraduate science degree and what they saw as important to their employment. These attributes included communication skills, planning skills and awareness of ethical and social issues (O'Byrne et al. 2008; O'Byrne and Mendez 2012).

Sharma, Pollard, Mendez, Mills, O'Byrne1, Scott, Hagon, Gribble, Kirkup, Livett, Low, Merchant, Rayner, Swan, Zadnik and Zealey (2008) interviewed physics graduates and their employers to assess how effectively undergraduate physics studies prepared students for the workplace. They found that graduates believed that their physics education was useful in developing skills necessary in employment, but commented on a lack of useful career information while employers considered that physics graduates were readily able to learn new skills and concepts in the workforce, but commented on a lack of experience in experimental design.

Studies of graduates from chemistry (Hanson and Overton 2010a), forensic science (Hanson and Overton 2010b) and physics (Hanson and Overton 2010c) across a number of UK universities showed that graduates valued generic skills and perceived them to have a greater level of usefulness than subject knowledge. These reports identified an imbalance between the development of such skills within degree programmes and their use following graduation.
Employers from both science and non-science sectors in the UK (Lowden, Hall, Elliot, and Lewin 2011) expected graduates to have discipline-specific knowledge and skills from their degrees but also expected them to demonstrate a range of generic skills and attributes including team working, communication, leadership, critical thinking, problem solving and managerial abilities. Similarly, an Australian study (Ferns 2012) reported that employers considered problem solving, team work and communication as a more critical element of employability

than disciplinary knowledge. These employer needs are well documented but universities continue to focus on promoting discipline-specific content knowledge (Jones 2014) at the expense of generic skills required in the workplace.

Methodology

Research approach and method

This study is guided by a philosophical worldview underpinned by a common set of beliefs that realities are 'socially constructed' (Mertens 2005, p. 12); that is, we construct our own understanding from an event. This understanding is subjective and hence varies from person to person (Creswell 2009). Moreover, these constructions are alterable as they are open to new interpretations as information and sophistication of understanding improves (Guba and Lincoln 2004). According to Guba and Lincoln, knowledge is created through interaction between the researcher and participants. The researchers' goal is to understand the multiple social constructions that the participants hold, thus research 'must employ empathic understanding of those being studied' (Tashakkori and Teddlie 2003, p. 705). This study espouses these views, which are also consistent with the views associated with the constructivist research paradigm. Thus our worldview for this research has been a constructivist one.

In line with our constructivist worldview, we adopted a mixed-methods approach with a perception that a more complete picture of human behaviour and experience can be constructed by using a combination of qualitative and quantitative methods (Gay, Mills, and Airasian 2006). Both quantitative and qualitative data were collected concurrently in the form of online surveys designed for recent graduates and employers, via the Google Form™ platform. Quantitative data were used to seek answers to the first two research questions, whereas the third question was explored using qualitative data. These surveys provided respondents with a list of knowledge and skills that have importance for, and use in, graduate employment. Based on reviewing the literature around graduate employability skills (Andrews and Higson 2008; ACCI 2002; Crebert et al. 2004; de Guzman and Choi 2013; Department of Education Science and Tranining [DEST] 2002; Hanson and Overton 2010a, 2010b, 2010c; Husain, Mokhtar, Ahmad, and Mustapha 2010; Inglis, Croft, and Matthews 2012; Lowden et al. 2011; Mayer 1992), a list of skills and knowledge important for graduate employability was compiled (Table 1). The first six areas are clustered into a 'discipline-specific' category, and the remaining are clustered into a 'generic' category.

In order to collect qualitative data, we included an open-ended item, which sought graduates' and employers' views on the measures that universities could implement to promote the employability skills of its students. These findings may provide universities with a useful source of information for the development and revision of its undergraduate programmes.

Participants

Graduates were invited to participate in the survey by the Monash Alumni Office through open advertisement in an alumni quarterly newsletter and alumni social media pages (e.g., Facebook and LinkedIn). Email invitations were directed to employers listed in an employer database that the Faculty of Science at Monash had developed. Both surveys remained open from June to November in 2015 for the ongoing collection of data from both groups. A total of 167 graduates and 53 employers responded to the respective surveys. The response rate of the graduate survey cannot be determined because of the open invitation approach we used. The employer survey was distributed among 295 employers, of which 18% responded.

Recent science graduates were defined as those who had graduated during 2012–2015 from any of the five schools of the Faculty of Science at Monash: Biological Sciences, Chemistry, Earth, Atmosphere and Environment, Mathematical Sciences, and Physics and Astronomy. Proportions of graduates in terms of their year of graduation were: 2012 – 28%, 2013 – 28%, 2014 – 29% and 2015 – 15%. Of the 167 graduates, at the time of response, 95 (57%) were employed, 64 (38%) were engaged in further studies and eight (5%) were unemployed and looking for a job. Within the employed graduate cohort, 65 were working in science-based sectors, 22 in non-science sectors, and 10 were engaged in teaching in a secondary school.
The employer group represents a range of industry types and sizes. Representations of employers from different industry types are as follows: eight from each of medical research, biotechnology, environmental research and cosmetic manufacturing; five from the food industry, and two from each of water technology, ICT, geophysics research, marine research, the mineral industry, instrument manufacturing, chemical manufacturing and metrology. The numbers of employees working in these industries also varies – ranging from seven to over 1600 employees (with an average of 350 employees).

