

Using a Professional Development Program to Enhance Undergraduate Career Development and Employability

Julia Choate^a, Judi Green^b, Sandy Cran^b, Janet Macaulay^a, and Michelle Etheve^c

Corresponding author: julia.choate@monash.edu

^a School of Biomedical Sciences, Monash University, Australia

^b Careers, Leadership and Volunteering, Monash University, Australia

^c Careers and Employability, RMIT University, Australia

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Abstract

Students in the final year of their Bachelor of Biomedical Science at Monash University participated in focus group interviews about perceptions of their employability. They felt they had limited employability skills and they were unaware of their non-medical/research careers options. In response to these issues a team of academics and careers staff developed a professional development program that aimed to build students' career development skills, careers knowledge and their ability to articulate their skills to employers. Each semester (starting from year one) students have an employability lecture and a careers development activity (assessed) linked to the development of an electronic portfolio. On completion of the program, students will have developed life-long career management skills and produced a transferrable profile that reflects their experiences, skills, knowledge and capabilities. We report on the initial introduction of the program into the first year of the Bachelor of Biomedical Science in 2015. This process has been associated with changes in students' careers certainty. We have also experienced issues with the integration of the careers and academic staff in the program and a need for staff and student training with the unfamiliar portfolio platform.

Introduction

Rationale for the project: traditional careers and employment prospects for Australian biomedical science graduates

In the Australian higher education sector, biomedical science bachelor degrees were established to educate and train students to become biomedical researchers. Progressively fewer Australian biomedical graduates, however are choosing a research career. In recent years, there has been extensive negative publicity about scientific research careers and with a diminishing pool of funding to support research, PhD graduates are seeking careers elsewhere in areas like secondary teaching, graduate medicine, law and business (Nielsen 2014). There is also evidence of reduced employment opportunities for biomedical scientists, with many graduates continuing into further studies. The Australian Government Job Outlook (2012) suggested that job prospects for 'life scientists' (including biomedical scientists) would be limited in some regions, with only modest increases in job opportunities predicted for this sector. The Australian Government Department of Employment, Industry Outlook research, indicates that the Scientific Research Services employment levels fell by 4,500 over the five years to May 2014 (Australian Government Department of Employment 2014). The Australian Graduate Destinations Survey measured the employment outcomes of university graduates as the number of graduates working approximately four months after graduation. The 2013 survey results show that only 68% of surveyed graduates were in full-time employment, the lowest level in 20 years. For graduates with a Bachelor degree in life sciences, 48% of those available for work had a job four months after graduation (although

not necessarily related to their area of study) and almost 50% continued into further full-time university study (Graduate Careers Australia 2014). Further study for biomedical science graduates includes graduate medicine and graduate courses in other allied health areas, such as optometry, dentistry and audiology.

Biomedical degrees as pre-clinical degrees

Australian graduate medical programs are increasingly using biomedical subjects as prerequisites for their degree (e.g. the University of Melbourne and the University of Queensland). In 2014 Monash University introduced a direct pathway from their undergraduate biomedical science degree into graduate medicine. Alongside this change, Monash University has increased student enrolments in biomedical science, from ~200 in 2013 to ~450 in 2015. The addition of the pathway into medicine has changed the characteristics of the biomedical science cohort; a survey of first year students in 2015 indicated that 82% were aiming to continue into graduate medicine after their biomedical degree, with only 5% indicating they would continue into a research career. This is markedly different to the first year students in 2011, with only 33% identifying medicine as their career choice and 20% planning on a research career (Hodgson, Waring, Flecknoe, and Choate 2015). With the majority of current students aiming for graduate medicine, it is likely that some of these students will not achieve this objective. Indeed, as biomedical subject convenors and careers educators, we see students with low grade point averages (at years 1 and 2) that are unlikely to be offered a place in a graduate medical course; many of these students are, or should be, re-evaluating their career options.

The need for a Professional Development Program in a Bachelor of Biomedical Sciences degree

We designed a Biomedical Science Professional Development Program in response to increased numbers in the degree as well as to student feedback from a final year 2014 focus group. The aim of the focus group was to investigate students' perceptions of employability and research skills. We used the definition of employability from Yorke (2006, p. 8): 'A set of achievements – skills, understandings and personal attributes – that makes graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy.' This definition takes into account a graduate's capacity for employment, as well as being in employment. The focus group students did not understand how to demonstrate or communicate skills for employment (nor that they were developing employability skills during their degree) and they felt that broader career planning could have assisted them with the uncertainty and confusion many experienced with shifting careers options and preferences during the degree. With a packed biomedical curriculum and limited time available for this commitment, a program was required which would concentrate on the shortfalls expressed by these students.

The goals of the program we developed were:

1. To address students' assumptions about their careers, including their potentially narrow focus on linear pathways that were frequently limited to medicine or research;
2. To raise students' awareness and ownership of their skill development; and
3. To assist students in building their capacity to effectively communicate their capabilities and transferable skills.

Theoretical background to the Biomedical Science Professional Development Program

An important aim of the program was to challenge beliefs regarding linear career pathways. Many biomedical science students commence their degree with narrow, short-term career plans (i.e. entry into graduate medicine) and little engagement in planning for broader career options. Students have followed an assumption that they could travel down a predictable and static path to achieve their career goals (Amundson, Mills, and Smith 2014). It is now understood that linear career planning is not effective for the complexity of career decision-making in the current dynamic environment (Bright, Pryor, and Harpham 2005b; Mitchell, Levin, and Krumboltz 1999; Savickas 2000). Students need to have the career management skills to cater for the disruption and uncertainty of career pathways.

