

CREATIVE THINKING THROUGH VISUAL LITERACY

Siu-Kay Pun, Nanyang Technological University

ABSTRACT

In an increasingly globalized and competitive world, larger numbers of entrepreneurs with creative minds are needed. This paper discusses the role of visual literacy in nurturing creativity and explores the experience gained in a course in creative thinking through visual literacy that was taught as an elective at Nanyang Technological University (NTU). It discusses the teaching methodologies to nurture creative minds in Business undergraduates, teaching issues encountered when teaching the course, and outcomes achieved from the course. It also provides advice for educators considering adopting such a program.

JEL: I20

KEYWORDS: creative thinking, visual literacy, entrepreneurs, teaching techniques

INTRODUCTION

A small city-state with no natural resources, education has always been Singapore's top priority. The primary focus of its education system had been on science and technology and in this it has done very well. In its latest study in 2003, the National Center for Education Statistics of the US Department of Education had Singapore's eighth graders topping 45 developed and developing countries in both science and mathematics (TIMSS, 2003). This strategy in developing a highly skilled and disciplined workforce for its economic development has served it well, propelling it from a third world to a first world economy in the four decades since its independence in 1965 (Lee, 2000).

The 2007-2008 Global Competitiveness Report (WEF, 2008) ranked Singapore 7th out of 131 economies and among the 31 which have transited the *factor-driven* and *efficiency-driven* stages to the *innovation-driven* stage. It will now have to be more creative and innovative to maintain its competitiveness.

To stay ahead and remain competitive, Singapore has embarked on the challenge to transform itself into the artistic and international business hub of the region, to become a vibrant cosmopolitan centre which can punch above its weight and support and influence markets beyond its natural boundaries (M.I.A., 1995). To realize its goal and to ensure continued economic progress, it has set out to cultivate a creative and thinking society with its graduates equipped not only with traditional skills and knowledge, but also having the extra competitive advantage of creative minds and the entrepreneurial spirit.

In response, schools have begun to restructure, allowing students greater flexibility and multiple pathways to develop their talents. Creative areas such as the arts and design now play a more significant role in a broad-based education aimed at developing the "whole person" (M.T.I., 1986). At the tertiary level, a key step taken is the broadening of the curriculum towards one aimed at providing students with greater choice and ownership in their learning, and the introduction of more courses which can nurture creativity and innovation and not just produce "one-dimensional engineers and accountants" (Straits Times, 2003).

This paper presents and discusses the experience gained from a course in visual literacy which is intended to nurture creativity and bring out the creative energies in business students. This elective course was introduced at the Nanyang Technological University (NTU) in response to the need for more creative, thinking and entrepreneurial graduates, ones who will have that additional competitive advantage in an increasingly globalized economy.

We first discuss the need to nurture creativity in education when a country's economic development has moved into the innovation-driven stage, taking the small city-state of Singapore as an example. Next we examine the concept of creativity and the role visual literacy plays in nurturing creativity and communication. This is followed by a detailed study, based on an elective visual literacy course introduced at NTU, of the effect of visual literacy in the training of creative thinking for business undergraduates. Highlighted are the rationale, structure and approaches taken in nurturing creative thinking in visual communication and in the creation of brand identities. The learning outcomes and performance of the students, based on the student projects completed, are also discussed and presented. Observations are drawn from the analysis of the students' feedback. This paper concludes with some implications and advice in nurturing creative thinking in business undergraduates.

LITERATURE REVIEW

Challenges of a Globalized Economy

Entrepreneurs are "agents of change and growth...and...act to accelerate the generation and application of innovative ideas" (OECD 1998). They are important and necessary drivers of innovation, growth, and job creation (Audretsch, 2002). Recognizing the central role they play in economic growth and competitiveness, governments and policy makers have increasingly explore different ways to promote and enhance entrepreneurship, not least through formal entrepreneurship education. The European Union, for example, adopted an Entrepreneurship Action Plan in 2004 with the aim of reviving Europe's "lagging economic competitive performance" (European Commission, 2004). A vital component in entrepreneurship is creative behavior. Management experts have emphasized the creative processes apparent in opportunity search and business model development, amongst many others (Berglund and Wennberg, 2006; Drucker, 1985).

In response to the need for creativity and entrepreneurship in business and industry, there has been a recent explosion in the number of universities offering entrepreneurship courses and programs (Vesper and Gartner, 1997; Johannisson et al., 1998). However, the academic focus on rigor and analysis together with the teaching style of traditional business education tend to clash with the entrepreneurial demands of creativity, novelty and synthesis. It has even been claimed that business education has worked to inhibit, rather than enhance, entrepreneurship (Gibb, 1996). Knowledge plays a paradoxical role in creative endeavors, supplying the raw materials from which creative new ideas are forged on the one hand, but also having the potential of inhibiting creativity on the other (Ward, 2004).