Table 1: Areas of knowledge and skills important for employability

1.	Content knowledge in your disciplinary area (e.g., content knowledge of chemistry)
2.	Ability to apply knowledge and skills relevant to your disciplinary area
3.	Ability to explain the role and relevance of science in society
4.	Research skills (e.g., planning and design of experiments)
5.	Appreciation of ethical scientific behaviour
6.	Technical analysis
7.	Knowledge/appreciation/awareness of business/commerce/industry
8.	Mathematical skills (numeracy/quantitative skills)
9.	Information and communication technology (ICT) skills
10.	Analytical and critical thinking skills
11.	Problem solving skills
12.	Report writing and/or written communication skills
13.	Oral presentation and/or verbal communication skills
14.	Ability to retrieve/locate information from a range of sources
15.	Leadership skills
16.	Team working skills
17.	Time management and organisational skills
18.	A capacity for flexibility or adaptability
19.	Ability to use own initiative
20.	Independent learning ability required for continuing professional development

Data analysis

Quantitative data were analysed using SPSS, whereas qualitative data were analysed using NVivo. As noted previously, an open-ended item was used in both the graduate and employer surveys to collect qualitative data. In order to develop a deeper understanding of the responses to this open-ended item, written responses were read several times (Creswell 2008) before emerging themes identified and codes assigned to the themes. It is worth-mentioning that although NVivo was used in managing coding, all coding was performed manually, with the written responses interpreted in context rather than as target words or phrases. Following Miles and Huberman (1994), a list of themes were identified as they emerged from the data. This approach allowed for the perspectives of the respondents to be identified without applying preconceptions. With this open-ended item we sought to articulate respondents' perspectives

in the absence of a prior set of research findings, to avoid a preconceived framework which might impose excessive rigidity on the research. The first author of this paper solely assigned codes to the qualitative data, and the codes were cross-checked and discussed in weekly meetings with the co-researchers. This approach helped to ensure the reliability of the analysis.

Findings

The findings are presented in two sections. The first section, based on quantitative data from both the graduate and employer survey, sheds light on the relative importance of knowledge and skills required for employment. The second section, dealing with qualitative data, discusses how universities could better prepare their graduates for employment.

Knowledge and skills developed in university and those required in work – graduate perspectives

As noted previously, a major purpose of the graduate survey was to determine which areas of knowledge and skills developed in the undergraduate degree programmes had been of most use since graduation and how well they had been developed within the degree programmes. This helped to elucidate any mismatch between knowledge, skills and capabilities developed in university and those actually required in post-graduation activities.