The job market our graduates face will be competitive. The workforce is being impacted by a range of influences including: increased number of graduates; technology automating jobs; globalised economies; demographic shifts; changing social attitudes; offshoring and new business models. The current process of job seeking and career paths are less defined, with many university graduates unprepared for these changes in the employment sector (Monteiro, Santos, and Gonçalves 2015; Perrone and Vickers 2003).

In a changing and multifaceted employment sector, and a degree where so many students were aiming for a single post-graduation option that is not even attainable, it was deemed essential to introduce students to a more complex view of their careers. A program was required to challenge students to view their careers, both through the lens of chaos theory (Bright and Pryor 2005a, Bright et al. 2005b; Amundson et al. 2014; Pryor, Amundson, and Bright 2008), and as something they are active in constructing over time (social constructivism) (Bassot 2012). The goal was to normalise change, uncertainty, and chance events.

A chaos theory perspective of careers highlights the unpredictable nature of careers (in the long-term) due to the complex nature of people, the many factors that influence an individual's career and development, and the effects of chance, change and uncertainty (Amundson et al. 2014). An emergent view of careers focuses on exploring possibilities and opens people to consider alternatives and the creation of broader options (Pryor et al. 2008).

The program aims to introduce students to the chaotic nature of careers and the value of embracing uncertainty and ambiguity. Concurrently, it aims to engage students in proactively managing aspects of career development and employability that are within their control. The program uses the careerEDGE employability model (Dacre Pool and Sewell 2007), which includes: **c**areer development learning; **E**xperience (work and life); **D**egree subject knowledge, understanding and skills; **G**eneric skills and **E**motional intelligence. The model suggests that through building and reflecting on these components, employability will be enhanced. In the program, students are asked to use a social constructivist approach (Bassett 2012) and look at elements of employability that they can develop immediately, rather than focusing specifically on their graduate options.

Examples of other undergraduate bioscience career development programs

A summary report from the (British) National Institute of Careers Education Counselling (NICEC) summarised three career development delivery models in the higher education setting: '(1) Through specific modules; (2) Through more general cross-curricular integration; and (3) Outside the curriculum.' (Hustler, Carter, Halsall, Watts, Ball, and Ward 1998). Some UK and US higher education providers have credit-based careers modules,

usually available during the second year of a bachelor degree (Watts 2006). The extracurricular delivery typically includes online careers resources, careers fairs, or individual sessions with a careers counsellor (Watts 2006). Examples of career development programs include one described by Willmott (2011). They developed a “Careers After Biological Sciences” program at the University of Leicester (UK) which involved a series of extra-curricular seminars from alumni and online resources (e.g. careers profiles). There was extensive use of current technology (e.g. LinkedIn) to find recent graduates to contact. There were, however issues with low student attendance at the seminars (which were not compulsory or assessed).

In contrast, Freeman (2012) developed a “career orientation” course for first year science students that involved weekly workshops with associated assignments. Students were surveyed before and after the course, with a significant increase for: “I can articulate my intended career path in a professional manner including a discussion of why my chosen career path is appropriate for me as an individual.” Freeman found that it helped to divide the course up into three main areas with frequent and short assignments, as this gave the students in-curriculum opportunities for in-depth reflection of their career pathways (Freeman 2012).

The success of careers development programs is mixed. In a review of 40 publications of undergraduate career development programs, Hughes et al (2002) concluded that they were associated with reductions in unemployment, job-search times and with improved productivity. A study of an in curriculum career planning course for psychology majors found that it increased students’ perceived knowledge of career options and confidence in their decision making (Thomas and McDaniel 2004). In contrast, Whiston and Sexton (1998) analysed 40 studies (from secondary schools) and found that career courses were less effective than individual and group counselling.

The need for assessment of the program

We believe that assessments are essential as prior programs at our university have been voluntary with poor student engagement and completions. For example, in 2013, 2014 and 2015 over 4000 undergraduate science students at our university were invited via email to register and participate in an extracurricular Professional Transitions Program (run by a dedicated Careers Education Consultant for the Faculty of Science), with 101, 85 and 105 students registering in 2013, 2014 and 2015, respectively, and an average of only 25 students attending the sessions (Monash University Career Gateway database). Bridgstock (2009) recommended that the development of career management skills should be an assessable component of undergraduate coursework as the assessment increases student engagement in career programs. Reddan and Rauchle (2012) highlighted that they changed their career management skills/work-integrated learning program (in an Exercise Sciences course) from un-graded to graded and found this increased student motivation and assignment completion.

Another key aim in designing the program was for students to build a record of experiences, skills, knowledge and capabilities that demonstrate their employability. We chose to use an electronic portfolio (ePortfolio) for this process as these can support learners to reflect on the process of personal development and learning, as well as to facilitate the organisation and maintenance of artefacts associated with these processes (Hallam and McAllister 2007; Hallam et al. 2008). von Kinsky and Oliver (2012) described improved employability outcomes using an ePortfolio, with assessment a key motivation for student uptake of the ePortfolios. The ePortfolios are transferrable, providing a mobile resource to support lifelong learning. In the context of career/skills development and employability, ePortfolios encourage

students to identify and articulate their skills, visualise their career goals and generally motivate students for employability (Peacock, Gordon, Murray, Morss, and Dunlop 2010).

