

Inculcating Visual Literacy to Meet the Professional Needs of Engineering Undergraduates

Pun Siu Kay*

School of Art, Design and Media, Nanyang Technological University, 31 Nanyang Link, Level 4, Room 24, SINGAPORE 637718

Abstract

Singapore has always been a results-oriented society. Its young are highly competitive and achievement-oriented, with the vast majority seeking higher education as they see this as a reliable route towards a good career and a good life. One of the main aims for Singapore's institutions of higher learning is to turn out employable graduates who can fulfil the economical and industrial needs of its society. With rapid economic globalization, today's graduates will need to re-train themselves for several careers and 30% of them may eventually work in jobs that do not exist yet. This paper describes one of the approaches taken at Nanyang Technological University in a move towards a more flexible and diverse education system in order to help develop students holistically. It highlights the results of efforts made in inculcating visual literacy in the General Studies elective programme for its Engineering undergraduates. The objectives are to nurture skills in visual perception, communication and creativity in engineering students to complement their traditional training which emphasizes logical-mathematical-analytical skills.

A learning model to develop competencies in visual literacy necessary for productive membership in the economy is first presented. This involves a progressive nurturing of cognitive skills from observation, interpretation, communication, and expression to creation. The outcomes of student learning turned out to be very encouraging. This is reflected by their performance in analyzing visual images and hands-on project works; by students who indicate that they want to further their studies in the visual media; and by the entrepreneurial endeavours of a few students.

Finally, this paper reflects on the challenges faced in training. The nature of Singapore students, the influence from their educational background and the effect of the Engineering curriculum in their learning are highlighted. Steps that need to be taken at the programme and course levels to raise the level of achievement of the outcomes are also discussed.

Keywords: Visual Literacy; Professionals Need; Engineering Education

1. Introduction

"It pays to study, especially in Singapore" - a recent study by the Monetary Authority of Singapore and the Ministry of Manpower has found that for every extra year of schooling, a Singaporean worker earns on average 13.2 per cent more, which is significantly higher compared with countries like the United States, Japan and Australia [1]. To its government, given its lack of natural resources, Singapore's human capital has been the most important resource contributing to its near-miraculous economic transformation in the past few decades. It is little wonder, therefore, that Singapore's education system has always been, and still is, one of the top priorities of the Singapore

Government, and is allocated about a quarter of the country's annual budget.

Singapore has always been a results-oriented society. Its young are highly competitive and achievement-oriented, with the vast majority seeking higher education as they see this as a reliable route towards a good career and a good life. One of the main aims for its institutions of higher learning is to turn out employable graduates who can fulfil the economical and industrial needs of its society, not only for the present, but for the foreseeable future. With rapid economic globalization leading to a shrinking world, and the intense competition from rapidly developing giants like China and India, Singapore has to prepare its young in

* Corresponding author. Tel.: 65-67905845; Fax: 65-67953140; Email: skpoo@ntu.edu.sg

ways substantially different from what has traditionally been done. With the exponential growth of knowledge and the explosion in the use of information and communications technology, the half-life of knowledge is becoming ever shorter and the types of skills required in the future knowledge-worker will become radically different. In fact, it is quite clear that many of today's graduates will need to re-train themselves for several careers over their working lives and 30% of current university students may eventually work in jobs that do not exist yet [2]. Tomorrow's knowledge-worker will need to be more broad-based and flexible in their outlook with sound fundamentals that will allow them to leverage on the rapidly evolving technology.

To cope with this kind of rapid change, students and educators alike need a working familiarity with a vast and growing body of knowledge that may have far more lasting value than specialized training. In fact, training for a specific career with specific information is too limiting for today's work environment because such information is quickly outmoded. Such a programme of study at the undergraduate level is likely to be insufficient for lifetime employment. The aim of education today, therefore, should be to produce graduate who would not only fit into the existing society but to develop the skills, habits of inquiry, and attitudes they need to change society for the better.

To meet the demands of the knowledge economy, changes were introduced to Singapore's education system, starting with the schools, to nurture creativity and entrepreneurship in its students in addition to providing core knowledge [3]. The universities, which had been based on the traditional British Commonwealth system of a structured, sequential model, responded by adopting more aspects of the American broad-based education model. One of the steps taken by the universities is the broadening of their undergraduate education. This was highly commended by the International Academic Advisory Panel (IAAP), a 12-member international panel of experts advising the government on how Singapore can build a world-class education system and enable it to cope with the demands of a fast changing, globalised system that require people with multi-disciplinary knowledge skills and work attitudes. The move is towards a more flexible and diverse education system, aimed at providing students with greater choice and ownership in their learning. It is about giving students a more broad-based education to help develop them holistically, in and out of the classroom.