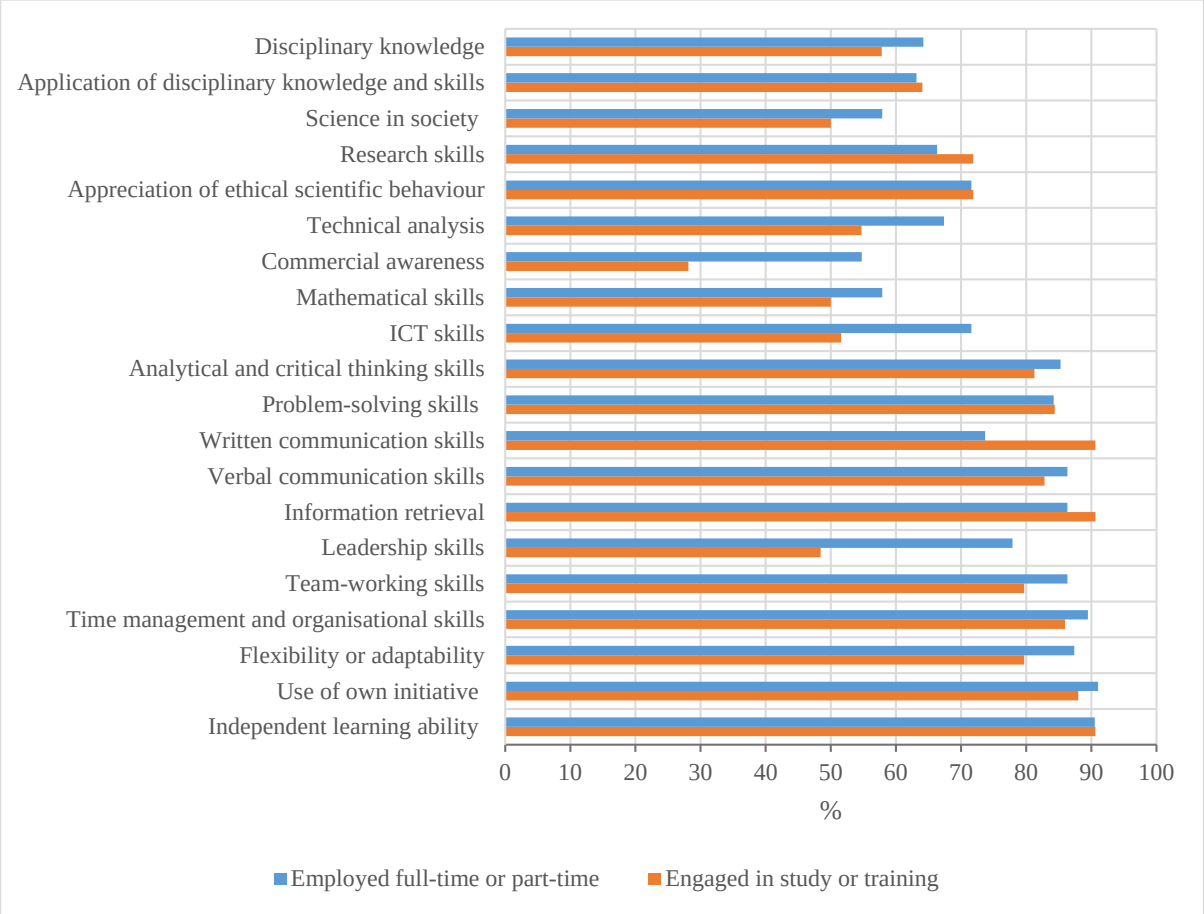

Figure 1: Percentage of graduates selecting 'Very useful' or 'Useful' for each knowledge and skills.

Knowledge and skills used since graduating.
We asked graduates to respond to the question: 'With respect to your career since completing your undergraduate degree, whether working, training or undertaking other activities, please indicate the value of the areas of knowledge and skills listed'. Respondents could select one of: 'Not at all', 'Very little', 'To some extent', 'Useful' or 'Very useful'. Figure 1 presents the percentage of graduates, in terms of their current activity, selecting the knowledge and skills as 'Very useful' or 'Useful'.

It can be seen that, irrespective of whether they are employed or are engaged in further studies, graduates generally ranked generic skills at a higher level of usefulness than the discipline-specific knowledge and skills. A large difference between employed and further study cohorts, however, was found with respect to the commercial awareness, leadership skills, ICT skills, and written communication skills, with the employed graduates valuing the first three at a higher level of usefulness and the further study cohorts valuing the remaining one at a higher level of usefulness.

Knowledge and skills developed in the university degree programme.
Graduates were asked to respond to the question: 'With respect to your undergraduate degree, please indicate how well the course assisted you in developing the knowledge and skills listed'. Respondents could select one of: 'Not at all', 'Very little', 'To some extent', 'Well' or 'Very well'. Figure 2 presents the percentage of graduates, in terms of their current activity, selecting 'Very well' or 'Well' for this question. As it can be seen, for most of the items, a smaller percentage of graduates in further study compared to employed graduates, felt that those skills were developed either very well or well in their undergraduate degree. Figure 2 also indicates that, of the listed items, commercial awareness, ICT skills, mathematical skills and leadership skills were not rated highly with respect to how well they were developed. Crucially, only about 15% of the graduates undertaking further study and 35% of employed graduates considered that commercial awareness was developed either very well or well in their undergraduate degree programmes.