Creativity and Visual Literacy

Creativity is a highly diverse concept which has been studied in a wide range of disciplines, with much research done on defining, measuring, nurturing and managing creativity (Runco, 2004; Fletcher, 1990). It includes the generation of new ideas, possibilities and alternatives (Smith, 1998). Creativity has also generally been regarded as useful innovation, novelty that can be applied and add value to an organization (Oldham and Cummings, 1996). It has long been recognized that creativity is an essential quality in entrepreneurship and innovative business behavior, translating into idea development, new product innovations, and improving existing innovations (Walton, 2003; Ward, 2004; Kirton, 1987).

Recent studies suggest that all human beings are potentially creative, having the same neural processes, although whether such creativity are expressed or suppressed and whether they are affected by personal experiences and the environment (Findlay and Lumsden, 1988). All undergraduates thus have the potential to be creative with the problem only in how such creativity can be nurtured and brought out into expression.

Creativity also relies heavily on a sound knowledge base which aids not only in the generation of ideas but also their evaluation, placing them in proper context and relative importance. According to Rhodes (1987), one approach of structuring creativity research is to divide it into person, process, product, and press. In this work, only the person and the process are of relevance, with the process involving various brainstorming and other creative activities.

Visual Literacy: According to A. Pennings, “Visual literacy is an emerging area of study which deals with what can be seen and how we interpret what is seen. It is approached from a range of disciplines that:

1. Study the physical processes involved in visual perception,
2. Use technology to represent visual imagery, and
3. Develop intellectual strategies used to interpret and understand what is seen” (Chauvin, 2003).

R. Hobbs defines visual literacy as “the ability to access, analyze, evaluate, and communicate information in any variety of form that engages the cognitive processing of a visual image” (Hobbs, 1977).

Why Visual Literacy: Lyn Lacy, public school media specialist and visual literacy advocate, identified six crucial roles of visuals in promoting thinking and learning which were adapted by Landra Rezabek, Past-President of the International Visual Literacy Association (Rezabek, 2005) (see Table 1)

Table 1: Role of Visuals in Promoting Thinking and Learning

Role of Visuals	Role of Visuals
People will become more creative and critical thinkers by identifying, analyzing, interpreting and evaluating what they see.	People will become more responsible citizens by being aware of the roles visuals play in reflecting and influencing a society.
People will become visual makers themselves, demonstrating the ability to create mental images and to communicate visually with others	People will become more discriminating consumers, understanding the motives, methods and emotional appeal of advertising visuals in a modern society.
People will be more perceptive individuals by recognizing and appreciating aesthetics of visual imagery and by understanding, accepting and valuing personal, cultural and historical differences in image creation.	People will become lifelong learners, with a positive attitude about learning how to learn about visual images.

Crucial roles of visuals in promoting thinking and learning (Rezabek, 2005)

While calling for heightened attention to visual literacy in educational curricula, Paul Messaris argued that “by acquiring visual literacy, people enrich their repertoires of cognitive skills and gain access to powerful new tools of creative thought” (Messaris, 1998). Edmund Feldman when he was president of the American National Art Education Association stated that “Art is a language of visual images that everyone must learn to read. In art classes we make visual images and we study visual images. Increasingly these images affect our needs, our daily behavior, our hopes, our opinions and our ultimate ideals. This is why the individual who cannot understand or read images is incompletely educated. Complete literacy includes the ability to understand, respond to and talk about visual images” (Feldman, 1982). It is also recognized that problem solving in art involves divergent thinking and multidisciplinary knowledge which in turn nurture creative thinking. As Elliot Eisner, Professor of Education at Stanford University, contended that “the value of arts in education is that arts teach students that problems in life can have more than one ‘right’ answer and that they teach that complex forms of problem solving are seldom fixed, but often change with circumstances” (Wong, 2001).

NURTURING CREATIVE THINKING THROUGH STUDIES IN VISUAL COMMUNICATION

This paper examines the effects of a free elective course entitled ‘Creative Design in Communication and Marketing’ conducted at NTU’s School of Art, Design and Media. Approved by the University Academic Committee, the objectives of this course are to nurture creative thinking in conceptualization; understand the planning and strategy involved in developing creative solutions including brand identity creation; and the training of visual perception, analysis and communication using design fundamentals.