The structure of the Professional Development Program

The essential criteria for the structure of our program were:

- (1) it would start early, and be developed across the whole three years of the undergraduate degree;
- (2) delivery would be completed by an integrated team of careers and academic staff and
- (3) student work in the program would be assessed (Bridgstock 2009; Ferns et al. 2010).

Start the program early in the course and integrate it into the whole course:

Many undergraduate students have not thought about post-university life and are not engaged with their career planning until they graduate, at which point it can be too late (Perrone and Vickers 2003). Bridgstock (2009, p.40) stressed the importance of starting undergraduate career development early in their courses: “for universities to fully engage with the graduate employability agenda, the careful integration of career management skill development into courses from first year is necessary, with ongoing input and feedback from faculties, industry, careers staff and students.” By thinking early about broader career options and what is needed to obtain them, students can engage in the development of their options and employability early, while building skills to self-manage this. Prior to 2015, the only scheduled careers session in the Monash University biomedical degree was held during a final semester capstone subject; it consisted of a two-hour presentation from biomedical graduates and a careers consultant. The 2014 focus group students thought that this careers information occurred too late as it was delivered after the time when (i) graduates are recruited by employers and (ii) students are applying for graduate programs. Thus, one of the key student recommendations was that careers awareness and the development of employability skills should commence at the beginning of the degree. This led to the decision to develop a biomedical professional development program to build students’ career development and preparation, commencing in the first year of the degree and scaffolded across all three years.

An integrated team of careers staff and biomedical academics:

It is important to engage the expertise of careers educators within courses so that they are visible and accessible, highlighting to students that the university takes their career development (and post-university careers) seriously. Bridgstock (2009) recommends that career development programs should include academic, careers and industry staff, as well as the students, in the process of design and delivery. This will ensure the development of programs that are relevant and useful to all of the stakeholders (Bridgstock 2009).

Aims of the project

This study describes the design and development of a biomedical professional development program, scaffolded across the three years of coursework for a Bachelor of Biomedical Sciences degree, together with an evaluation of the first year of implementation in 2015.

Methodology

Context and participants

The program was introduced into the coursework for the first year of a three-year Bachelor of Biomedical Sciences degree (BBiomedSci) in 2015, at Monash University, an Australian research intensive university. There were 475 first year students including double degree students (double degrees take four or five years): 30 BBiomedSci/Law; 40

BBiomedSciEngineering; 75 BBiomedSci/Commerce and 87 BBiomedSci/Science students. In addition, there were 10 students from the local high school completing a first year university biomedical science subject as part of their final year studies.

Five subjects were selected to incorporate the professional development lectures and associated assessments. These were chosen as they form the sequential core of biomedical science subjects for both the single and double degree students. These subjects are: year one BMS1011 (Biomedical Chemistry) and BMS1052 (Human Neurobiology); year two BMS2031 (Body Systems Physiology) and BMS2062 (Introduction to Bioinformatics) and year three BMS3021 (Molecular Medicine and Biotechnology).

Staff delivering, reviewing, evaluating and assessing the program

Three careers staff from a central university careers unit and two biomedical academic staff were involved in the design and introduction of the program. Careers staff organised the content and delivery of the lectures (attended by the biomedical academics) and set up the guidelines for the assessments, including the marking schemes. The assessments were marked (with feedback provided) by biomedical teaching associates (biomedical PhD students) following a briefing session from the careers and academic staff managing the program.

Overview of the program and timeline of delivery

A summary of the three-year biomedical science professional development program is provided in Table 1, with detailed information about the aims and assessments in the following paragraphs. The learning objectives for the program were aligned with the biomedical degree objectives and Monash University graduate attributes. The assessments were all submitted by the students on their ePortfolios, using the Mahara open source portfolio platform (Mahara). Instructions for the assessments were provided during the relevant lecture and on the student online learning system. Each assessment is worth 2% of the subject in which it is embedded. A rubric was provided to the markers, with a completed assessment worth 2 marks and a partially completed assessment worth between 0.5 and 1.5 marks (depending on how many aspects of the assessment were incomplete or missing).

Year 1

The main aim of the first year of the program was to broaden students' understanding of careers, through challenging common assumptions that their careers will be linear and that their degree alone will get them a job. Students were introduced to chaos theory and chance (as applied to careers) (Bright and Pryor 2005a; Bright et al. 2005b) and ways they can navigate uncertainty and construct their careers through experiences that build employability. *Semester 1 assessment:* Students were required to create an ePortfolio profile. They were asked to nominate and engage in three activities (outside of their degree) that they believed would increase one or more of their skills, experiences, networks, broader discipline/field knowledge and potentially create career building opportunities. They were required to discuss the activities they would undertake, with a step by step plan and a hypothesis as how this activity could benefit their career development.

Semester 2 assessment: students reflected upon the three career related experiences they engaged in during their first assessment. In addition, they created a digital profile of their current personal/professional networks.

Year 2

The main aim of the second year of the program is for students to identify their skills, complete a gap analysis and prepare to communicate skills (to prospective employers, for

graduate medicine interviews, to potential PhD supervisors). The gap analysis identifies the gap between a student's current skill set and the future skills that they wish to develop.