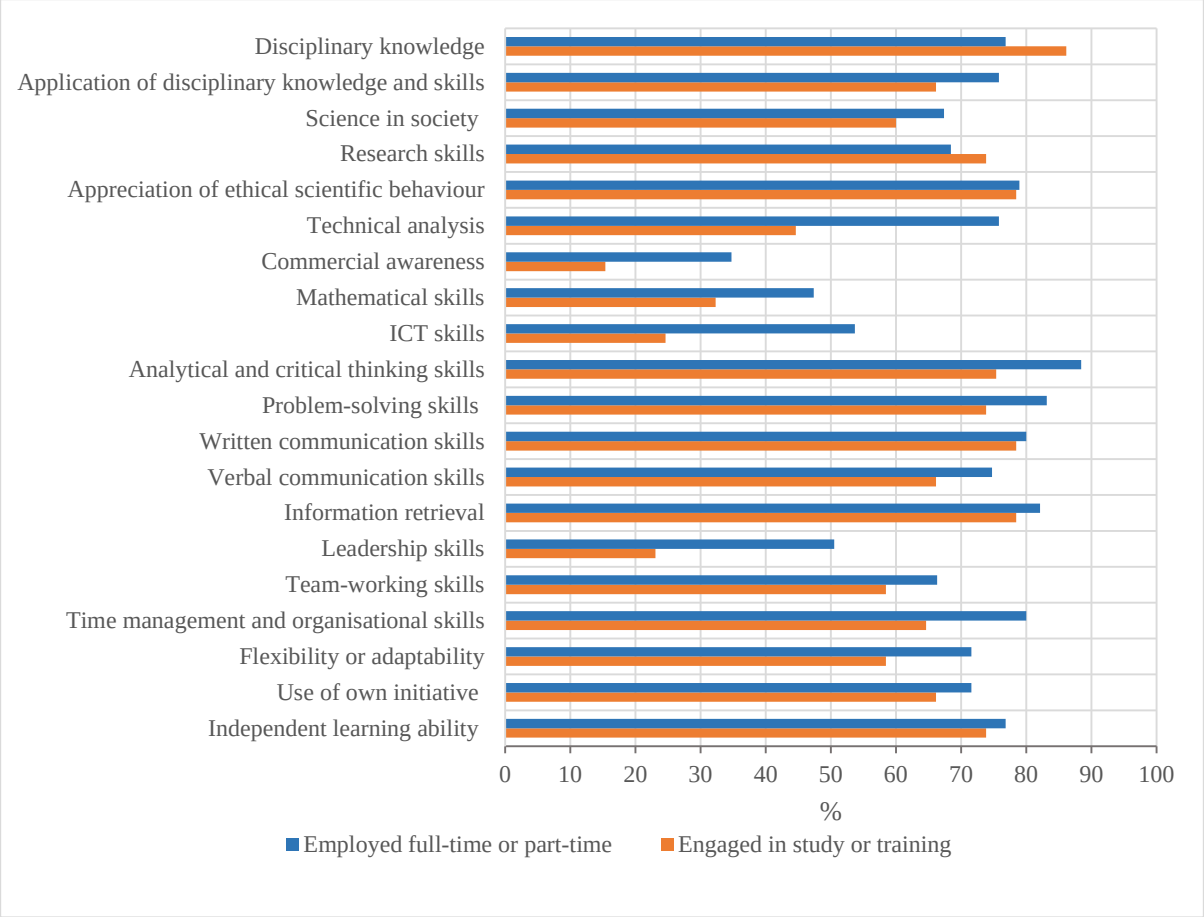

Figure 2: Percentage of graduates selecting 'Very well' or 'Well' for development of each knowledge and skills in their degree.

Use versus Development.

In order to ascertain how well the knowledge and skills used by graduates relates to their development in degree programmes, the differences between 'Use' and 'Development' data are plotted as so-called 'development deficits' (Figure 3). Development deficit for a particular skill is calculated by subtracting the percentage of graduates selecting the skill 'Very well' or 'Well' (see Figure 2) from the percentage of graduates selecting it as 'Very useful' or 'Useful' (see Figure 1). For example, for 'Disciplinary knowledge', 64% of employed graduates selected it as 'Very useful' or 'Useful', whereas 77% of that particular graduate cohort selected that 'Disciplinary knowledge' was developed either 'Very well' or 'Well' in degree programmes. Development deficit for 'Disciplinary knowledge' for employed graduates is thus 64% – 77% = –13%. A negative 'development deficit' indicates that it has been developed to a higher level relative to use in employment, whereas a positive value indicates that the area has been developed to a lower level relative to use in employment. Although a rather crude measure, Figure 3 does help to visualise the apparent deficit in development of most of the generic skills, for the graduates irrespective of whether they are employed or are engaged in further studies.

