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Science Undergraduates Are Motivated to Undertake Leadership Education to Enhance Employability and Impact

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Abstract

Leadership education is increasingly prevalent, with tertiary institutions offering leadership programs in a variety of formats. Leadership curricula are traditionally underrepresented in science, but provide a promising way to develop a range of transferable skills. Moving forward, it is important for educators and curriculum designers to ask why science students should choose to layer their discipline-specific education with leadership education. Our study aimed to identify the key motivations for undergraduates to choose leadership education alongside a traditional science degree. We surveyed 70 undergraduates across the Bachelor of Science, Bachelor of Science - Advanced Research (Honours) and two emerging science leadership programs (Science Future Leaders and Bachelor of Science Advanced - Global Challenges (Honours)) at Monash University, Australia. We also interviewed 13 students, asking open-ended questions about their motivations for undertaking leadership courses and coded responses to identify common themes. All interviewed students indicated that employability was important in their decision-making. Most respondents were motivated to develop transferable skills and broaden their employment options, competitiveness and adaptability in what scholars have described as an uncertain and dynamic workforce. Some respondents also cited a wish to increase their capacity to have a positive impact in society during their careers. Our findings suggest that today's Australian science students are receptive to broadening their skills, attributes and competencies beyond traditional technical and content-rich discipline training.

Introduction

Science and leadership

Leadership is increasingly discussed in relation to science, such as in calls by industry, business and political leaders for greater leadership from science (Gibbons, Limoges, Nowotny, Schwartzman, Scott, and Trow 1994; Hauser, Tellis and Griffin 2006). Despite this, few scientists have received leadership training or developed their leadership capacity throughout their education or careers in the same way as their disciplinary skills (Leiserson and McVinney 2015). In 2015 *Nature* published a special issue around the theme 'Building the 21st century scientist'. Several articles suggested that leadership capacity is required to advance science and its impact across sectors and that the new wave of scientists must be equipped by a broadening of their skills to solve problems that would benefit society (Nurse, Sunami, Polka, Teitelbaum, Tjian, Kinaret and Handelsman 2015). In particular, scientists are being called upon to integrate interdisciplinary scientific knowledge within public and private sectors, set strategic directions and goals, and promote scientific literacy and education among the non-scientific public (Mujumdar, Ila, Krishnan, Roy, Gardagkar, Singh, Varshney, Ganesh, Narain and Mondal 2015; Weigold 2001).

To promote science-led benefits to society, science graduates need transferable skills, or 'twenty-first-century skills', alongside traditional technical and content-rich disciplinary expertise (National Research Council 2010). Leadership education represents one potential pathway for helping science graduates develop a broader skills-set. This is because leadership capacity uniquely embodies a broad range of transferable or so-called 'soft' skills, including communication, team work and interpersonal skills (Brungardt 2011). Here we define leadership as an activity resulting in the mobilisation of people or organisations toward positive progress (Heifetz, Grashow and Linsky 2009).

Student motivations for undertaking leadership education in science

While there is a clear rationale for embedding leadership education in science from a societal and educational perspective, little is known about why the students themselves are motivated to undertake leadership education alongside a science degree. Indeed, the general topic of why students partake in leadership education at all is underexamined across disciplines (Caza and Rosch 2014; Hamid and Krauss 2013; Rault 2008). Rosch and Collier (2013) argue that it is critical to develop a good understanding of why undergraduates choose leadership education to inform an effective curriculum that aligns with the aspirations of students. Specifically, it is crucial to ensure that curriculum and pedagogical approaches meet the goals, interests and needs of students, particularly given the changing, unpredictable and complex employment market and world that students are preparing to enter (Hodson 2003).

