ABSTRACT

Technopreneurship is an activity promoted by the Singapore Government. Many programmes are in place to boost the growth of technopreneurs. Previous research had reported the status quo of entrepreneurship education in Singapore. In an effort to understand the development of technopreneurs in Singapore, and help the country to train more technopreneurs, this paper attempts to study the current state of art in entrepreneurship education.

INTRODUCTION

The objective of entrepreneurship education is to nurture not just more entrepreneurs, but successful ones who can bring wealth and prosperity to themselves and their countries. Not only that, the mission of entrepreneurship education should be to deliver successful entrepreneurs who can create new jobs to sustain growth in a nation (Birch 1987, McMullen and Long 1987). In the Knowledge Economy that characterizes the 21st century, Governments around the world attempt to stimulate the creation of technopreneurs.

Technopreneurs, in this context, refer to people who can see opportunity to venture into technology-related knowledge-based businesses such as e-business (e-biz), Information Communication Technology (IT/ICT), advanced manufacturing, biotechnology, and logistics (Leung 2003). In short, technopreneurs are, as the Webster Dictionary defined, “entrepreneurs whose business involves high-technology (high-tech)” (Maalej 2006).

Exploitation of technology has become enterprises’ tactic to gaining competitive edge in recent years, and helped America to achieve economic growth (Wong et al 2005, Acs and Varga 2004, CIBER 2004). Technopreneurship is also a key initiative promoted by the Singapore Government since 1999 (See and Kirby 2007, 2006). The Global Entrepreneurship Monitor (GEM) of Singapore (Wong et al 2005) accentuated that high-tech entrepreneurship is a catalyst of economic growth.

To propel increased levels of technopreneurship in Singapore, it was reported that more than S$7.1 billion was injected into a Science and Technology Plan 2010 to help develop an entrepreneurial culture through Research, Innovation and Enterprise Strategies (MTI 2006). The Education System was challenged, and commissioned to help develop individuals to their fullest potential to contribute in the knowledge-based economy (MOE 2006). In view of these phenomena, a longitudinal study was carried out to understand the development of entrepreneurship education in Singapore.

The Singapore Institutional Technopreneurship/Entrepreneurship Education Survey (SITEES) was administered in 2001 and 2006 (See and Kirby 2007) to analyse the trend of entrepreneurship education in Singapore. From the study, it was found that the number of entrepreneurship provisions in Singapore has increased due to the government’s initiatives, and institutions have become more entrepreneurial. However, challenges still lie ahead in designing high quality and desirable course contents to training potential technopreneurs, and in creating an entrepreneurial culture in Singapore.

The study also found that schools have begun to place more emphasis on teaching entrepreneurship to children and youth (for example, using creative mind mapping technique), as well as on replacing lectures with more seminars, industry attachments, case studies, and experiential learning in the course curricula. To follow up on this study, this paper attempts to elucidate the training of future
technopreneurs in Singapore, through content analysis of recent literature, and action research in training students at different levels for a research and development (R&D) career towards technopreneurship goals.

**KEY PROPOSITION**

In previous and many studies, research is conducted on the microscopic study of the design of course curricula in schools, especially at university level. In this follow-up research, a macroscopic study of entrepreneurship education is explored, by extending previous study to investigate the teaching of entrepreneurship to children and youth (See and Kirby 2007). This research hopes to shed lights on the rationale behind such training, to identify the link of its implication to designing the course curricula at university level, and more importantly, to elucidate the training of future technopreneurs in Singapore.

**RESEARCH STUDY AND ANALYSIS**

In order to find answers to the key proposition, mixed method research is used in this study. Content analysis and action research are considered in this paper. By leveraging on these methods, the paper examines recent literature to elicit the trend in entrepreneurship education, and shares insight from training students at different levels for a research and development (R&D) career towards technopreneurship goals.

**Recent Focus in Entrepreneurship Education**

Recent literature highlighted the increase in demand for entrepreneurship education by non-business students (Page West III, Gatewood, and Shaver 2009). Cross-disciplinary entrepreneurship education becomes a solution, and intellectual entrepreneurship plays an important role to encourage the cross-disciplinary collaborations, and ensures proper maintenance of accountability for creative innovations (Beckman and Cherwitz 2009). Pedagogy has evolved (see Table 1) such that constructivistic education has become a better approach in entrepreneurship education; since experiential learning can allow learners to know what and how they know when they are trained to do entrepreneurial activities (Krueger Jr 2009). If good experiential learning can be acquired at young age, it “would have a lifelong effect on students’ thinking and actions, and significantly contribute to their career success as adults, regardless of whether they ever launch an enterprise” (Kourilsky and Walstad 2007). This would therefore explain the trend in teaching entrepreneurship to children and youth.