Course Description

This course introduces ways to attain creativity in design that is intended to inform, persuade and to shape perceptions of a distinct brand or identity for marketing. Students are introduced to the creative thinking processes and techniques that unlock their potential power in visual imagination. They learn to develop dynamic concepts and develop value innovation strategies that generate creative solutions. Students also learn how to use design basics to get creative results and their applications in designing brand identity.

Data Used for the Study

This course is conducted weekly with 3-hour lecture-cum-tutorial classes over 12 weeks. It is available to all NTU undergraduates as a general elective complementing their majors and minors. It has been running for eight semesters starting in July 2004. The maximum enrolment was 40 students but it has been increased to 50 since January 2008 semester because of its popularity. The majority of those who have taken this as elective course were Business students with final year students outnumbered year one and year two students as enrolment preference is given to final year students. Survey conducted indicates that almost all of the students enrolled had no background in visual art. This, however, is expected as visual art education has been sidelined in Singapore's primary and secondary education system until recent years.

This paper reflects on the experience gained in the teaching of this course as part of a regular teaching load by the author who is also the lecturer since July 2004. Also discussed are its modes of delivery and the extent to which the objectives have been met in inculcating an appreciation of visual literacy and in nurturing creative thinking in the Business students.

Rationale, Structure and Approaches to Nurture Creative Thinking in Visual Communication

Visual communication involves developing a creative solution to a visual design problem and delivering this effectively to the target audience. In order to conceptualize the idea for the creative solution, one needs to come up with an innovative, original and fresh approach leading to a new improved situation. Creative thinking is the process of getting this 'big' idea that fits the solution perfectly. Thus, to be creative in thinking, one first needs to be able to produce original ideas or thoughts.

The teaching implications of creative thinking in visual communication thus include the need to:

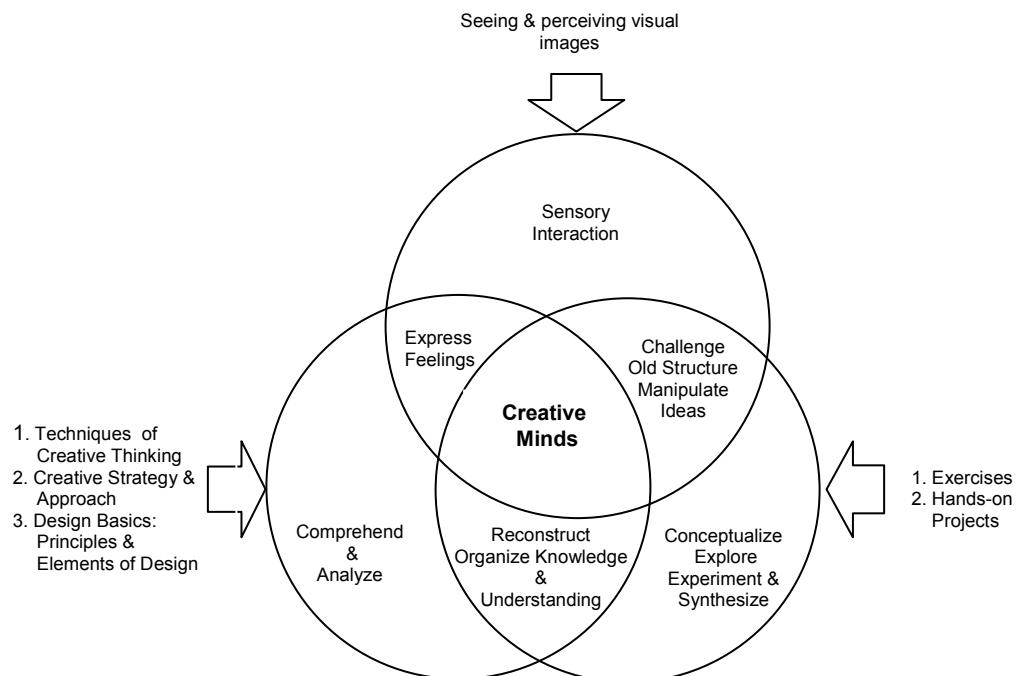
- develop the ability to rapidly produce ideas (Fluency); produce original, divergent solutions (Flexibility) and be able to frequently come up with original ideas (Originality). These are the three types of traits common in people of high creative ability according to Guilford (Moriarty, 1986);
- enhance visual literacy skills which involve the ability to interpret, use, appreciate, and create images and video using both conventional and 21st century media in ways that advance thinking, decision making, communication, and learning (enGauge 21st Century Skills).