Semester 3 assessment: Students find three positions of interest, analyse how they meet the criteria of the position and identify any development needs they have to meet the selection criteria.

Semester 4 assessment: Students find three positions of interest (new or previous), write examples of experiences that match the criteria, using appropriate skill communication techniques (Situation, Task, Action, Result - STAR) and language.

Year 3

The main aim of the third year of the program is for students to prepare for what they choose to do on completion of their degree through engaging in planning and connecting them to the resources they need to support them in their next steps.

Semester 5 assessment: Students create a series of measurable and achievable career related goals, define steps toward achieving their goals and transfer their ePortfolio for future personal use.

Research Design

Surveys (Table 2) were approved by the Monash University Human Research Ethics Committee and delivered to the students via their online learning management system such that all student responses were anonymous.

Table 1. Overview of the Professional Development Program

Semester (year)	Focus
Semester 1 (year 1)	Thinking about careers and building options <ul style="list-style-type: none"> ● Career unpredictability/ambiguity/complexity ● Build my experiences, opportunities, skills, knowledge and networks ● What are employers looking for?
Outcomes	On completion of this module students will: <ul style="list-style-type: none"> ● be aware of the need to build employability skills to prepare for their career
Semester 2 (year 1)	Building a career profile <ul style="list-style-type: none"> ● Build my professional profile ● Create and leverage networks
Outcomes	On completion of this module students will: <ul style="list-style-type: none"> ● have gained knowledge of their networks and have created opportunities for career relevant experience
Semester 3 (year 2)	Exploring options (Data gathering and gap analysis) <ul style="list-style-type: none"> ● Source job opportunities and potential employers ● Job search using a variety of methods ● Am I ready for the career I want?
Outcomes	On completion of this module students will: <ul style="list-style-type: none"> ● have knowledge of their skills and capabilities, and have the ability to assess them against employment opportunities ● have the ability to plan for their development to meet employment needs
Semester 4 (year 2)	Reflect on and communicate capability <ul style="list-style-type: none"> ● Build my career profile ● How to translate experience (skills)
Outcomes	On completion of this module students will: <ul style="list-style-type: none"> ● have demonstrated the ability to communicate evidence of their ability to meet the skill requirements of a job opportunity
Semester 5 (year 3)	Preparing for transition <ul style="list-style-type: none"> ● What am I doing next year? ● What do I need in preparation? ● Goal setting
Outcomes	On completion of this module students will: <ul style="list-style-type: none"> ● have demonstrated an ability to take responsibility of career planning for their future ● have demonstrated an ability to set measureable and achievable career goals and define steps toward them

Table 2. Surveys utilised for the research project

Instrument	Participants	Purpose
Careers awareness survey	First year undergraduate biomedical science students in semester one (BMS1011) and semester two (BMS1052).	To investigate the employability skills and careers knowledge of BBiomedSci students, allowing for the further development and improvement of the Professional Development Program.
Assessment survey	First year undergraduate biomedical science students in semester two (BMS1052) who had not submitted the assessment.	To investigate why students decided not to complete the professional development program assessment.

The Careers awareness survey was administered when students submitted their ePortfolio assessment. It contained eight statements (Table 3), answered with a five point Likert scale from strongly disagree to strongly agree. There were also two statements that invited students to write responses (Tables 5 and 6). For analysis of the Likert scale data, the responses were allocated values from 1 (strongly disagree) to 5 (strongly agree), then a non-parametric Chi-square test was completed on the data. The qualitative written comments were collated and grouped into major themes by an independent administrator, then checked by one of the researchers. As the Mahara ePortfolios are the personal property of the students, they are no longer visible (to staff) once they have been reviewed and assessed by the teaching associates. Feedback about the ePortfolios was thus requested from the teaching associates immediately after they were marked.

Results

What was the careers awareness of the first year students?

There was an 87% response rate for BMS1011 (semester one; 411 of 475 students) and a 76% response rate for BMS1052 (semester two; 352 of 465 students) for the careers survey. The data from these survey results (see Table 3) indicates that approximately half of the students in BMS1011 and BMS1052 agreed (or strongly agreed) that they knew what they needed to do to pursue their career after graduation (statement 1), were certain of their post-biomedical science career path (statement 4), knew how to develop experience and skills in preparation for their career (statement 5), were confident with their ability to communicate their skills, knowledge and abilities to employers (statement 6) and were confident of their ability to independently manage their career development (statement 7).

Table 3. Student responses to the careers awareness statements from year one semester one (BMS1011) and semester two (BMS1052), completed on submission of the relevant assessment.

