DEVELOPMENT OF AN EARLY-ONSET INNOVATION CULTURE IN AUSTRALIA





EXECUTIVE SUMMARY

Entrepreneurship and innovation are increasingly important to our economic and social well-being. It is under this context that the recent PolicyHack event in Australia included the mission to "improve education systems to foster innovative thinking, creativity, entrepreneurship and digital skills", resulting in a pitch for a "Lemonade Day" project in Australia based on its successful US counterpart. However, despite developments such as this, and global growth of entrepreneurship programs and studies, there is still a lack of study on the effect and impact of entrepreneurship education in primary and secondary schools.

This article aims to establish a framework for further studies of entrepreneurship education in schools by reviewing the available literature to determine the consequences of utilising entrepreneurial education programs in schools. Initial findings reveal that early age experiences can influence whether an individual will later demonstrate entrepreneurship traits. In particular, fostering non-cognitive skills before adolescence, such as creativity and self-efficacy, has been found to be effective. Based on these research conclusions, this report suggests that the government implements guideline changes to cultivate an entrepreneurial culture in schools.



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INTRODUCTION

Entrepreneurship leads to comprehensive economic and social benefits, including increased innovation, accelerated structural changes or renewal to the economy, and lower unemployment rates. It is a broad term that is seen as a crucial factor in the development and well-being of societies¹. Governments have been increasingly recognising this view. The European Union Green Paper on Entrepreneurship associated job creation and growth, social and economic cohesion, competitiveness, productivity improvements and social interests with entrepreneurship². In Australia, the government stated that to remain internationally competitive "we must invest properly in research, innovation, skills and critically in research infrastructure … We either make this investment or we irreparably fall behind those that do."

Entrepreneurship education — the process of teaching or imparting entrepreneurial traits and skills — is one approach that can be used to achieve these aims. Entrepreneurship education can be delivered via three main avenues (1) infrastructure, (2) publications, and (3) courses³. ACER reported in 2003 that "Sustained innovation is the key to future growth and prosperity in a competitive global economy. Building a culture of continuous innovation through education is an essential requirement parallel to and supporting research and development⁴."

POLICYHACK

However, despite aims to improve investment in research and innovation, the Australian Innovation Systems Report in 2012 found that Australian business management capability and innovation culture is poor by international standards⁵, and our nation is still the only OECD country without a national research and innovation plan⁶. Education has likewise faced issues; the release of the *Gonski Report* (2012) found that performance of Australian students had declined at all levels of achievement compared to international benchmarks⁷. In 2013, the OECD international education rankings revealed that Australia saw a precipitous fall in its maths ranking, from 15th in 2009 to 19th in 2012⁸. NAPLAN test results from 2009 to 2013 also showed student achievement stalled across a majority of measures⁹. The NAPLAN results also revealed that the gap between our top performers and low performers has since increased¹⁰. These statistics are compounded by low prestige associated with teaching in Australia, which has deterred generations of potential educators from joining the profession, resulting in a negative flow on effects¹¹.

As а step toward addressing these issues, 'Policyhack' (http://www.policyhack.com.au/) was held in Sydney on 17 October 2015. This event was led by assistant minister for innovation, Wyatt Roy, and provided an opportunity for "representatives from industry and government to collaborate on developing and pitching innovative solutions to some of Australia's most pressing policy problems¹²". In relation to the topic of education, this included the mission to "improve education systems to foster innovative thinking, creativity, entrepreneurship and digital skills." The event had representatives from startups, VC funds, accelerators and other components of the innovation ecosystem, with policy experts from government departments collaborating in a one-day industry policy hackathon. There were ten groups tackling a different issue, each led by a 'champion'. Group nine's mission was to "improve education systems to foster innovative thinking, creativity, entrepreneurship and digital skills" and championed by Erin Watson-Lynn, a PhD Candidate from Monash University¹³. The group's resulting pitch was to create "DICE kids" – Digital, Innovative, Creative and Entrepreneurial¹⁴. The head of CSIRO was impressed by Erin Watson-Lynn's team proposal to teach entrepreneurship to students and offered her the support of the CSIRO student program.