In this course, students are firstly introduced to various ways of creative thinking to generate ideas. These include divergent thinking (Guilford, 1959), associative thinking (Young, 1975), lateral thinking (de Bono, 1970), analogical thinking (Gordon, 1971) and visual thinking. An "open-ended" mode of inquiry is encouraged in order to get a free flow of original and novel ideas for divergent solutions. In conceptualizing for a creative solution, students learn the essentials of background research, and the strategy and approach to a creative outcome. They also learn and apply design elements and principles to achieve creative results. The emphasis is on cognitive growth, on comprehension of knowledge learnt, on perception of visual images, and on verbal and written analysis using the design basics in order that students can reconstruct and organize their personal knowledge and understanding. Figure 1 illustrates the Learning Model used to nurture creative minds.

Secondly, while understanding design basics can help students to engage their visual senses, and to infer the meaning intended in a visual message, the approach taken also helps them to engage their feelings, and subsequently express emotions when conceptualizing ideas. Thirdly, students are given as much opportunity as possible during this course to develop their fluency, flexibility and originality. During class, students form themselves into small groups after the lecture for each topic to work on an exercise which involves brainstorming and applying the concepts learnt. This develops in them, through actual practice, their fluency, flexibility and originality. Each group then presents its solutions to the whole class for peer comments and discussions.

Students also form themselves into teams of four each to work on a final project which is to create a brand identity for a product, for a company or for an event. These projects provide opportunities for students to conceptualize and experiment with original and novel ideas, and to brainstorm in a group to challenge preconceived patterns and to further explore new ideas. The aim is to facilitate formation of a new, one-of-a-kind identity as a creative solution to a design problem. The goal of this process is to nurture creative thinking by providing opportunities for cognitive growth, to learn through sensory interactions, to explore and experiment in a team, to challenge one another's mind and to learn from one another's talent. Each team has to submit a report on how they conceptualize the idea, the creative strategy and approach involved, and present this to the whole class. The aim for all these approaches is to nurture creative minds.

Figure 1: Learning Model to Nurture Creative Minds



This figure shows knowledge comprehension while interacts with one's senses and hands-on activities allows individual to explore and experiment with new ideas. These multiple experiences set in an enriching environment enable deep engagement and creativity which in turn nurture creative minds.

LEARNING OUTCOMES

Assessing the Final Team Project

Based on the quality of the team projects and presentations made by students in the course over the past 8 semesters, the students taking this course can be broadly classified into three categories:

The first consists of those who evidently show enthusiasm and strong interest and who had gone through thorough brainstorming and come up with very creative ideas. They successfully created distinctive brand identities with designs that are original and novel. They exhibited excellent strategies and approaches and constantly improved on their designs. They also put in extra efforts and submitted more design applications than was required. Before they made presentations on their project, they used other media, such as video, to set the mood so that the audience could have a better idea about the nature of their project. It is encouraging that over 40% of the students fall under this category. The results show that this category of students, while not majoring in art and design, has the interest in, and talents for, becoming excellent creative designers.

The second category, comprising about 35%, submitted works in which very good brand identities were created. There were some originality in the designs indicating that these teams had gone through their brainstorming and came up with some reasonable strategies and approaches. They submitted sufficient applications and made good presentations. It is clear that these teams have grasped the fundamentals and can produce good results in visual communication to support their area of work in business.

The third category consists of students who submitted works in which the brand identities were not clear. Although there were some good ideas for the designs, these were not well executed indicating lack of commitment or enthusiasm among these students. There seems to be also a lack of thorough brainstorming for creative ideas and the strategies and approaches proposed needed further improvements. This category, comprising about 25% of all the students, only submitted applications which met the minimum requirements.