Survey statement:	Subject	Strongly disagree	Disagree	Neither disagree or agree	Agree	Strongly agree	Mean (StDev)
1. I know what is required of me to pursue a career of my choosing after graduation	BMS1011	2%	12%	23%	49%	14%	3.47 (0.95)
	BMS1052	4%	10%	25%	48%	13%	3.24 (0.97)
2. I believe that my degree will provide me with all the skills and knowledge I require to gain employment in my field	BMS1011	2%	12%	22%	51%	12%	3.47 (0.94)
	BMS1052	5%	11%	24%	49%	11%	3.23 (0.99)
3. I am aware of the career options available to me after I complete my degree	BMS1011	3%	15%	23%	50%	9%	3.47 (0.95)
	BMS1052	3%	13%	28%	46%	10%	3.23 (0.95)
4. I am certain of what career path I want to pursue when I graduate from Biomedical Science	BMS1011	9%	21%	21%	25%	24%	3.36 (1.29)
	BMS1052	8%	18%	22%	34%	17%	3.35 (1.19)
5. I know how to develop experience and skills in preparation for my career	BMS1011	1%	18%	30%	44%	6%	3.36 (0.88)
	BMS1052	5%	13%	34%	38%	10%	3.35 (0.99)
6. I am confident of my ability to communicate my current skills, knowledge and abilities to potential employers	BMS1011	1%	15%	30%	45%	9%	3.46 (0.90)
	BMS1052	4%	16%	27%	42%	10%	3.39 (1.01)
7. I am confident of my ability to independently manage my career development	BMS1011	1%	16%	40%	36%	7%	3.32 (0.86)
	BMS1052	3%	20%	30%	40%	7%	3.27 (0.97)
8. I am confident that I will obtain a job related to my degree when I graduate	BMS1011	3%	13%	41%	34%	9%	3.32 (0.92)
	BMS1052	5%	13%	39%	34%	9%	3.30 (0.97)

However, about half were undecided or disagreed (or strongly disagreed) with all of these statements. Most (~60%) of the students thought their degree would provide them with the skills and knowledge for employment (statement 2) and were aware of the post-degree career options (statement 3), with ~40% unsure or disagreeing with these statements. The least positive responses were for statement 8: “I am confident that I will obtain a job related to my degree when I graduate”; only 43% agreed (or strongly agreed), with ~40% undecided and ~17% disagreeing (or strongly disagreeing) with this statement. The statistical comparison between the results for BMS1011 and BMS1052 showed no significant differences ($P > 0.05$).

What did the student portfolios look like?

The students put a lot of effort into their portfolios, using a variety of media to incorporate images. Figures 1A, 1B and 2 provide a sample portfolio, with the assessments from both semester one (Figure 1A) and two (Figures 1B and 2).

Create a LinkedIn Profile

Image removed due to copyright

Why this is a Career Related Experience

Creating a LinkedIn profile will allow me to **learn** how to use technology and social media to my advantage in order to expand my connections with people in the medical field. This experience will give me the **opportunity** to keep in contact with those I meet throughout my career, and to build healthy, professional relationships with those people. This is an excellent first step in establishing my **network** of colleagues that consists of my fellow students, past and present teachers/lecturers, Monash alumni, and industry and professional groups. This task will provide me with the **knowledge and skills** involved in keeping in contact with others who will be beneficial to know in the future, and which may eventually lead to employment opportunities after I complete my Biomedical Science and/or Graduate Medicine Degrees.

Create a LinkedIn Profile

Completion date	Title	Completed
3 May 2015	Register for a LinkedIn profile	
4 May 2015	Search for my past high school friends who are enrolled in science courses to add as 'colleagues'	
4 May 2015	Search for my past high school teachers to add as 'colleagues'	
4 May 2015	Search for my current Biomedical Science friends to add as 'colleagues'	
7 May 2015	Download the LinkedIn App for my iPhone	
11 May 2015	Regularly check my LinkedIn profile for updates and messages	

6 tasks

Figure 1. (A) Example of a student assessment from year one, semester one (BMS1011) showing one of the three career-related experiences and a timeline for this experience.

Create a LinkedIn Profile

Completion date	Title	Completed
3 May 2015	Register for a LinkedIn profile	✓
4 May 2015	Search for my past high school friends who are enrolled in science courses to add as 'colleagues'	✓
4 May 2015	Search for my past high school teachers to add as 'colleagues'	✓
4 May 2015	Search for my current Biomedical Science friends to add as 'colleagues'	✓
7 May 2015	Download the LinkedIn App for my iPhone	✓
11 May 2015	Regularly check my LinkedIn profile for updates and messages	✓

6 tasks

Reflection

Creating a LinkedIn profile was an easy first step in expanding my professional network. I was able to find 14 colleagues to connect with just by searching for past high school friends, past high school teachers, and my current Biomedical Science peers. By downloading the LinkedIn App for my iPhone, I have been able to regularly check for updates and messages from these colleagues. I believe I developed vital communication and networking skills that are required to make the most of any career-related opportunities that may come my way. Further, my network has certainly expanded beyond the friends I see everyday in my Biomedical Science course. I have learnt that networking is not as daunting a task as I previously thought, and that I will need to do more of it in the future!

FIGURE 1 (B): the year one, semester two (BMS1052) assessment that checks if the submitted timeline was achieved and reflects on the semester one career-related experience.

Did students attend the professional development lectures?

Lecture attendance was tallied by the biomedical academic in the lecture. Student attendance at the professional development lecture in semester one (BMS1011) was about 80% of the student cohort, much higher than for the other lectures in this subject (~60%). Attendance at the semester two professional development was lower, about 60% of the cohort, similar to attendance for the other lectures in this subject (BMS1052).