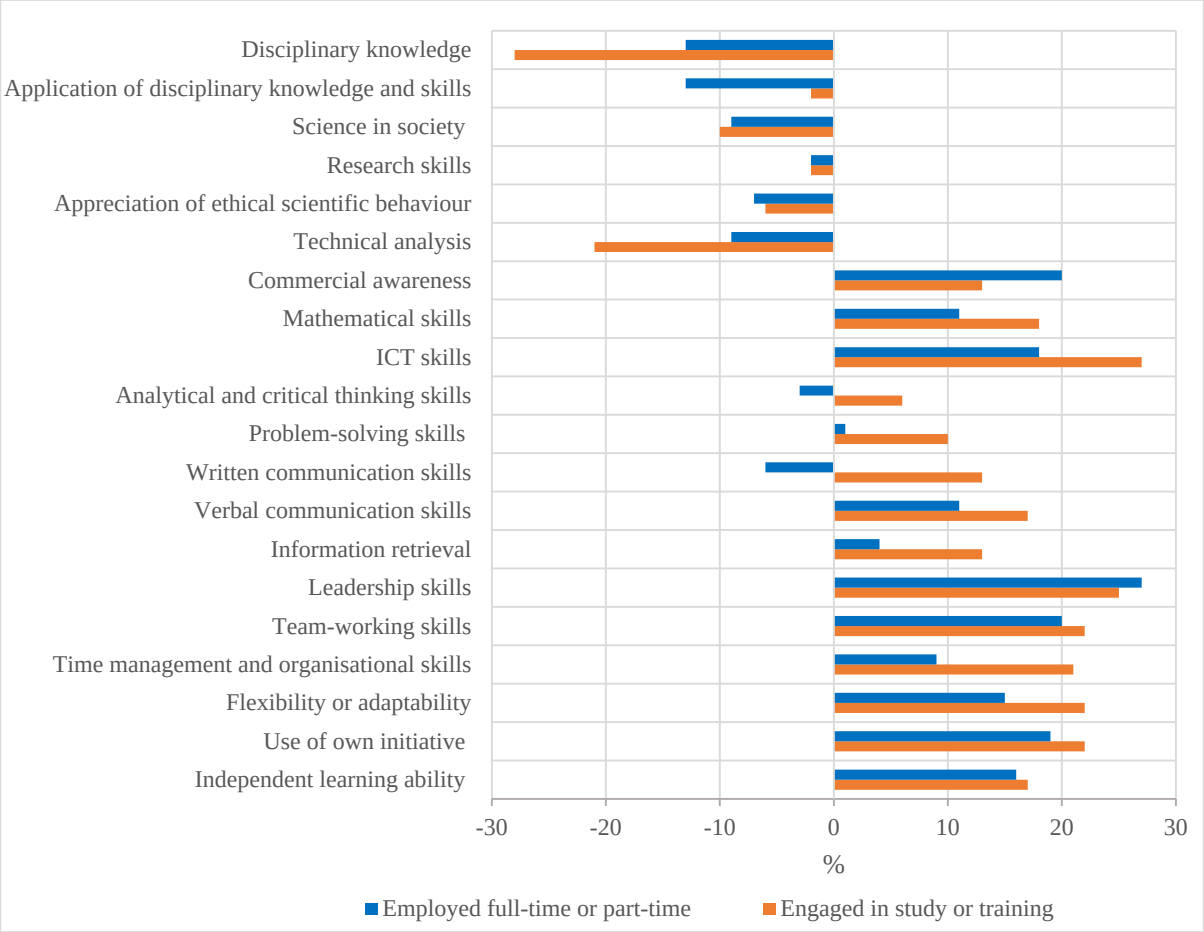

Figure 3: Development deficits in regards to knowledge and skills for all graduates.

Knowledge and skills graduates would have liked more opportunity to develop within their degree.

Graduates were asked to indicate the five knowledge and skills that they wished had been developed to a higher level within their undergraduate degree. This question was asked to see if graduates would have liked to have developed those areas of knowledge and skills identified having positive development deficit. Figure 4 illustrates the percentage of respondents that included the areas in their top-five wish list. As the figure shows, generic skills appeared frequently in the graduate wish list, irrespective of their occupational situation. More specifically, commercial awareness and leadership skills appeared most frequently in the wish list. The other areas of knowledge and skills which appeared frequently are, in order: analytical and critical thinking skills, ICT skills, mathematical skills and problem-solving skills (Figure 4). When compared with the 'development deficit' (Figure 3), these results are in broad agreement for most of the knowledge and skills listed, but a major difference is found for analytical and critical thinking skills. Whilst analytical and critical thinking skills showed a negative development deficit for employed graduates, a large portion of this cohort (30%) considered these skills as one of the top five that they wished had been developed further within their undergraduate degree. This may be seen as an indication of how employed graduates valued analytical and critical thinking skills.