Observations from Exercises Done in Class and Students' Feedback

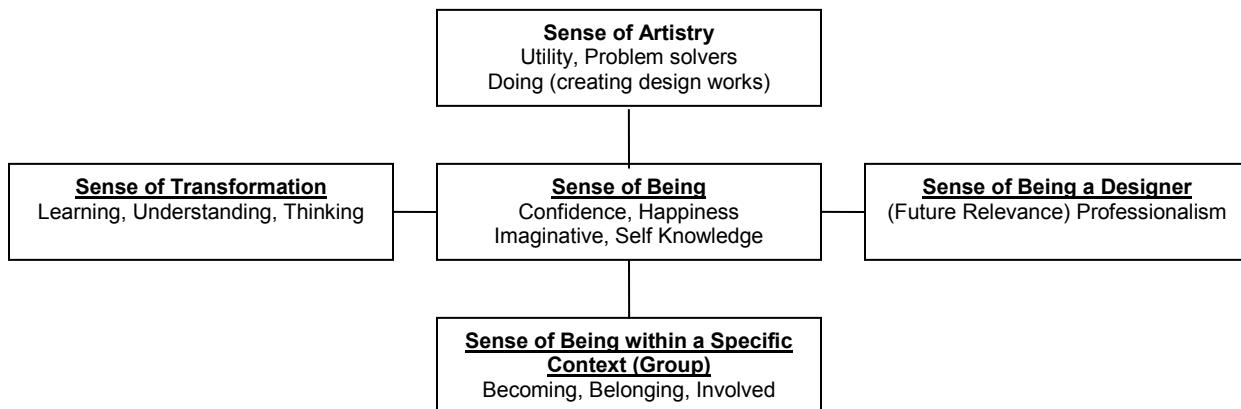
It is observed that students enjoyed themselves and had fun when they were in small groups doing their exercises. Most were relaxed, had good team spirit and spent a great deal of effort in brainstorming and discussion. They were instructed to delay judgment on their peers' ideas and, consequently, came up with quite divergent and novel solutions on the same problem given. For example, instead of just the 'visual with words' idea, some groups worked out a storyboard for a TV commercial.

To gauge the effectiveness of the course in meeting its objectives, student feedback were conducted at the end of each semester. Although many students indicated that, prior to taking the course, they did not have the background or interest in creative design, most students rated this elective course very favorably. In order to analyze students' experience of engagement and creativity, Anna Reid's and Ian Solomonides' model (Reid & Solomonides, 2007), illustrated here in Figure 2 can be used.

Although the model in Figure 2 represents key features of variation in design students' experience of engagement and creativity, many of these features can also be found in the Business students enrolled in this course. According to Reid and Solomonides, the center of this model is the 'Sense of Being' hub which denotes students' personal relationships and approaches to engagement and creativity. This hub emphasizes their confidence, happiness, imagination and self-knowledge. From the feedback conducted, 87% of the students expressed that they enjoyed doing the exercises and the final team projects although they also, at the same time, admitted that this was hard work and much effort and time were needed to

achieve creative results. They used very positive languages like "enjoyed immensely...fun and exciting...eye-opening, rewarding and challenging...very insightful module...memorable experience...end result was absolutely satisfying...we are able to churn out non-conventional ideas and are willing to put in effort to make our ideas work...I enjoy the process of starting from nothing and ending with something we are all very proud of."

Figure 2: Design Student's Experience of Engagement and Creativity



This figure illustrates Anna Reid's and Ian Solomonides' model of the key features of variation in design students' experience of engagement and creativity. The core feature, the 'Hub' represents a 'Sense of Being', the referential self with an axis about which the outer components of the 'wheel' turn. The outer components of the wheel represent the different ways that the students expressed their understandings of engagement and creativity that contributed to their understanding of 'self' as a design student (Reid & Solomonides, 2007).

According to Reid and Solomonides, students' Sense of Being is central to their experience of 'Artistry, Designer, Transformation and Context' in which each serves as a wheel component relating to a different aspect of the experience of being a design student. A 'Sense of Transformation' is a category that relates to the ways students' Sense of Being is changed through learning. 83% of the students fed back that the creative thinking skills that they had learnt would help them seek divergent solutions and not just settle for the first idea that comes to mind. This group also cited "valuable learning experience... see things which I never see before...seeing how others have done their projects has also inspired me to create my own designs...I want to be a trend setter for green (referring to the project to promote environmental friendliness.)"

In this study, the 'Sense of Being within Specific Contexts' would be more appropriately applied to how students recognized their experience while working in a team and the nature of their involvement. 80% cited "having fun brainstorming in a group...learning to share ideas...understand the creative differences between people...my email account is flooded with discussions and the responses are fast and furious...making the learning journey fun and enjoyable...learn from one another...made new friends". Some were fortunate to have "super fabulous team mates who are committed and creative" while some others struggled with differences in ideas.

In the category 'Sense of Artistry', engagement is represented by students' responses to their ability to solve design problems and the creation of the actual design. 81% were positively engaged with comments including "enjoy the process of starting from nothing and ending with something we are all very proud of...very satisfied with the final outcome ...able to apply what we learnt in class...a peek into the work of advertising agencies, copywriters, graphic designers – which was definitely no easy task. We were initially intimidated by the huge amount of work needed: conceptualization, brainstorming, making the form work. We had to throw away many ideas we liked because it was impossible to execute with our limited skills in computer software. Nevertheless, the end result was absolutely satisfying – we mastered the various design concepts and tools with many sleepless nights. My experience will definitely help my career in the future...It was fun creating something physical. I felt like an Art student...In the end, there were surprisingly so many good different solutions presented in class ...the challenge was to come up with innovative ideas that have not been used before." Some of the common responses students gave were the limited skills in design software resulting in difficulty in execution. A few were inspired by this

difficulty to take up courses in *InDesign* and *Photoshop* to sharpen their technical skills while some indicated that they would like to take more elective courses in visual literacy and other similar courses.