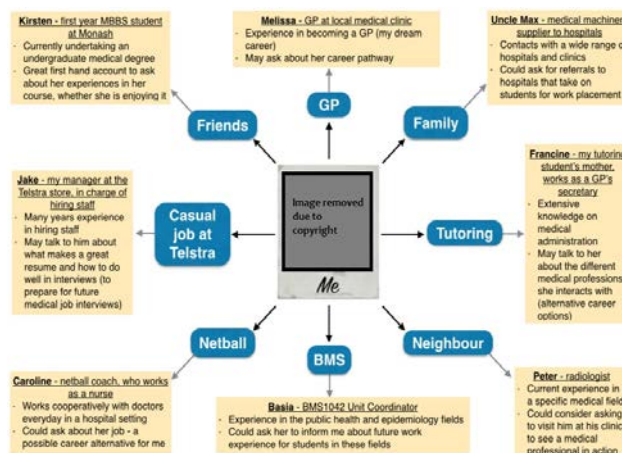


Figure 2. Example of a portfolio from year one, semester two (BMS1052); a personal and professional network

The program assessments: how did students perform and why did some students not complete them?

33 of 438 (7%) BMS1011 students did not submit the initial assessment. All students who completed this assessment were awarded full marks. Of the 465 BMS1052 students 75 (16%) did not complete the second assessment. This is a higher proportion than other non-submission rates for this subject (BMS1052), with only 10 (2%) of these BMS1052 students failing to submit a practical worksheet earlier in the semester and a 99% completion rate for in-semester on-line quizzes. Only 13 of the students who submitted the second assessment did not receive the full two marks (as they had aspects of their submission missing or incomplete). Of the 75 students who did not submit the BMS1052 assessment, 40 had not undertaken BMS1011 and 13 did not complete the assessment for BMS1011. These students were sent an anonymous on-line survey to determine their reasons for non-submission. Thirteen responded and most indicated that they had been too busy working on more important assessments (see Table 4).

Table 4. Student responses to the question: “Why didn’t you complete the assessment for the BMS1052 professional development program?”

Survey options	Number of responses	Student responses to: “How could we improve the professional development program?”
(1) I did not know we had a professional development assessment.	2	<i>“Make the assessment easier to complete.”</i>
(2) I did not understand how to use Mahara,	3	<i>“Clearer instructions for Mahara.”</i>
(3) I forgot the assessment deadline.	2	<i>“More advice on how to use Mahara.”</i>
(4) I was too busy working on more important assessments.	6	<i>“Mahara was WAY too complex to figure out and at the end the amount of effort needed didn't warrant the grade given (2%).”</i> <i>“I think it should just be a seminar that's optional.”</i>

What did the students think about the Professional Development Program?

Students were invited to provide anonymous written feedback about the best aspects of the program and how they felt the program could be improved (see Tables 5 and 6). About half of the BMS1011 (163 comments) and BMS1052 (104 comments) students who provided feedback felt that the program encouraged them to think about their careers, with about 10% indicating they felt that it made them think about careers early in their degree (see Table 5, row 3). Surprisingly, only 3% mentioned that the program made them think about non-Medical careers.

When asked how the program could be improved, about 30% of the responders (from both subjects) felt that more pathways and career options related to employability should be provided. The other common themes for these comments included the provision of more details about the assessment, changing the timing of the assessment or removing the assessment, providing workplace or volunteer opportunities, more lecture time or one-on-one sessions for the program and also more information about non-biomedical science careers.

Table 5. Main themes of the student responses to the question: “What were the best aspects of this program?”

Main themes of the student responses to: “What were the best aspects of this program?”	BMS1011 (semester 1) ^a	BMS1052 (semester 2) ^b	Selected student comments
(1) It made me think about careers and/or career planning.	163 (55%)	104 (51%)	<i>“The awareness factor. I hadn't thought about career development and I was focusing on my course work.”</i>
(2) It made me think about my future career early in my degree.	25 (8%)	22 (11%)	<i>“Making first year students think about their future and become aware of how to improve employability early on.”</i>
(3) The program and/or the information presented were useful (for career planning, skills development, employability).	23 (8%)	7 (3%)	<i>It was comforting to know that it is okay to be unsure of what I want to do in the future but also encouraging in that it gave me tips on how to figure out what my goals are.</i>
(4) It made me think about non-Medical careers.	8 (3%)	7 (3%)	<i>It gave students like me the ability to consider what they want to do after their Biomed degree. It showed me that there are more options than just Medicine!</i>
(5) The specific examples of different careers.	8 (3%)	3 (1%)	<i>Learning about other ex-biomedical students' career paths and the choices they've made.</i>
(6) It helped with my skills/professional development.	8 (3%)	5 (2%)	<i>Learning how to professionally interact with employers to convey skills and knowledge.</i>
(7) It encouraged networking.	4 (1%)	11 (5%)	<i>It opened my eyes to the importance of developing a wide network. Opened my eyes to the importance of developing your own brand, and developing a wide network.</i>

(8) The electronic portfolios.	4 (1%)	2 (1%)	<i>Developing an online ePortfolio using Mahara.</i>
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^a295 comments = 72% of survey responders; ^b205 comments = 58% of survey responders.

Table 6. Main themes of the student responses to the question: “What aspects of the program could be improved?”