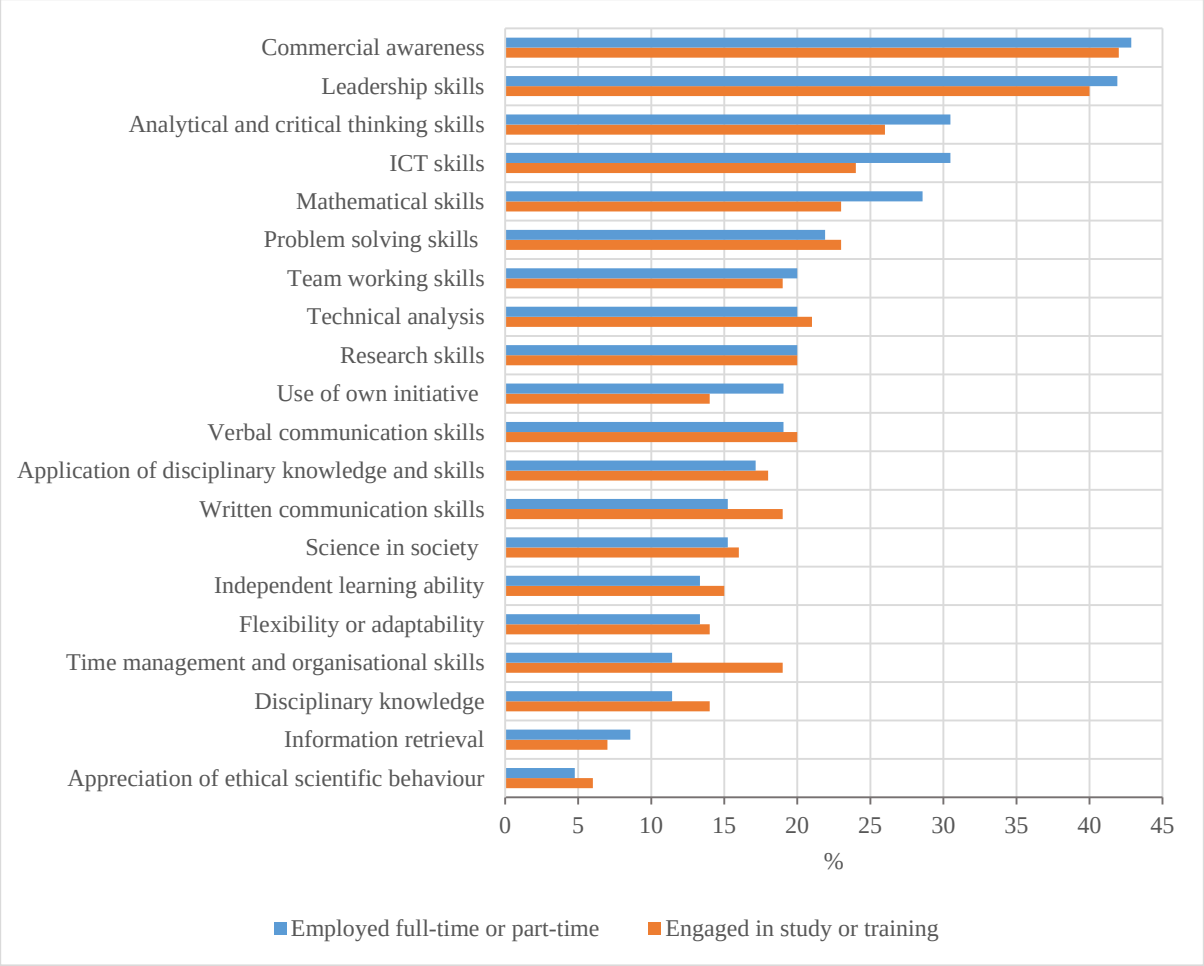

Figure 4: Percentages of graduates selecting the knowledge and skills in their wish list.

Knowledge and skills important for employment – employer perspectives

The employer survey aimed at exploring employers' views of recent science graduates' preparedness for the workplace, and their views of employability skills in the current and future work climate.

Employers were asked to indicate how much they agree or disagree with the statement: 'In general terms, graduates recruited in the last three to five years have had the skills required to work in my organisation'. A majority of employers either 'agreed' or 'strongly agreed' with the statement, indicating they were generally satisfied with the skills of the graduates that they had employed recently.

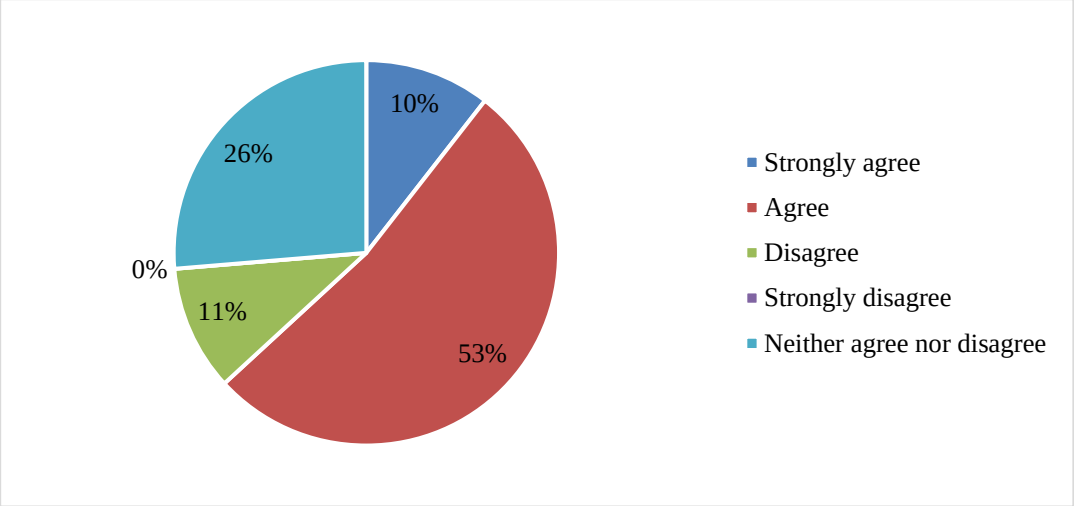

Figure 5: Employers' satisfaction with graduate skills

The employers were then provided with the list of knowledge and skills (as in Table 1) and were asked to indicate how satisfied they were with their recent graduate employees with respect to the development of each item in the list. It was revealed that a large number of employers were dissatisfied with the following areas of knowledge and skills of the graduates:

1. Commercial awareness
2. Independent learning ability
3. Problem solving skills
4. Leadership skills
5. Ability to use own initiative

The employers were also asked to rate the importance of the knowledge and skills from the list (Table 1) when recruiting graduates, considering both current and future situations (in 5–10 years). Table 2 was constructed from their responses to illustrate the five most important areas. As it can be seen, all of these important areas are considered as generic skills. Also, no major difference was found between current and future situations in regards to how employers rated their importance and this concurs with what was found in a recent study by Rayner and Papakonstantinou (2015).

Table 2: The top five important graduate knowledge, skills and capabilities in current and future situations

Current situation	Future situation
1. A capacity for flexibility or adaptability	1. Problem solving skills
2. Problem solving skills	2. A capacity for flexibility or adaptability
3. Analytical and critical thinking skills	3. Analytical and critical thinking skills
4. Ability to use own initiative	4. Ability to use own initiative
5. Team working skills	5. Team working skills

The role of the university in helping students prepare for employment

This section discusses what graduates and employers viewed universities could do to better support employment for graduates. As noted previously, open-ended responses from the graduate and employer survey generated qualitative data to explore this issue. A total of 136 (82%) graduates and 43 (81%) employers provided responses to the question. From a thematic

analysis of the qualitative data, the following themes emerged. It may be noteworthy that we had no underlying intention to explore any differences between employers' and graduates' views. Instead, we were primarily interested in constructing an holistic picture from their views of measures that universities could use to better promote graduate employability.