In the category ‘Sense of Being a Designer’, it would be more appropriate to focus on how students perceive themselves as effective visual communicators in their future careers rather than being a professional with the design community as Reid and Solomonides have intended in this model. 81% indicated that with their newfound abilities in perceiving and creating visual images, they were confident of becoming effective visual communicators. A few cited “I’ve learnt to think about the possible thoughts and processes which go through designers’ minds...I felt like I was really working for an advertising company.” Some, in fact, had started to engage themselves in free lance design work, both for their own interest and to earn some extra income.

OBSERVATION AND CHALLENGES FACED

The heavy Business curriculum at NTU leaves little time and space for students to strive for creative, original ideas. In the team projects, while most strived for good results, not all members put in the same effort. Still, the team project brought out the different talents the group had – one may be good in computer graphics, another in writing the report, and others in presentation and in organizing the group effort. Students learn the importance of working together in a team, leveraging on each other’s talent and, equally important, to have fun. It is observed that those who had fun went through a very thorough brainstorming process and were motivated to put in extra efforts to produce more creative results.

A sample of works by this category of students is shown in Figure 3 which illustrates the talents and tremendous effort a team put in in designing a brand identity for a Flea Market. These were the students who attained a real ‘Sense of Being’, experiencing deep personal engagement and creativity which will likely change their outlook and benefit them in their future careers. It is also noticed that works that were not original and unique reflected a lack of thorough brainstorming and a tendency to take short cuts. As students can opt for pass-fail grade in all electives, the tendency for some not putting in sufficient effort in creative solutions will persist unless this option is taken away.

The challenge for educators is to understand that students learn to experiment with original and creative ideas in an environment where they find enjoyment and fulfillment. As educators, we enrich the learning environment by facilitating understanding and comprehension of visual messages through our perception, our senses and our emotions. Aldous Huxley, author of the novel *Brave New World* carried on to say that ”the more you know, the more you see” (Lester, 2001). Activities that can draw students together in a relax environment where they can brainstorm without inhibition, challenge each other’s ideas, and learn from each other’s talents can further enhance learning, personal engagement and creativity.

Experts in visual literacy advocate that “training for visual literacy should begin at least by school age and continue in college or on the job” (Kirrane, 1992). Developing countries like Singapore, which focused on science and technology to power its industrial economy and at the same time putting visual literacy on the side now face catching up time for the art. As technology changes the way economy works, and as our economy becomes more visual and globalizes, today’s students need to develop skills to enable them to stay competitive in the new global market. Visual literacy can add another dimension to their core knowledge, helping them recognize and explore multiple perspectives and resolutions through creative thinking skills. More studies in this area on a wider scale can be explored beyond the scope of this paper to find out whether visual literacy remains beneficial to working graduates when conducting their businesses.

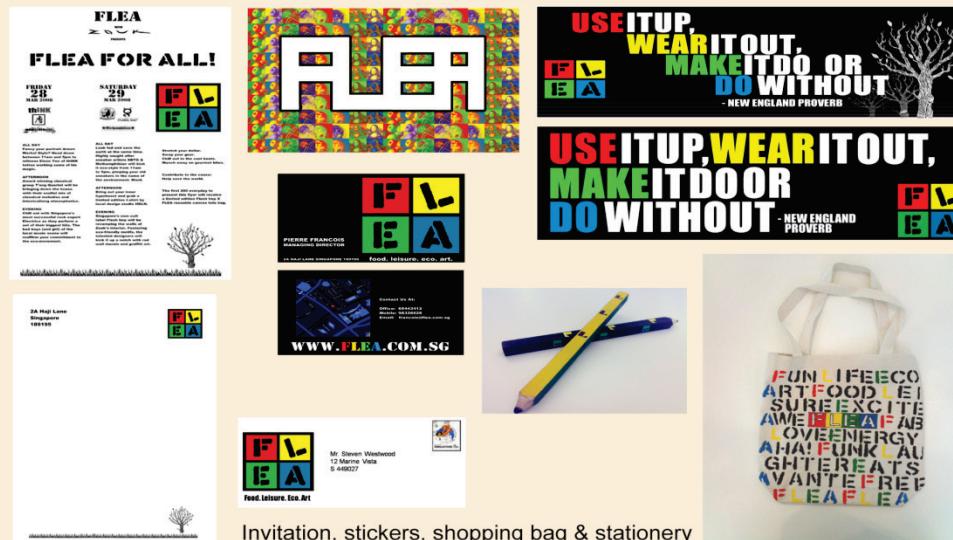
Figure 3: Example of a Brand Identity Design for a Flea Market