Themes	BMS1011 (semester 1) ^a	BMS1052 (semester 2) ^b	Selected student comments
(1) Provide more pathways/options related to employability.	76 (29%)	16 (33%)	<i>Provide more concrete pathway and specific careers options for biomedical students.</i>
(2) More speakers from the biomedical area.	31 (12%)	28 (57%)	<i>Have a panel of biomed graduates to talk to, with a variety of experiences including medicine and research.</i>
(3) Nothing.	26 (10%)	22 (45%)	<i>Everything was perfectly fine, great program.</i>
(4) Provide more details about the assessment.	20 (8%)	4 (8%)	<i>Some clear expectations of our goals in Mahara could have been discussed.</i>
(5) Have small group activities or tutorials	12 (5%)	2 (4%)	<i>Have more career sessions with 1 or 2 small group sessions.</i>
(6) Change the timing of the assessment (too close to exams in semester 1)	12 (5%)	6 (12%)	<i>The timing is inconvenient with exam study and other assignments a priority - should be completed at the start of the semester.</i>
(7) Don't have an assessment	10 (4%)	10 (20%)	<i>Having an assessment is unnecessary. This is simply to help our careers and shouldn't be related to our mark in the subject.</i>
(8) Provide more information about the program.	9 (3%)	1 (2%)	<i>The program could have been explained in better detail.</i>
(9) Provide more information about non-biomedical careers	9 (3%)	9 (18%)	<i>Stories of people with interests outside of biomed. This currently feels outside the realm of what's possible for me.</i>
(10) Work placements or volunteering opportunities.	9 (3%)	8 (16%)	<i>Learning about job opportunities in the field as well as potential placements for experience.</i>
(11) Individual support such as one-on-one sessions with a careers advisor	7 (3%)	7 (14%)	<i>One on one sessions would be helpful - everyone is different and should be guided differently.</i>
(12) More lectures or	6 (2%)	3 (6%)	<i>More than one lecture on</i>

other teaching time on the program.			<i>the topic, to obtain more information.</i>
(13) Mahara needs to be easier to use	4 (2%)	14 (29%)	<i>The Mahara interface is difficult to use and slow.</i>

^a263 comments = 64% of survey responders; ^b49 comments = 14% of survey responders.

Has the program increased student engagement with the University Careers Service?

Students can book 30-minute one-on-one sessions with a careers education consultant (at Monash Careers, Leadership and Volunteering) for personal career discussions, alternatively they can drop-in for a 10 minute career chat. There has been a significant increase in the number of first year biomedical science students attending these sessions, with a total of only 19 students attending sessions in 2014 (with 7 of these students returning for another session) compared with 37 students attending sessions in 2015 (up to the middle of semester 2; with 11 of these students returning for another session). These sessions were publicised in the two first year professional development lectures so it is likely that this has led to the increased careers consultation sessions.

Discussion

In 2015, in response to shifting biomedical student career aspirations, a team of biomedical academic and careers staff designed and developed a biomedical undergraduate professional development program, with lectures and assessments scaffolded over the three-year biomedical science degree. We report on the initial introduction of the program into the coursework for year one of the degree, with feedback from the students.

Careers awareness and directions of the first year students

A major driving force for the introduction of this program was the large number of biomedical students aiming for graduate medicine (and the expectation that not all of these students could achieve this career option). Whilst about 80% of the (~475) students indicated at the commencement of their degree that they intended to continue from their biomedical degree into graduate medicine (Hodgson et al. 2015), our careers awareness survey showed that by the end of semester one (and mid-semester two) about 50% of the students were uncertain of their post-biomedical science career path (see Table 3). This suggests that they may have re-evaluated their career options once they realised that they are in a high achieving cohort with most competing for the same career outcome. There were no significant differences between semester one and semester two for the student responses to the careers awareness statements (see Table 3). These results are not surprising for first year students and it would be reassuring to see their confidence and careers awareness improve as they progress through their degree and the professional development program, especially when they complete the second year of the program when they will engage in career exploration and an analysis of the requirements for positions of interest.

Evaluation and review of the program following student survey feedback

Student feedback in semester one (2015) highlighted the importance of the timing of the assessment; the assessment had been placed at the end of semester and students were not happy about this as it clashed with several of their other assessments (as well as exam preparation) in their subjects. The feedback was implemented and in semester two the assessment occurred before the mid-semester break. However, the completion rate in this semester was lower (down to 84% from 93%). It is unclear what has contributed to the drop in completions, but some students indicated that they had either forgotten the assessment deadline, had weightier assessments to work on or they did not understand the portfolio

instructions (see Table 4). It may also be that these students were not comfortable or familiar with reflective practice and thus some chose not to complete the reflective assessment in semester two. Woodley and Sims (2011) found that 45% of their students were negative about an assessed undergraduate (Business and Law) Professional Development ePortfolio that included students' personal reflections on the curricula, as well as on extra-curricular activities. Similarly, Faulkner et al (2013) used ePortfolios to document achievement and to develop their undergraduate Engineering and Law students' understanding of professional networks. Many of the students struggled with the reflection and personal development, as these processes did not align with their normal learning behaviours. Only a handful of our students felt there should be no assessments (see Table 6):

"Though it's great to be reminded of things we could be doing and career options after our degree, it shouldn't be taught during one of our lectures and then made to be a graded piece of assessment."