Leadership and employability

Universities are under pressure to provide graduates with the opportunities and employability skills for career development and lifelong learning (Bridgstock 2009; Harvey 2000; Kavanagh and Drennan 2008; West 1998). It is argued that universities have been slow to identify and address the breach between technical and disciplinary knowledge, on the one hand, and employability skills, on the other (Baker and Henson 2010; Hesketh 2000). In science, there is an understanding that the majority of graduates will enter work outside university-based research, with jobs in academia being scarce (Nurse et al. 2015). While universities have increasingly focused on graduate outcomes and fostering careers outside academia, there have been mixed outcomes for students attempting to enter the workforce due to perceived skills gaps (Cranmer 2006; Jones, Torezani and Luca 2012).

Employers posit that many graduates are poorly equipped for work, perceiving that the knowledge and skills that graduates gain from university are different from the practical skills that employers require (Davies 2000; Wickramasinghe and Perera 2010). From the students' perspectives, graduates appear to lack confidence with the suite of skills developed at university. For example, science graduates have noted that their degree strongly develops skills in analysis, evaluation, and logic but not leadership or collaboration (Harris 2012). Many graduates even find it difficult to identify important transferable skills and are unsure which skills make them most employable and useful in the workplace (Ball 2003). Students perceive that their academic credentials will provide them with important employment opportunities relative to those without a degree, however, students understand that they need to add value to their degree to set themselves apart from other graduates and succeed in the workplace (Cranmer 2006; Tomlinson 2008).

Leadership programs can develop skills and knowledge that increase a student's employability. Leadership programs vary, ranging from short, formative co-curricular programs (e.g. workshops or a residential), to embedded programs with scaffolding and assessment of leadership skills throughout. Whilst the focus of undergraduate leadership programs varies

depending on the model of leadership and pedagogical approach (Brungardt, Greenleaf, Brungardt and Arensdorf 2006; Jenkins 2012), there is often a strong focus on soft skills associated with employability (Brungardt 2011). For example, through leadership development, students enhance their teamwork and communication (Dionne, Yammarino, Atwater and Spangler 2004) and build their capacity for self-awareness and self-efficacy (Komives, Longerbeam, Owen, Mainella and Osteen 2006). These are the same non-technical skills sought by employers, which include an aptitude for communication, networking, problem-solving, teamwork, confidence and self-management (Glover, Law and Youngman 2002; Raybould and Sheedy 2005; Wickramasinghe and Perera 2010).

There has been much debate surrounding the definition of employability due to the difficulty in accurately measuring the concept (Harvey 2001; Tomlinson 2007). The literature suggests tension between (1) use of the term to define a specific set of skills that improve an individual's chances of obtaining (and maintaining) employment and the concept of employability to (2) define an overall concept of personal identity and a set of subjective lived experiences influencing success in the labour market (Cassidy 2006; Rothwell, Herbert and Rothwell 2008; Tomlinson 2007;). This study incorporates both aspects in assessing how undergraduates perceive leadership education in relation to employability.

Very little has been published about student motivations for participating in leadership education, or the perceived benefits that students expect to gain. As such, this study aims to use an exploratory approach to address the following research question: Why do undergraduates choose to undertake leadership education in partnership with a science degree? A broader applied aim of the study is to help inform the development of appropriate curriculum and pedagogy in science leadership education.

Methodology

The study used a mixed-methodological approach comprised of an online survey and face-to-face interviews. The online survey aimed to assess undergraduate perceptions of the skills associated with leadership and science education. A small number of survey respondents were interviewed on this same general topic, as well as their reasons for enrolling in both science and leadership training, to enable deeper examination of the themes and results emerging from the online survey.

Participants

Science undergraduates from Monash University (Melbourne, Australia) were invited to participate in the study using a variety of methods. Invitations were made using email, physical posters at the university campus, lecture announcements, and online announcements via a learning management system. The study involved a two-step process. First, a total of 70 first- and second- level undergraduates participated in an online survey. The study focused on first- and second- year students, since we aimed to compare responses from those undertaking and not undertaking leadership programs (which, at the time of the study, only involved first- and second-level students). Second, a subset of survey respondents (13) participated in an interview (see procedures below).