The aim of such educational programs is generally to raise awareness of entrepreneurship as a suitable career choice and to develop entrepreneurial skills and traits in future generations. Moreover, these initiatives also plan to establish a culture that supports the economic and societal benefits that entrepreneurship brings¹⁵. However, studies into entrepreneurship education are still limited, with most focusing only on American university and graduate level courses¹⁶. In particular, there seem to be few studies on early education programs, despite the notable success of programs such as the US Lemonade Day program, which has been in operation from 2007 and since grown significantly¹⁷. This shows that there is much work to be done in order to design and implement entrepreneurship education programs, such as the Lemonade Day project, in Australian schools. While the Policyhack was an undoubtedly important step, as Wyatt Roy highlighted, "this is just the start. The hackathon itself was never the end game¹⁸."

Henceforth, it is becoming increasingly important to understand the effect and impact of early education entrepreneurship programs in schools. It is necessary to conduct further research into how the desired outcomes might be achieved. Such studies can set the foundations for planning an effective Lemonade Day, among other entrepreneurship school programs, in Australia.



ENTREPRENEURSHIP EDUCATION

There are many approaches to cultivating entrepreneurism, such as commercialisation tools (tax breaks) and productivity tools (hubs and incubators). However, entrepreneurship is more than just about career choices and business practices — it is a culture, a way of thinking, a way of acting, and a freedom to assume risks and innovate¹⁹. Whether or not education programs will shift Australia's culture is yet to be known; however, making the younger generation a key part of the government's policy could certainly drive a more innovative, synergistic society.

Nevertheless, despite the significance of the views surrounding the importance of entrepreneurship and its connection to education, as stated before, there is not yet enough study on the impact of entrepreneurship education. In particular, there is very little research on the impact on an early education context (e.g. primary and secondary school), or the necessary developmental precursors that lead to entrepreneurship²⁰. There have been relatively few studies conducted on the development of entrepreneurial skills and values²¹. Thus, this report will look at two main questions — firstly, can entrepreneurship education programs effect entrepreneurship (such as by leading to self-employed career choices or through demonstration of the entrepreneurial trait) later in life? Secondly, if entrepreneurship outcomes and how must entrepreneurship programs work to have the desired effect?

TEACHING ENTREPRENEURSHIP

Education may play a key role so long as entrepreneurship is indeed something that *can* be taught and not an innate ability or personality characteristic. There is some dispute over this, but there seems to be a general belief that it can, for example in 2009 the World Economic Forum stated a belief that "all human beings are inherently entrepreneurial, that is, entrepreneurial potential is in all of us²²". While Management leader Peter Drucker similarly claimed that "most of what you hear about entrepreneurship is all wrong. It is not magic; it is not mysterious; and it has nothing to do with genes. It is a discipline and, like any discipline, it can be learned²³." Governments hold a similar view, for example as the European Parliament and European Council stated "... each citizen will need a wide range of key competences to adapt flexibly to a rapidly changing and highly interconnected world. Education in its dual role, both social and economic, has a key role to play in ensuring that Europe's citizens acquire the key competences needed ..." As such, education is generally seen as a legitimate approach to fostering entrepreneurship.

If entrepreneurship is not just a set of skills but includes a way of thinking — and education is able to impart the traits needed for this way of thinking — then entrepreneurship education programs must work by not only teaching practical (cognitive) skills, but by imparting the necessary attitudes, culture and thinking (non-cognitive) skills. The early ages of education are a key point for the development of non-cognitive skills, thus making schools an attractive candidate for the implementation of entrepreneurship programs that impart the necessary attitudes and traits²⁴. However, to be effective the education methods employed must be



suited to entrepreneurial skills and competencies. In other words, teaching entrepreneurship requires a different pedagogical approach to traditional teaching methodologies²⁵. As the World Economic Forum underlined in 2009, "mainstream pedagogy will have to change, leading to the hands-on, project-based, multidisciplinary, non-linear approaches that education entrepreneurship requires. (...). Entrepreneurship is reflective action; no amount of book-based learning on its own will allow the student to progress in this field." The findings of a large number of researchers support this, indicating that the best way to teach entrepreneurial skills is through student-centred and active experiential learning, and not just didactically²⁶. The World Economic Forum describes examples of experiential learning methodologies and stresses the importance of learning outside the class and through real context approaches. Thus, there appears to be a world-wide consensus that entrepreneurial education is best delivered through programs that would enable students to engage in entrepreneurial activities or exercises that cultivate entrepreneurial skills; i.e. taking a hands-on approach.