The student comments suggested that they find the program valuable, with about a third of students in both semester one and two commenting that the program made them think about careers and/or careers planning (see Table 5). This is supported by the excellent attendance at the initial professional development lecture, suggesting that students were motivated to learn about the program. It was reassuring that 10% (semester one) and 45% (semester two) of the student comments (see Table 6) indicated that no changes to the program were necessary. Student feedback also indicated that they appreciated the early introduction of the professional development program into their degree (about 10% of student comments, see Table 5): *"Having this program on the first year of university helped create awareness about the fact that career development is an important aspect of being in university."*

"It opened me up to thinking about the future. When just beginning a degree, the prospect of finishing it seems so far away but obviously this isn't the case and it is good to get us thinking."

It was predicted that not all students would like the chaos careers framework as it challenges people to embrace uncertainty. Some students have very specific career plans (i.e. graduate Medicine) and may resent being asked to think more broadly. The broader focus on careers and employability did jar with some students who would prefer instructions and tips to improve their entry into graduate medicine: *"The program should be more focused towards people wanting to get into medicine (i.e the majority of BMS students)."*

The use of assessed ePortfolios for professional development

An ePortfolio was used by students to record and reflect on their careers experiences and their personal and professional networks. There were issues with the ePortfolio format, with students requesting more information about the Mahara platform (see Tables 4 and 6). This highlights a need for staff and student training with this medium. Similarly, Peacock et al (2010) interviewed 23 (Scottish) further and higher education tutors about their experiences of ePortfolios. The tutors' raised concerns about the role of assessment, a need for both student and tutor training and support with the technology (as well as in the areas of personal development and reflective practice) and a lack of time and resources to enable tutors and students to fully engage with the ePortfolio medium. It is clear that students need clear guidance about the role and purpose of the ePortfolio in their studies, and this needs to be reinforced by the teaching staff (Peacock et al. 2010).

One of the strategic recommendations of the Australian ePortfolio Project (Hallam et al. 2008, p.136) was "that government policy recognise ePortfolio practice as a strategy to build

an integrated relationship between higher education and the vocational education and schools sector, in order to support the individual's lifelong and lifewide learning needs and to increase the potential for career progression." This report also discusses the potentially accepted roles of ePortfolios for employment and professional accreditation. A survey prepared for the Business, Industry and Higher Education Collaboration Council indicates that "employers generally favoured the ePortfolio approach as a means to obtain a more informed picture of a candidate than is usually provided in a traditional curriculum vitae" (Precision Consultancy 2007, p.42). However, a survey conducted for the Australian Association of Graduate Employers indicated that they are not using ePortfolios as part of their selection process (High Fliers Research Ltd 2014, p. 56). It would be interesting to know if our students will use their ePortfolios beyond their biomedical degree. At the moment, their final assessment in the professional development program has been organised such that students will retain a copy of their ePortfolio.

How to integrate careers staff and academic staff into a professional development team

Our program management team consisted of both careers and biomedical academic staff and we had hoped this would help with the integration of the program into the biomedical curriculum. Similarly, Woodley and Sims (2011) suggested that interactions between their professional development coordinators and the core subject coordinators in the degree should lead to a more integrated ePortfolio. Additional teaching time could better integrate careers staff with academic staff and students; student feedback (see Table 6) suggested additional professional development sessions, including lectures and small group tutorials, an indication that they found the program worthwhile, but it is not possible to achieve this due to time constraints and a packed curriculum:

"It felt as if it was only a side note on the course, which gave it less reason to pay attention. Either integrate the career aspects into multiple lectures, or at least make a more prominent feature of the program."

Bridgstock (2009) recommended including staff from the primary career destinations workplaces in the program development and delivery. Our students indicated that they would like to be exposed to more people working in the biomedical sector, especially biomedical graduates from our university (see Table 6). In order to address this, we plan to have some invited speakers, either incorporated into the existing lecture slots, or as an extracurricular offering to students.

With improving the employability of graduates becoming a priority area for successive Australian Governments, our university has developed support for academics to help them improve their students' employability. The Office of the Vice-Provost (Learning and Teaching) has introduced a Continuing Education Excellence Development Framework with a module entitled '*Improving your students' employability*' offered in conjunction with the Monash Career, Leadership and Volunteering unit. In the module, academics will investigate employment trends and influences in their discipline, critique an employability framework for their curriculum, analyse the relationships between employment outcomes and employability and identify important employability skills in their discipline.

Enabling academics to place a greater focus on careers in their curriculum is one manner in which careers could be sustainably introduced into the curriculum. Whilst the biomedical science professional development program may provide a useful model for other programs, the reality is that with a careers service containing limited staff that could provide support on career program delivery, it would not be possible to support the delivery of a similar program across the university's degrees.

Limitations and future directions

We had underestimated the number of double degree students and how this would impact on their participation in the new program. Of the students in the second-semester subject (BMS1052) 125 had not taken BMS1011 in the previous semester. These double degree students will take BMS1011 next year. Whilst this was an issue for the initial year of the program, it will be resolved in subsequent years.

As our students progress through the professional development program and complete their degree, it will be useful to track them into their future careers. In this context, it is worth considering alternatives such as LinkedIn as a portfolio tool as this has an analytics function that allows users to search for registered students and alumni. We are also planning to track our graduate employability via government graduate surveys. From October 2015 the Graduate Outcome Survey (GOS) will replace the Graduate Destination Survey (GDS). The GOS will be one of several new Quality Indicators for Learning and Teaching (QILT) surveys endorsed by the Department of Education and Training, and conducted by The Social Research Centre, which will replace the AGS (Social Research Centre 2015).

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