In his inaugural address, Dr Su Guaning, President of Nanyang Technological University or NTU, stated that "NTU does not intend to produce just one-dimensional engineers and accountants" [4]. At NTU, General Studies programme was introduced as a diverse set of free

electives which students can select to supplement modules in their Major and Minor disciplines. These electives are open to all NTU undergraduates from freshmen to seniors, the majority of whom are Engineering students. This is because Engineering students constitutes 65% of the undergraduate population. The objective of this General Studies programme is to enrich and broaden the intellectual growth and cultural development of the students beyond their immediate disciplines. With a broader curriculum, students will be exposed to more areas and be able to develop competencies necessary for productive membership in the new economy.

This paper reflects on the approaches taken in nurturing visual literacy in two such free elective modules. The objectives are to lay a foundation for students' understanding of visual perception, to inculcate in them an analytical mind when seeing visual images and to enable them to become more effective visual communicators. Throughout Singapore's previous education system, the emphasis has always been on linguistic and logical-mathematical-analytical literacy. Programmes that encourage the development of the arts have only been recently initiated. It is thus timely to examine the contribution of visual literacy to meet the professional needs of engineering undergraduates.

2. Visual literacy, what do we mean?

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" [5].

R. Hobbs defines "Visual literacy is the ability to access, analyse, evaluate, and communicate information in any variety of form that engages the cognitive processing of a visual image" [6].

Why should we be concerned about this new literacy? 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" [7]. Edmund Feldman (1982) while 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 behaviour, 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” [8].

3. Misconception about art

There has always been a misconception about art in this society. It is something for the elite, and the appreciation of it is very often subjective. It is a luxury and it is for entertainment. Not everyone has a creative mind. One has to be born to be creative in the arts. To be successful in the engineering and scientific field, one does not need to be visually literate.

4. Course structure

To dispel these misconceptions and to complement the training in Engineering studies which traditionally emphasizes logical-mathematical-analytical skills, the two General Studies electives described in this paper provide first a solid foundation in nurturing visual perception. This is to impart the skills of observation or what Aldous Huxley’s idea of seeing: “Seeing clearly is mostly the result of thinking clearly” [9]. To him the visual process involves “sensing + selecting + perceiving = seeing.” After sensing, a conscious, intellectual act is made when a person selects or focuses on individual element. Selecting is followed by perceiving which is to make sense of what one selects. It is this process of seeing that enriches a person’s repertoires of cognitive skills.

To process an image mentally requires a higher level of cognition than observation. It requires a person to concentrate with an intent to find meaning which demands much sharper mental activity. The second level of our learning model is then to inculcate in the students the skills of analyzing a visual message and the skills of interpretation.

The third level involves students in learning how to create visual images. This implies developing abilities to represent and interpret feelings and thoughts, to create personal responses to experience, to be able to communicate using visual images and to produce visual messages that others will remember. This involves the skills of expression, communication and creation.

In the first General Studies elective, entitled Aesthetic and Creative Use of the 2D Media, students are taught how to respond to visual images using the elements and principles of design (line, shape, type, texture, colour,

value, balance, contrast, unity, movement, depth and space), visual hierarchy and Gestalt Theory (the whole is more than the sum of its parts). They also learn how to decipher messages conveyed by these images. In the second General Studies elective, entitled Aesthetic and Creative Techniques in the Moving Images, students are taught how to respond to moving images using cinematic techniques (camera framing, camera angles, lens, aperture, camera movement, composition, lighting, sound and editing). They also learn to decipher intended messages conveyed by the director. Students are given opportunities to respond verbally to visual images presented in 2D or moving images either individually or in groups. The knowledge gained serves as the foundation for visual perception and the skills of observation, the first level in our learning model. These are illustrated in Figure 1.

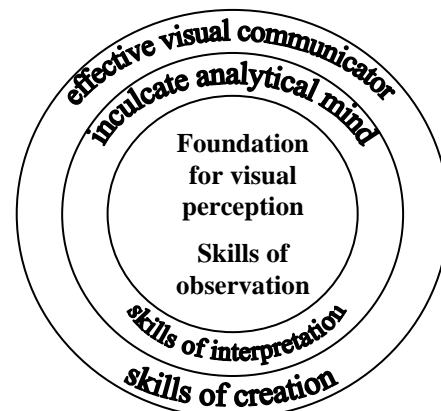


Figure 1. Model for course structure

The second level in our learning model requires students to find meaning in what is seen. After identifying the elements and principles used in the design or cinematic techniques used in moving images, they learn to analyse and interpret the meaning and why the designer or director chooses to convey his message in this manner. The analyses are done verbally in class and in written form as continuous assessment. This ability to interpret requires a higher level of cognitive skills than observation and set the direction for critical analysis.