There were two main age ranges in the sample. Most participants were aged 18-20 years, with 4% aged 20-33 years. The sample has a relatively balanced mixture of male and female participants. The sample included students from four different educational programs. These were the Bachelor of Science degree (BSc; 14 students), the Bachelor of Science Advanced - Research (Honours) degree (A; 15 students), the Bachelor of Science Advanced – Global

Challenges (Honours) degree (GC; 24 students), and the Science Future Leaders program (SFL; 17 students). The latter two programs involve leadership education. GC provides training in a scientific discipline in combination with skills in leadership, science diplomacy and entrepreneurship. SFL is a co-curricular program that fosters leadership skills in students undertaking second-level study in the Bachelor of Science degree.

Survey procedures

Participants were invited to complete an optional and anonymous online survey in their own time during July-August 2014. The survey was developed using Google forms and took a mixed-methodological approach. It comprised 56 questions, including an open-answer survey question about the nature of leadership. Likert-scale questions (1- very strongly disagree to 7- very strongly agree) were employed relating to student perceptions of the skills, competencies and attributes that are developed from having a background in leadership or science. Questions were developed by the researchers based upon related studies from the education and leadership literature (e.g., Bass 2008; Lord and Hall 2005; Wickramasinghe and Perera 2010; Zimmerman-Oster and Burkhardt 1999).

Interview procedures

A total of 42 students from the GC and SFL leadership programs completed the online survey, with 18 of them randomly invited to participate in a subsequent interview. Thirteen participants (5 male and 8 female) representing the two programs (5 GC and 8 SFL) were willing to attend a 15-20 minute interview in September 2014.

A member of the research team conducted the semi-structured interviews with each student individually. The questions were broad and open ended in nature, for example, 'What has influenced you to undertake your leadership course?', 'Why are you interested in leadership education?' and 'How do you think leadership education will benefit you?' The interviews were recorded and later transcribed. To avoid bias in results, members of the research team who are lecturers and course facilitators in the aforementioned education programs were not involved with the interview process. The survey and interview methods complied with Monash University Human Research Ethics Committee guidelines.

Data analysis

Quantitative survey data (Likert ratings) were summarised and presented as means with standard error. Single-factor nonparametric analysis of variance (ANOVA) was used to compare responses among education programs. The significance threshold was set at 0.05. As no differences among programs were identified, survey results from across the four educational programs were subsequently grouped for the purposes of the study. We compared student ratings for particular questions related to a background in science or leadership, with significant differences between group means determined by single-factor ANOVA.

Coding of qualitative open-answer survey responses and interview transcripts was performed using NVivo (QSR International Ltd. Version 10 2014) to establish dominant themes. We used open, axial, and selective coding (Strauss and Corbin, 1998). Three different researchers independently coded responses, and results were compared and consolidated to reduce bias. Inter-rater reliability was moderate. Quotations from interviewees are presented below with an anonymous student code, to distinguish between individuals, as well each interviewee's sex and leadership program.

Results

The results are explored below in two parts. First, the quantitative and qualitative survey results are summarised; these highlight a perception that leadership education provides a different suite of employability skills than a science degree alone. This link to employability is explored in more depth in the second part of the results, which is a summary of the interview data. All the interviewees cited reasons for why leadership education builds employability. Taken together, the survey and interview data indicate that science undergraduates appear to primarily value leadership education because of a perception that it increases employability.

Online Survey Data

Student perceptions of the value of a background in leadership compared to science

Survey responses suggest that students perceived that they would develop some different skills, competencies and attributes with an education in leadership compared to a focus solely on science. A greater percentage of the respondents agreed that a background in leadership would enable them to demonstrate particular skills, competencies or attributes than a science degree alone (see question list in Table 1).

Respondents rated a background in leadership more highly than a background in science for enabling them to be inspirational ($F_{1, 138} = 8.14$, $p = 0.005$), facilitate excellence in others ($F_{1, 138} = 49.25$, $p = <0.001$), anticipate, initiate and implement change ($F_{1, 138} = 6.31$, $p = 0.013$), demonstrate ethical values ($F_{1, 138} = 4.09$, $p = 0.045$), and communicate perceptively and effectively ($F_{1, 138} = 22.98$, $p = <0.001$) (Table 1).