Providing placements.

Seventy-one graduate responses (53%) and 14 employer responses (31%) highlighted the importance of placement in students' preparation for a career. For example, a graduate commented how placement opportunities could promote business awareness among students:
If there was an opportunity for placements or work experience, I believe that after graduating I would have been a lot more prepared for employment. Also I would have been able to gain awareness and expectations required in the scientific working industry.

Employers also viewed business awareness as important given that business practice is different from that in the university. They commented that they could help students in developing this awareness through placements. In relation to this, one employer commented that:
Understanding how business works, understanding that what is learnt at university is quite often not what is practiced in business. You need to understand it – you can learn it from internship and here we are.
Twenty-one graduate responses expressed the view that work placement can provide networking opportunities that may promote skills and capabilities important for employment. One graduate commented, for example,
Placement or internship opportunities to learn networking skills in a friendly and supportive environment, such as professional mentorships, to build confidence and interpersonal and communication skills.

Both graduates and employers suggested restructuring of placements so that students earn credit for successful completion. This suggestion appeared in nine graduate and four employer comments. As the following comment from an employer indicates, an extensive placement programme with students receiving academic credits can promote networking between students, the university and the industry: "*Internship programs which run for longer and that go towards University extra credit will be better for developing a relationship between the student, University and the organisation.*" Employers also viewed that internship programmes can benefit from well-maintained communication by the university with industries, as illustrated by this comment: "*Better communication about what the University offers students, and why the internship programs will help. Better communication about the expectations of internship programs."*
Whilst employers perceived the importance of placements and internships, there were four comments indicating students' low interest and under-preparedness while they were engaged in such programmes. For example,
Placement programs are good, but some students are disinterested. We have had better experiences with students who seek us out rather than students who are assigned to come here.
An ability to provide feedback/review would be good as well as some job readiness for students – e.g. Don't play with your phone the whole time. Contribute to discussions, take notes (and no, not on a phone).
"*Teach about appropriate workplace behaviour. How to impress your supervisor. What not to do.*"
The comments above indicate how low interest and under-preparedness of students during placement programmes may lead to employer dissatisfaction. This suggests that students need

to be given opportunities for pre-placement preparation before they are sent to the workplaces (Barthorpe and Hall 2000).

Building professional networks.

As noted above, building professional networks is seen by graduates as useful for employability and they viewed the role of placement being important in promoting this. Twenty-one graduate comments (16%) additionally suggested providing workshops with guest lecturers from different industries and recent graduates as an opportunity to promote networking. For example,

… providing more networking opportunities to meet people working in relevant fields in Victoria. It would have been good to have a guest lecturer from different institutions (Parks, Melbourne water, Phillip Island nature parks, enviro consultancy companies) talking about what they look for in graduates etc.

Set up more workshops and panels involving potential employers and recently graduated students who are now employed.

A notion of building relationships between industries and the university also appeared in six employers' comments (14%). As the following comment indicates, employers showed interest in building a relationship with the university in order to contribute to the development of students' employability through mentoring research students and participating in curriculum revision.

We can provide research projects to students to do research at Monash laboratories. The research outcome can be published as articles or book chapter. I am willing to have long term relationship with Monash Uni to help develop research skills of students and also help modify curriculum to improve employability of students in long term.

Clear career directions, pathways and opportunities.

Graduates expressed the view that making career directions, pathways and opportunities clear and explicit would help them in finding employment. This view appeared in 20 graduate comments (15%). Specifically, graduates would like to receive clear career advice at the beginning or prior to the commencement of their degree:

Engage students at the beginning of their studies. Provide realistic information and expectation of career progression and employment attainment post-graduation (e.g., not all first year psych students are aware of the challenging pathway to becoming a psychologist).

I am not clear if I perhaps have not had sufficient guidance in potential employment or if it was not made clear prior to studying that employment options would be limited.

The comment below further illustrates how high achieving students also encountered challenges finding employment after graduation as result of their limited awareness of their career options.

Provide a better focus on the practical application of the degree and the content. A lot of people struggle with where to go afterwards even when having done so well. A clearer path to careers is needed so that we can understand where we are going and how we will get there.

This may be seen as indicative of how the university fails to provide adequate information to students to build their awareness of career opportunities.

Embedding employability within the degree.