Created by Cameron Ng, Lim Yan Liang,
Sheryl Huang, Lian Yiting and Cai Shiwei

Figure 3: Example of a brand identity design for a flea market

Group project by Cai Shiwei,
Cameron Ng, Huang Shumin,
Lian Yiting & Lim Yan Liang

Promotion inside Mass Rapid Transit &
a series of 4 posters



Invitation, stickers, shopping bag & stationery

Figure 3 shows the creative solutions for a design problem to promote an eco-friendly 'Flea Market'. The problem was selected by a group of students themselves. They designed the creative strategy, creative approach and the message for their target audience. They also designed the visual applications like the posters, stationery etc to create a visual brand identity for this event. The outcome is a very attention grabbing brand identity with designs that are creative and original, and professionally executed.

Figure 3 shows the creative solutions for a design problem to promote an eco-friendly 'Flea Market'. The problem was selected by a group of students themselves. They designed the creative strategy, creative approach and the message for their target audience. They also designed the visual applications like the posters, stationery etc to create a visual brand identity for this event. The outcome is a very attention grabbing brand identity with designs that are creative and original, and professionally executed.

CONCLUSION AND IMPLICATIONS

In an increasingly competitive and interconnected world with its globalize economy, to become and to remain among the top economies, entrepreneurs with creative minds and are multidisciplinary and able to see the big picture will be needed in sufficient numbers. Those who are effective visual communicators and have the skills of bringing good design into marketing and business will have a clear competitive advantage over others. As Tom Watson, a former Chairman of IBM puts it, "Good design is good business" (Wheeler, 2003).

Governments and universities have responded to this challenge and recent times have seen efforts at producing larger numbers of such entrepreneurial and creative graduates. One approach in developing such workers in sufficient numbers is to introduce art and design, and in particular visual literary skills, to the large number of engineering and business graduates. The success and popularity of one such elective course at NTU indicates that a large portion of students majoring in business do have creative skills which can be nurtured and developed. Exit surveys among students taking this course showed clearly that they are well aware of the relevance of such creative skills learnt and the impact that these skills can make in their future careers. It is also clear, from their feedback, that most of them will make continual effort to pursue and sustain creative thinking not only in visual communication but also to extend this into business and to combine the multidisciplinary knowledge acquired to seek new frontier and create new enterprises.

REFERENCES

- Audretsch, D.B (2002). *Entrepreneurship: A Survey of the Literature*. Report Prepared for the European Commission, Enterprise Directorate General
- Berglund, H. and Wennberg, K (2006). "Creativity among entrepreneurship students: comparing engineering and business education", *Int. J. Cont. Engineering Education and Lifelong Learning*, vol. 16(5), p.336-379
- Buttner, E.H. and Grysiewicz N (1993). "Entrepreneurs' problem-solving style: An empirical study using Kirton's adaption/innovation theory", *Journal of Small Business Management*, vol. 32(1), p.22–32
- Chauvin, B.A (2003). "Visual or Media Literacy?", *Journal of Visual Literacy*, vol. 23(2), Autumn, p.123
- De Bono, E (1970). *Lateral Thinking: Creativity Step by Step*. New York: Harper and Row
- Drucker, P.F (1985) *Innovation and Entrepreneurship: Practice and Principles*, New York: Harper & Row
- enGauge, 21st Century Skills: Literacy in the Digital Age, <http://www.ncrel.org/engauge/skills/skills.htm>, p.24
- European Commission (2004). *Entrepreneurship Action Plan*. http://europa.eu.int/comm/enterprise/entrepreneurship/action_plan.htm
- Feldman, E (1982). "Art in the Mainstream: A Statement of Value and Commitment", *Art Education*, vol. 35(5), September, p.6
- Findlay, C.S. and Lumsden C.J (1988). "The Creative Mind: Toward an Evolutionary Theory of Discovery and Innovation," *Journal of Social and Biological Structure*, vol. 11, p.3-55
- Fletcher, W (1990). "The management of creativity", *International Journal of Advertising*, vol. 9(1), p.37–43
- Gibb, A.A. (1996). 'Entrepreneurship and Small Business Management: Can we afford to neglect them in the Twenty-first Century Business School?' British Journal of Management. Vol. 7. pp 309-321