To achieve the skills of creation which is the third level in our learning model, students are given the opportunity to convey meaningful messages by creating design materials for promotional purpose which is carried out as a team project in the first elective. In the second elective, students are tasked to create storyboards with a given scenario conducted as a class exercise. This hands-on approach to nurture creativity requires students to apply what they have learnt and to experiment novel ways in expression and creation. Although students enrolled in these electives are mostly Engineering students who are likely to be working with skilled designers and

professional directors to produce visual messages rather than being the designers or directors themselves when they embark on their professional careers, engaging students in production activities enhance key concepts learnt. Their comprehension and discourse will also be enhanced significantly when they attempt to create works that embody analytical and synthetic principles. This level of involvement prepares Engineering students to be effective visual communicators with competencies that are crucial in the increasingly visual economy.

5. Students' responses to training

In the training of the skills of observation, students were initially not very responsive when they were asked to identify design elements or cinematic techniques presented as 2D images and moving images. This could be due to the general tendency of Singapore students not wanting to stand out from the crowd. This may also be partly due to students not having enough background knowledge to be comfortable to speak out as only 14% of the students surveyed had some interest or background in the visual arts before they registered for the course. The majority of them had no prior background in the visual arts and some might have possibly registered for these electives to satisfy the requirement of general electives for their degrees. However, after some encouragement, students were found to be more responsive. For the elective on 2D media, when students were tasked to verbally analyse visual images during the fifth to seventh lecture period and to each submit a written analysis, about 75% of the students performed well. For the elective on moving images, when students were tasked to analyse moving images in writing as a continuous assessment done in class, around 60% of them performed well.

When it came to hands-on group projects in the 2D media elective, 44% of the teams showed good understanding of what constituted creative design. The message chosen in each of these projects was single, relevant and simple. The designs and layouts were unique, artistic, surprising and full of impact. Their reports were well-written with indications of thorough brainstorming for concept and how the design evolved in the process. These project works can be said to be on par with that of professional designers. 31% of the teams turned out works and reports which indicate that these students had the potential to be trained as designers. The remaining 25% of the teams still lacked understanding of what constituted an effective message and a visual form that had impact.

In the moving images elective, most of the students showed a general understanding of the process involved in creating storyboards. At the end of the course, most of

them showed a clear idea of the cinematic techniques required in developing storyboards and would be able to work with professionals when using moving images to communicate.

Another encouraging fact is that, by the end of the July semester 2002, two students taking the 2D Media course actually set up companies to do design work. One of them engaged five designers to work with him and the other partnered up with two artists. In 2004, one student started a business providing graphic design services while another student ventured into designing T-shirts and partnered with a manufacturer in China to produce them. In the survey conducted after each semester, several students showed keen interest in pursuing post-graduate studies in graphic design while most of them indicated they would take graphic related courses in the future and that the knowledge gained in this course would help them in their future careers. A number of them expressed great fun doing the design project work.

6. Challenges faced in training

The workload in the Engineering curriculum is very heavy. This leaves little time and space for the students to think and create. This, coupled with the results-oriented mentality of Singaporean, leads to the tendency for some students to try to take short cuts. Since General Studies electives are not core subjects and the grades are not counted in the students' cumulated scores, some students tend to just take these courses as a requirement to be fulfilled in a degree. So behaviour such as absenteeism and submitting the first idea or design that comes to mind instead of working for a better idea may apply to some. The policy of having a maximum of 30% continuous assessment and at least 70% examination does not help either. Some students may just study blindly for the examination without any contribution in class.

7. Conclusion and Implications

Based on the experience over five semesters in teaching a course on **Aesthetic and Creative Use of the 2D Media** and another on **Aesthetic and Creative Techniques in the Moving Images** to primarily engineering students at NTU, it can be concluded that a broad application of visual literacy has been successfully attempted in a predominantly technology undergraduate curriculum. As some students indicated, the continuous assessments turned out to be something they enjoyed doing and enabled them to apply what they had learnt. Most felt that the knowledge gained in this course would be beneficial to them in their future careers. Some would like to have more hands-on

applications. However, the ultimate test is whether they will continue to use and build upon what they have learnt. The author feels that there is still room to explore more application works, class discussions and case studies. This can be achieved by putting more weightage on continuous assessment and class participation and less on examination and counting the grades on General Studies electives in the cumulated scores. More General Studies courses catering to different levels can be designed so that there is more room to nurture creativity.

PUN SIU KAY is currently a lecturer in the School of Art, Design and Media at the Nanyang Technological University. Prior to teaching Creative Design and Moving Images, she was the Senior Media Specialist and later Senior Deputy Director of the Centre for Educational Development at NTU. She also spent many years as Producer/Executive Producer at the Singapore Broadcasting Corporation.

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Biographical information