Students rated science more highly for enabling them to produce innovative solutions to problems ($F_{1, 138} = 17.58$, $p = <0.001$). There was no significant difference between science and leadership with regards to forward thinking ($F_{1, 138} = 1.01$, $p = 0.316$), applying a range of skills and capabilities to problems ($F_{1, 138} = 0.36$, $p = 0.551$) or engaging in an internationalised world ($F_{1, 138} = 0.79$, $p = 0.379$) (Table 1).

Table 1: Mean ± SE ratings showing how strongly respondents agreed that a background in leadership or science would enable the listed skills, attributes and competencies. First and second level science undergraduates (N=70) used a scale of 1-7 (1 - very strongly disagree, 4 - neutral, 7 - very strongly agree) to respond to statements in an anonymous online survey (July-August 2014). The percentage of respondents who gave a rating of 5 or above (agreed) is shown in brackets. Statistically significant differences between science and leadership are indicated ($p = \leq 0.05$*, ≤ 0.01, ≤ 0.001***).**

SURVEY STATEMENT Having a background in _____ will enable me to:	LEADERSHIP Mean ± SE (% agree)	SCIENCE Mean ± SE (% agree)
Be forward thinking	5.53 ± 0.15 (84)	5.74 ± 0.15 (87)
Be inspirational	5.13 ± 0.18 (66)**	4.41 ± 0.18 (47)
Apply a range of skills and capabilities to problems	5.87 ± 0.14 (89)	6.00 ± 0.16 (88)
Facilitate excellence in others	5.89 ± 0.15 (86)***	4.31 ± 0.17 (47)
Anticipate, initiate and implement change	5.86 ± 0.14 (89)**	5.31 ± 0.16 (74)
Engage in an internationalised world	5.20 ± 0.16 (76)	4.96 ± 0.18 (71)
Demonstrate ethical values	5.19 ± 0.18 (74)*	4.67 ± 0.19 (51)
Produce innovative solutions to problems	5.17 ± 0.16 (70)	6.03 ± 0.13 (91)***
Communicate perceptively and effectively	6.11 ± 0.13 (93)***	5.06 ± 0.18 (74)

In the open-responses to the statement, '*Leadership is…*', 82% of survey respondents (58 students) included explicit reference to group work, interpersonal skills and/or communication with regards to work.

Interview data

Student motivations for undertaking leadership education in science

Each of the thirteen interviewees noted a key motivation for undertaking and/or valuing leadership education in science was enhancing employability. Employability was referred to unprompted at least twice by all interviewees during the 15 minute (ave.) interviews. Within the broad theme of employability, the most important sub-themes were i) developing transferable skills, competencies and attributes (100%, 13 students), ii) opportunity in the workforce (85%, 11 students), and iii) personal impact and benefits to society during employment (77%, 10 students). Another major motivation for undertaking leadership education was childhood and secondary experiences related to leadership (54%, 7 students). For example, a student who had not been chosen to undertake leadership programs at school was motivated to gain leadership experience in university. However this last theme was considered outside the scope of the present study and will not be explored herein.

Transferable skills, competencies and attributes

A desire for specific transferable skills, competencies and attributes emerged in the narrative responses. The need for transferability of skills was attributed to the uncertain future of work. For example, a student noted, "*I don't know where I will end up, but I think it will have something to do with communication in science and I thought a course in leadership would help in that regard*." – (AB Male, SFL)

Nearly all interviewees (12 students) reported that leadership programs would increase their communication skills. For instance, one interviewee noted "*If you are presenting to business or decision makers, or business or government, there can be a knowledge gap so I think communication is important.*" – (PC Male, GC). Most interviewees (11 students) also indicated that leadership education would develop teamwork capacity, including cross-disciplinary team work. One student explained, "*In any career you work with others and communicate with others and SFL enables me to be more aware of how people work in different environments and how best to work in a group*." – (CG Female, SFL). This was supported by another student who indicated "*Yes communication and teamwork…that is important in learning how to work with other people.*" – (PC Male, GC).