- Gordon, W.J.J (1971). *The Metaphorical Way of Learning and Knowing*. Cambridge: Penguin Books
- Guilford, J.P (1959). *Creativity and Its Cultivation*. New York: Harper & Brothers
- Hobbs, R (1997). "Literacy for the information age", *The Handbook of Research on Teaching Literacy through the Communicative and Visual Arts*. New York: Simon & Schuster Macmillan, p.7-14
- Johannesson, B., Landström H. and Rosenberg J (1998). "University training for entrepreneurship – an action frame of reference", *European Journal of Engineering Education*, vol. 23, p.477–496
- Kirrane, D.E (1992). "Visual Learning", *Training & Development*, vol. 46(9), September, p.59
- Kirton, M.J (1987). "Adaptors and innovators: cognitive style and personality" in S.G. Isaksen (Ed), *Frontiers of Creativity Research: Beyond the Basics*, Buffalo, NY: Bearly Limited, p.282–304
- Lee, K.Y (2000). *From Third World to First - The Singapore Story*. HarperCollins Publishers
- Lester, P.M (2001). *Visual Communication: Images with Messages*. Wadsworth Publishing Company. p.5
- Messaris, P (1998). "Visual Aspects of Media Literacy", *Journal of Communication*, vol. 48(1), Winter, p.70
- M.I.A. (1995). *Singapore: Global City for the Arts*, Ministry of Information and the Arts, Singapore
- Moriarty, S.E (1986). *Creative Advertising*. New Jersey: Prentice-Hall, p.3
- M.T.I. (1986). *Report of the Economic Committee: The Singapore Economy: New Directions*, Ministry of Trade and Industry, Singapore
- Oldham, G.R. and Cummings A (1996). Employee Creativity: Personal and Contextual Factors. *Academy of Management Journal*, vol. 39(3), p. 607-635
- OECD (1998). *Fostering Entrepreneurship: The OECD Jobs Strategy*. Organization of Economic Co-operation, Paris
- Reid, A. and Solomonides I (2007). "Design students' experience of engagement and creativity", *Art, Design & Communication in Higher Education*, vol. 6(1), p.30-33
- Rezabek, L.L (2005). "Why Visual Literacy: Consciousness and Convention", *TechTrends*, vol. 49(3), May/June, p.19-20
- Rhodes M (1987). "An analysis of creativity" in *Frontiers of Creativity Research: Beyond the Basics*, eds SG Isaksen, Buffalo NY: Bearly, p. 216-222
- Runco, M (2004). "Creativity", *Annual Review of Psychology*, vol. 55, p.657–687
- Smith, G.F (1998). Idea-Generation Techniques: A Formulary of Active Ingredients. *Journal of Creative Behavior*, vol. 32(2), p. 107-133
- Straits Times (2003). Choices, Choices: NTU to engineer new breed of grad. *The Straits Times*, March 4, 2003
- TIMSS (2003). Trends in International Mathematics and Science Study. U.S. Department of Education. <http://nces.ed.gov/timss/tables03.asp>
- Vesper, K.H. and Gartner W. B (1997). "Measuring progress in entrepreneurship education", *Journal of Business Venturing*, vol. 12, p.403–421
- Walton, A.P (2003). "The impact of interpersonal factors on creativity", *International Journal of Entrepreneurial Behavior and Research*, vol. 9, p.146–162

- Ward, T.B (2004). "Cognition, creativity, and entrepreneurship", *Journal of Business Venturing*, vol. 19, p.173–188
- Wheeler, A (2003). *Designing Brand Identity*. New Jersey: John Wiley & Sons, Inc. p.33
- WEF (2008). *The Global Competitiveness Report, 2007-2008*. <http://www.gcr.weforum.org/>
- Wong, A (2001). "Knowing Understanding & Creating with Art", *Presidents & Prime Minister*, vol. 10(4), p.20. Available: <http://proquest.umi.com>
- Young, J.W (1975). *A Technique for Producing Ideas*. Chicago: Crain Books

BIOGRAPHY

Siu-Kay Pun BA (Honors & High Distinction in Communications Design) University of Illinois, Chicago; MA (Communication Art, specializing in TV production) University of Wisconsin, Madison. Currently, a Lecturer in the School of Art, Design & Media, Nanyang Technological University (NTU), Singapore, where she has also been, for 15 years, a Senior Media Specialist & Deputy Director with the Center for Educational Development. Prior to joining NTU, she spent 12 years as Senior Tv Producer/Executive Producer with the Singapore Broadcasting Corporation.