**R&D Career for Technopreneurship**

According to the Action Community for Entrepreneurship (ACE) (2009), there has been an increase of business formation every year in Singapore from below 36,000 in 2002 to almost 50,000 in 2008. And their aim is to have “a future generation of innovative and entrepreneurial Singaporeans to build the next wave of Singapore-built global enterprises…emerging (ing) from the youth today”. As such, in Singapore, we are seeing the growing emphasis of encouraging more young people to take up technopreneurship. For example, during the Global Entrepreneurship Week (GEW) from 16 to 22 of November 2009, young people in Singapore joined youth from 75 other countries to learn and participate in entrepreneurial activities, and they were encouraged to “think of innovation as a vehicle that can take them anywhere” (GEW 2009).

In addition, the Ministry of Education is also working closely with research institutions and universities on programmes such as the Science Focus Programme (SFP) (MOE 2009a), and Science Mentorship Programmes (SMP) (MOE 200b) to provide opportunities for gifted students to be trained for a research and development (R&D) career. It is through introducing Science to students in high schools, and involving scientists and researchers from these institutes and universities to encourage them to understand and experience R&D, to creating more intellectual properties, and mould these youth today into tomorrow’s technopreneur (Leong 2006). However, this is not a short term process, and it will require time to see the results (ST Forum 2009). Yet from the author’s mentoring experience, by
seeing the development of high school students to become confident student researchers, this is already an encouraging outcome (Straits Times 2009).

CONCLUSION

The findings implied that for these young people to become future technopreneurs, there may be new challenges in designing the curricula at pre-university and university levels. In Singapore, to support and encourage youth to embark on R&D, the pre-university curriculum was revised to include a research paper component, such that the students could further their research from the SFP or SMP, and then further their research at university level (MOE 2006). There would also be new challenges to developing young student researchers into technopreneurs at university levels, and in developing students from other disciplines into future technopreneurs in Singapore.

By sharing results from content analysis and action research as above, this paper has identified a few focal points in current trend of entrepreneurship education. These include the demand of cross-disciplinary entrepreneurship education, and to encourage experiential learning in entrepreneurial activities at young age. With further analysis, these focal points were found happening in Singapore, and the status of technopreneurship education in Singapore was updated, with reference to these current trends in literature.

This research contributes to better understanding of training technopreneurs, especially in a country like Singapore, where government invested heavily to groom future technopreneurs. And the education sector in Singapore has also invested efforts at all levels to make contribution in this aspect.

DIRECTIONS FOR FURTHER RESEARCH

In view of above implications and developments, future research could possibly involve case study of the young student researchers who become technopreneurs indeed, and to investigate further into future curricula design and development for this group of young learners in entrepreneurship education. And last but not least, to investigate into the possible new challenges resulting from this new phenomenon of training young people into tomorrow’s technopreneurs.
### Table 1: A Simplified View of How Modern Pedagogy Has Evolved (Krueger Jr 2009: Table 4.1)

<table>
<thead>
<tr>
<th>Key Theory</th>
<th>Core Assumption</th>
<th>Key Activity</th>
<th>Sample Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher-centered</td>
<td>Expert teacher; passive student</td>
<td>Memorization</td>
<td>Fact-based lectures</td>
</tr>
<tr>
<td>Teaching-centered</td>
<td>Expert teacher; active student</td>
<td>Skill development</td>
<td>Pro formas; business plans</td>
</tr>
<tr>
<td>Learner-centered</td>
<td>Learners need to control learning process</td>
<td>Teacher-student interaction</td>
<td>Case studies</td>
</tr>
<tr>
<td></td>
<td>(student as customer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning-centered</td>
<td>Metacognitive understanding of learning (from what we know to how we know it)</td>
<td>Problem-based learning</td>
<td>Self-managed field projects</td>
</tr>
</tbody>
</table>

(more behavioristic)

(more constructivistic)

### NOTES

1. Global Entrepreneurship Monitor (GEM) is an international project that started in 1999. Singapore started participating in GEM since 2000 and this is the only survey in Singapore that aims to measure the relationship of entrepreneurship with economic performance of a country (Wong et al 2005).

2. The Singapore Institutional Technopreneurship/Entrepreneurship Education Surveys (SITEES) were designed for the longitudinal study to understand the development of entrepreneurship education in Singapore. Information (such as courses and subjects details of entrepreneurship provisions) were collected from both private and public institutions in Singapore. These institutions were registered with the Singapore Ministry of Education (MOE). The surveys were conducted in 2001 and 2006 to examine the change in status quo of entrepreneurship education in Singapore during the years. The findings were summarised and presented at AGSE2007 (See and Kirby 2007).
REFERENCES


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