Effect

On the first question of whether early age entrepreneurship education programs can have an effect, recent studies do suggest that early age experiences can be an influence on whether an individual will later demonstrate entrepreneurship. A study by Huber, et al. (2012) looked at a "leading entrepreneurship education program" called BizWorld for 11-12 year olds, and their findings indicated a significant positive impact on non-cognitive entrepreneurial skills, including risk taking, creativity and persistence. However, the study did not find a strong benefit to cognitive entrepreneurial skills, which tentatively suggests that non-cognitive entrepreneurial skills are more effectively developed at an early age. A study by Oosterbeek et al. (2010) that focused only on adolescents found insignificant effects of a similar student 'mini-company' program²⁷, furthering the possibility that early ages are more ideal targets for programs than adolescents. Meanwhile, a longitudinal study by Schoon and Duckworth (2012) starting in 1970 that followed 16,000 subjects in the UK, found that for both men and women, the likelihood of becoming an entrepreneur was associated with social skills and entrepreneurial intentions expressed by the age of 16^{28} . This further suggests there may be an 'optimal' age range or limit, and that early age (primary level) education may be the crucial period for developing non-cognitive skills that would be a predictor of entrepreneurial ability. Overall, these studies suggest that early entrepreneurship education for noncognitive skills such as risk taking, creativity and persistence can have an important positive influence on later entrepreneurial outcomes.

DESIGN

The aim of educational entrepreneurship programs is generally to raise students' awareness of entrepreneurship, develop knowledge of entrepreneurial skills, and help them identify whether it is a suitable career choice for them²⁹. There are many studies and articles discussing the background, personality and traits deemed important to entrepreneurship³⁰. A full study extends beyond the scope of this article, but non-cognitive skills are of particular importance; for example, the study by Schoon and Duckworth (2012) found that social skills were positively associated

with becoming self-employed ³¹. Risk-taking, creativity and self-efficacy are particularly notable examples³².

Creativity is seen as integral to the introduction of new and useful ideas and, thus, its connection to entrepreneurship is important³³. Creativity is a complex process beyond the scope of this article, but at the very least can be described as including the mental structures and processes underlying novel idea generation ³⁴. Entrepreneurs must generate new and better ideas, such as for new, useful goods, services or solutions and identifying opportunities. Hence, creativity is seen as an important trait to entrepreneurship. For example, there is a significantly positive relationship between creativity index and the high-technology industry³⁵. "Hub regions" such as Silicon Valley can perhaps be seen as exceptional examples of this.

Self-efficacy, or self-confidence, is based on self-perceptions of one's skills and abilities in specific tasks and situations. In other words, those with high self-efficacy are more likely to pursue and persist in a task or challenge. Such efficacy is a beneficial life trait, but seems especially important to entrepreneurial careers, which involve complex tasks such as locating an opportunity, gathering resources, setting up a business, and building it into a successful entity, compounded with the need to often persist in the face of uncertainty and high levels of risk. Entrepreneurs are thus expected to need high levels of intrinsic motivation and belief to push ideas even in the face of negative feedback³⁶.

Returning to the early education context, the presence of these skills in schools can influence entrepreneurship aspirations. For example, high scores on a creativity test were found to be positively associated with entrepreneurial intentions³⁷. Meanwhile, self-efficacy was found to have the strongest direct effect on children's career aspirations³⁸; thus, entrepreneurship education programs that focus on relevant traits such as creativity and self-efficacy will likely have a positive impact on the effectiveness of educational entrepreneurship programs. Notably, these skills are non-cognitive skills, which are weakly correlated with measures of intelligence and instead seen as 'personality traits' and aligns with the findings that suggest entrepreneurial education programs should target these skills at early age education.