Twenty of the graduate comments (15%) suggested that aspects of employability (for example, preparing a job application) should be integrated into their degree programme. Here are few such comments, for instance:

It would have been helpful to have been taught at Monash how to apply for jobs including answering Key Selection Criteria. I realise the Careers Hub offers this service, however I feel it should be an integral part of a Monash university degree.
Potentially the compulsory science unit offered would have been more beneficial if it provided and prepared us for jobs, resume writing, interviews - tailored for Science jobs.
These comments above indicate that graduates need support from the university in developing practical skills for finding employment, such as preparing their first job application. Nine of the employer comments reflect this too. For example,
We get probably 100 applications for every Research Assistant job we post on seek. Teach them to follow instructions. Many applicants simply click on the Apply Now button without reading the full ad and application instructions. This is a clear indication of a lack of attention to detail and a preference for shortcuts.
Importantly, employers do see it as the responsibility of the university to prepare students for employment: "*More focus on taking students from being students to being employees - preparing them for work.*"

Suggested revisions to undergraduate curricula.
While no graduates commented on curriculum revision, nine of the employer comments highlighted the need for revising the undergraduate curriculum. Their comments include addition of industry specific content into the curriculum:
Monash Uni needs to include subjects like regulatory affairs in their curriculum and need to talk with industry experts regularly.
Employers' comments on curriculum development also included changing approaches to teaching and learning, for instance, engaging students in solving authentic problems in a range of situations:
I find some high performing 'quantitative' students struggle with unsolvable problems (e.g. not enough data is available) or uncertain situations (e.g. what does the customer want). If possible give them some exposure to uncertain/ambiguous problems.

Discussion and Conclusion

Our study reports how generic skills are valued by both science graduates and employers from science-based sectors and how the university could do more in preparing its graduates for employment. As reported, both employers and graduates, irrespective of whether they are employed or engaged in further studies, viewed generic skills as having a higher level of usefulness in workplaces compared to discipline-specific knowledge and skills. Also, most graduates wished generic skills had been developed further within their undergraduate degree. These views of graduates from a range of science disciplines very much aligns with what has been reported for chemistry, forensic science and physics graduates in the UK (Hanson and Overton 2010a, 2010b, 2010c). Academics may consider this evidence while advising undergraduates on the importance of generic skills development and providing them with opportunities to develop those skills during their degree programmes.

That generic skills were considered to be less well developed than the discipline-specific knowledge and skills within degree programmes may indicate a mismatch between the use of knowledge and skills by graduates in post-graduation activities and their development within degree programmes. This is consistent with what has been reported by Hanson and Overton (2010a, 2010b, 2010c) and in a number of Australian studies (O'Byrne et al. 2008; O'Byrne

and Mendez 2012) for physics graduates. This result provides evidence for greater focus on the development of generic skills as part of better preparation for students for employment.
Graduates' and employers' responses to how universities could better support graduate employability provide a useful source of information for the development of degree programmes. Data suggest that increased opportunities for placements would promote networking and generic skills, for example, business awareness, among students to enhance their employability. This concurs with Crebert et al. (2004) that graduates value highly the experience of placement learning and the associated generic skills development that would eventually contribute to subsequent employment. For credit, year long, industry placements are widespread in Europe and their benefits are well-reported, including improved employment prospects (Basit, Eardley, Borup, Shah, Slack, and Hughes 2015; Bowes and Harvey 2000; Pillai, Khan, Ibrahim, and Raphael 2011; Silva, Lopes, Costa, Seabra, Melo, Brito, and Dias 2015) and enhanced academic performance (Gomez, Lush, and Clements 2004).

Findings of this study indicate that clear and useful career advice at an early stage of a degree programme would be helpful for graduates. Although graduate views on the lack of career advice in university is a well-reported issue (e.g., Hanson and Overton 2010b; Sharma et al. 2008), it seems that universities have still much to do in this regard. Our findings also show that presentations by recent alumni and employers from different industries may be a further useful way to support students in making informed careers choices. This may also create opportunities for students to meet career role models and build professional networks with them. Along with career advice, graduates and employers commented on a need for a greater focus on employability and career support tailored for science students (e.g., how to prepare a job application in science) to prepare them for work.

Employers in this study recommended changes to university pedagogy, especially in regards to exposing students to authentic or open-ended problems. This could be interpreted as a suggestion to shift from recipe-like or algorithmic problem solving to more inquiry-oriented learning, which would help students to learn real problem solving skills across a range of situations. Rayner, Charlton-Robba, Thompson, and Hughes (2013) reported that in addition to enhancing students' ability to solve open-ended problems, an inquiry-oriented approach can provide students with increased opportunities to exercise and develop higher-order thinking (e.g., critical thinking), teamwork, self-directed group learning, and communication skills. This suggests that exposing students to more open-ended problems has considerable potential to develop generic skills that eventually can positively impact their employability.

In addition to the views of recent science graduates and employers documented here, an ongoing study is surveying current science students and science academics for their perspectives. Using these data and drawing on existing published resources (e.g., Chin, Grice, and Overton 2004; Overton, Johnson, and Scott 2015) an intervention will be designed for students, focusing on the development of skills required for graduate success beyond university. The plan is to engage employers in the development and delivery of such an intervention. It will be delivered to final year students from across the Science Faculty and gather evidence of effective pedagogies and activities though observation, interview and discourse analysis. Participants will be followed into post-graduation activities. By using surveys and follow up interviews data will be gathered on their use of skills and knowledge in post-graduation activities, compare them with their experience on the intervention activities, and look at gap analysis and learning gains. Identifying skills gaps from graduate and employer perspectives and developing intervention for undergraduate students to bridge the gaps and following them into post-graduation activities provides an holistic approach to research around

graduate employability. This approach is expected to provide important insights for universities into designing their undergraduate curricula.

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