A substantial number of interviewees (7 students) suggested that leadership education would enhance interpersonal skills, with reference by some to these interpersonal skills being important for facilitating a team. One student stated, "*The principles [of leadership] are universally applicable when it comes to working with team members. Viewing it [teams] from a leadership side changes your perspective.*" – (SJ Male, SFL). This statement was echoed by another student suggesting, "*With organizations such as the World Wildlife Fund, they need you to work with people and campaigning. When you are working in policy and with people you need those [interpersonal] skills.*" – (BK Female, GC).

The aforementioned specific skills, competencies or attributes were perceived to increase employability. These results echoed the survey responses, which referred to these same skills, competencies and attributes when defining the nature of leadership (see previously in the section Online Survey Data).

Opportunities in the workforce

Most interviewees (11 students) associated leadership education with greater adaptability and flexibility in the workforce. They noted that leadership education in science would broaden their skills and thus opportunities, particularly outside academia, and thereby provide them with more career options after graduation:

> *[For employment, leadership skills are…] Fundamental. Almost more important than science."* – (CAL Female, GC) *"[With regard to a career…] The only way to play it is to have many options open.* – (RD Female, GC)

> *I have done bio, maths and chem because I don't know which one I want to do yet. I haven't cut anything out yet. Science you can learn on the job anyway. People change careers all the time, and you will be learning more information, but if you have those fundamental [leadership] skills to be able to adapt, it makes you more employable*. – (CAL Female, GC)

> *I want to go into teaching after this but, again, I like these [leadership] skills, and having these skills keeps doors open. I can backflip into research or as an academic, or work in geology - I could easily go into that field. They keep things open. They give you skills you don't have*. – (AMS Female, SFL)

"*Communication skills are great because not all people who do science want to work in a lab…. We now know that there are so many options to go through science*." – (RD Female, GC) Some interviewees (7 students) perceived that leadership education would give them a competitive edge over other university graduates due to the value it added to their education. One student explains:

> *It's good for people looking to employ. Leadership is so important these days. Anyone can get a degree. It's the extra stuff that counts - how you carry yourself, and how to deal in times of hardship, and how you bounce back from setbacks, and how you work in adverse environments*. – (CAL Female, GC)

Interviewees perceived that leadership education would broaden the range of job opportunities available to them after graduation, by providing them with a competitive edge and adaptability that would appeal to employers.

Personal impact and benefits to society

Most interviewees (10 students) claimed that leadership education within science would allow them to benefit society during employment. The most commonly reported rationales were i) bridging the perceived gap between science and society, ii) decision making and strategy and iii) personal beliefs and impact.

Leadership was cited as a means to increase the impact of science on society (six students). For example:

> *If you don't communicate it [science] effectively, it won't get you anywhere especially between bridging the gap between scientists and the community. Especially now you watch the news and you hear something about Kim Kardashian and then you read in the Guardian or in a scientific report they have found a new cure for cancer and you think, why is it not on the news? There is no bridge between science and the public*. – (CN Female, GC)

Five interviewees noted that leadership education would enhance the way they approached specific strategies and decision making in science. For example:

> *It [leadership in science] is crucial. So many decisions are made in science every day that have huge consequences on the rest of the world. People with leadership can make these correct decisions.* – (JB Male, SFL)

Leadership education was described as increasing their capacity to have a positive impact on people (six students), and often also the environment (five students), with some referring to boosting the scale of their impact. One student stated:

> *I was dead set on being a biologist and marine biologist, but who does it help? It does but not on the scale that I want to change things around the world. I have always wanted to have an impact. I see science as a great degree. You get a lot of knowledge. In terms of application, when you do a science degree, you end up as a scientist or in a science related job. I don't want that. I want to go through my life, and I want to change other people's lives. I don't want to just work in a job and fulfil my needs and happiness. I want to help others, so just doing science without communication and leadership - it doesn't equip you … The leadership component allows me to have a bigger effect on people around the globe and the environment.* – (CN Female, GC)

For enacting positive change in society, the interviewees acknowledged that disciplinary knowledge was less important than the transferrable skills developed through leadership education.