IMPLICATIONS

While there is much focus on teaching entrepreneurship in order to stimulate entrepreneurial outcomes and self-efficacy through self-employment, entrepreneurship does not need be considered purely as a means for creating new businesses. Rather, entrepreneurship should be generally adopted as a positive attitude, because it encompass a myriad of skills, including technical skills, critical thinking, team work, creativity, communication, and a sense of innovation and proactivity, that are useful to everyone in their daily lives³⁹. While studies have been focused on the question of creating entrepreneurs or entrepreneurial mindsets, a further benefit of entrepreneurial education programs may also be improving the overall rate of economic engagement such as by reducing the rates of dropping out. Non-cognitive skills play an important, although complex, role in school attainment and performance⁴⁰. For example, Marques & Albuquerque theorise that an entrepreneurial pedagogy could help students understand the connection between education and real-world benefits⁴¹. Thus, entrepreneurial education programs can benefit both future entrepreneurs (self-employed business founders) and the innovative individuals who work within companies.

Entrepreneurship Education Programs may have flow on benefits, as well. The Educational Opportunity in Australia 2015 report published by the Mitchel Institute has found a staggering 26 per cent of Australians do not finish school or gain a certificate III by age 19⁴². Mitchell Institute director, Dr Sara Glover, said; "This is the future workforce of Australia. If we are not equipping them well enough for that, this is a quarter of young talent wasted. For our economy, and for our future, we can't afford to do that⁴³." Ensuring that entrepreneurship education is both relevant and effective for our potential young entrepreneurs should be a top priority for educators⁴⁴.



RECOMMENDATIONS

Based on the findings above, this article recommends that the government implements guideline changes to foster an entrepreneurial culture in schools. If Australia wants to observe a culture shift which embraces an entrepreneurial spirit, there needs to be greater collaboration between government and education. As Dr David Cropley, University of South Australia's associate professor in engineering innovation, states, "part of the innovative mindset starts right back in schools. We've got to be educating kids to have a more creative and innovative mindset, to be open to new ideas and open to experiences — that begins at school⁴⁵." Indeed, focusing on the youth could ensure the next generation has a strong foundation of entrepreneurial abilities. Queensland has taken the first steps in embracing a more technological economy by making coding and robotics compulsory in schools from prep to Year 10. Furthermore, the Lemonade Day initiative referenced in this article would allow primary school-aged children to go through the process of starting a small business from a young age. These practical and hands-on initiatives could certainly cultivate children that are trained in skills such as creativity, risk-taking and self-efficacy.

In addition, the government is under pressure to transform their practices by better engaging students. Therefore, it is recommended that the Australian government implements guidelines, such as a government program, to improve the quality of teaching in Australian schools. As this report highlighted, Australian education results have been dwindling downwards in the last few years. Hence, guidelines that focus on improving the quality of teachers could help in boosting the younger generation's innovation levels. For example, this report suggests that the government implements professional teaching standards, awards for quality teaching and school leadership, and a more rigorous admission process into university courses. In addition, a national approach to teacher's practicum should be observed and should include particular education programs linked to creativity and innovation, such as the Lemonade Day. However, the precise mechanisms of entrepreneurship educational programs may not have heterogeneous effects, with factors such as grades, gender and familial factors shown to influence entrepreneurial career choices. Considering that, currently, men are more likely to become entrepreneurs than women⁴⁶, the reasons behind this gender gap is a topic that should be further explored. Therefore, further research into how different program prototypes can meet the needs of a diverse group of children is recommended before implementing entrepreneurial education programs in Australia.

CONCLUSION

This article discussed the effect of entrepreneurial education programs; particularly in early education. Findings so far suggest they can indeed positively influence entrepreneurial career choices later in life. Early ages — before adolescence — are a particularly important time to focusing on development of non-cognitive skills, such as creativity, self-efficacy and social skills, which are seen to benefit entrepreneurship. Cultivation of these skills does not just benefit entrepreneurial career aspirations, such as the starting of new businesses, but are beneficial life skills and important elements that improve overall educational and economic outcomes. For example, children educated with these traits will become adults who are better at dealing with uncertainty, innovating and supporting the development of a national competitive advantage.

Key findings in this article show positive support for introducing entrepreneurship education programs in Australian schools. Hence, recommendations in relation to this involved shifting the culture in Australia by implementing practical incentives in schools, such as the Lemonade Day. Furthermore, it was recommended that the government changes its practices to include guidelines that improve the quality of teaching in Australian schools to foster innovation. However, as this report revealed, entrepreneurship education programs may not have a heterogeneous effect due to the diverse nature of students. Therefore, it is recommended that further research is conducted into how different programs can meet the needs of a diverse group of children before implementing entrepreneurial education programs in Australia.



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