Discussion

A main finding from this study is that undergraduates are primarily motivated to partner leadership education with science education to enhance their employability. More specifically, science undergraduates value leadership education to develop transferable skills, competencies and attributes (particularly communication, teamworking and interpersonal skills), enjoy greater opportunity in the workforce, and build the capacity to have personal impact on society. These motivations, needs and aspirations of undergraduates partnering training in science with training in leadership suggest that employability should be a key consideration in the development of appropriate curriculum in science leadership education.

Student perceptions that leadership education adds value to a science degree

We identified a perception of science students that leadership education adds value to a degree in a science discipline. This concept of adding value was flagged by Tobias (2009), who found that an increasing number of science graduates feel it is necessary to undertake professional science master degrees. Some interviewees referenced the competitive labour market and the need to display flexibility and adaptability. This view aligns with Tomlinson (2008), who argues that undergraduates recognise the uncertainty of the employment market and feel under pressure to add value to their degree in order to be competitive. Science undergraduates may choose to do leadership because, as suggested by Harris (2012), they believe they would not develop specific kinds of professional skills from their science education (and likewise from their leadership education).

Thus, students may combine both science and leadership to increase their opportunities in the workforce. This perception of increasing the value of their education is important considering that the vast majority of graduates enter work outside traditional academic research (Nurse et al. 2015). Preferences during undergraduate years are mostly aligned with these outcomes. Within this study, only 31% of survey respondents (22 students) wanted a career in scientific research after graduating. Most aspired to work in other fields including education (19%), not for profit organisations (15%), business (15%), government (8%), medicine (4%) and the private sector (4%), with some undecided on their career (4%).

Leadership and '21st Century Skills'

We find that science students perceive that leadership education develops what is commonly referred to in the literature as '21st Century Skills', or those skills that prepare students for life and work in a rapidly evolving world (Bellanca and Brandt 2010; Levy and Murnane 2004). These abilities include a suite of social behavioural skills related to emotional intelligence (Cobo 2013; Goleman and Boyatzis 2008; Mishra and Kerelui 2011; Toner 2011). Some of these '21st Century Skills' have long been valued by employers. For example, communication and collaboration skills featured alongside knowledge and intelligence in organisational graduate specifications in the 1970s (Kelsall, Pool and Kuhn, 1972). However, the term '21st Century Skills' has come to reflect a more fluid and competitive employment market as well as technological and organisational change over the past 25 years (Mishra and Kereluik 2011). There is, for example, a stronger emphasis on problem-solving within different contexts, entrepreneurship, communication and collaboration, innovation, and adaptability (Dede 2010; Partnership for 21st Century Skills 2008). Congruent with past studies, there was a perception by some interviewees in our study that some of these transferable skills were of equal or greater importance than the degree subject studied (Harvey 2000).

Students also perceived value in leadership education for addressing unfolding complex global challenges, such as climate change, water and energy security, and biodiversity loss. Citizenship, or the capacity of students to benefit society, is another so-called '21st Century Skill' (Dede 2010), and global awareness is an educational theme related to it (Partnership for 21st Century Skills 2008). We found that science students articulate that global issues, such as sustainability, can be improved by combining the skills and knowledge of both leadership and science. For some students, it appears important for these issues to be addressed because they see the current actions being taken as inadequate. Others have personal beliefs about being employed in work with a sense of social justice. Our findings support previous studies that suggest that meaningful work, or work with impact, is important to undergraduates' career aspirations (Cobo 2013; Chalofsky and Krishna 2009; Komives, Longerbeam, Owen, Mainella and Osteen 2006).

Interestingly, students noted that a background in science – more than leadership – develops the ability to produce innovative solutions to problems. There may be a perception among science students that innovation primarily refers to technical innovation, which could have contributed to this result. Alternatively, science students may be specifically looking to their science disciplines to develop their skills in innovation. However, Trilling and Fadel (2009) highlight that collaboration and other interpersonal skills are a crucial part of innovation. Thus, leadership education in combination with science may better promote innovation skills than science alone.

Students choosing to undertake both leadership and science education expressed a desire to increase their capacity to make a contribution to society after graduation. They appear to value leadership education, and developing 21st century skills, because of a perception that it will assist them in addressing the challenges facing society.

Leadership education to increase impact

Taking a societal and educational perspective, Caza and Rosch (2014) state that it would be 'hard to overstate the importance of leadership education' (p. 1586) because all citizens are required to lead in some capacity. Traditional science education equips graduates with the technical expertise to understand problems and develop the technical solutions to try to address

them. Social and workplace challenges require more complex solutions, necessitating for example the ability to deal with uncertainty, negotiate with multiple stakeholders, and consider the social, economic, political, organisational and behavioural aspects of enacting change (Cortese 2003).

Leadership education uniquely develops science graduates' capacity for broader engagement with society (Fielding 2006; Rost and Barker 2000). Leadership education is a pathway to facilitate students' varied career aspirations as well as their capacity to have a positive impact. By focusing on external engagement and a broad range of professional skills (McCallum and O'Connell 2009), leadership is also a means to help integrate science across sectors of society.

Future directions for research and leadership training

While leadership education can be a pathway to develop employability in science graduates, few strategies and approaches to leadership education have been evaluated regarding improvements in graduates' perceptions, behaviours or employability (Brungardt and Crawford, 1996; Komives 2011; Zimmerman-Oster and Burkhardt 1999). This paper provides initial findings about why science students are motivated to enrol in leadership education; however, a natural next step would be to investigate the components of the curriculum and pedagogy most valued by students graduating from science-based leadership programs such as SFL and GC. As the sample was self-selected within one science faculty, a further study is planned to investigate the views of more students to ensure the applicability of our findings across a greater context.

There is contention in the literature about how employability skills are taught and measured (de la Harpe, Radloff and Wyber 2000; Radloff, de la Harpe, Dalton, Thomas and Lawson 2008) and whether training should be embedded or 'bolted-on' (Washer 2007) or provided only within vocational courses, such as business or law (Cranmer 2006). Part of this debate stems from concerns about scaling employability programs to suit large cohorts and perceptions that employability curriculum reduces the time available for teaching disciplinary content.

This study involved programs that employ two approaches (embedded and co-curricular), with both clearly perceived by students as desirable for employability. Nevertheless complementary bolt-on modules, focused on developing particular skills, competencies and attributes, can be useful for teaching employability skills (Fallows and Steven 2000; Panagiotakopoulos 2012). Such an approach should be considered for delivering leadership education to large cohorts of science students, particularly where implementing bespoke embedded or co-curricular programs is unpractical or unfeasible.

Conclusion

This study explored the motivations of science undergraduates for undertaking leadership education in combination with a science degree. It highlights student acknowledgement of the employability benefits a leadership education brings to science. This study of science and leadership training contributes to a large and growing body of research that stresses the importance of developing broad transferable or '21st Century' skills to foster graduate employability and impact in an uncertain and complex workforce and world (Cranmer 2006).

Our findings add two layers of complexity that have not yet been uncovered. First, this study examines specific understandings of leadership education in relation to students within the discipline of science. Second, it highlights specific reasons why science students value

leadership education. These insights may help educators to tailor curriculum design and/or program advertising for future leadership courses. We find that science undergraduates seem receptive to broadening their skills, attributes and competencies beyond disciplinary-science. They appear open and reflective about developing transferable skills to increase opportunities for work outside of academia and expand their capacity to have a positive impact on society.

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