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Introduction

Advancement in science and technology is indebted to innovative and creative ideas. Economic modernization and social advancement would not be possible without creative thinking. Seeing that, teaching creative thinking is regarded as one of the essential social and pedagogical endeavours. How should creative thinking be cultivated? Can creative thinking be taught? Can pupils think creatively after attending lessons on creative techniques? How can creative thinking be cultivated?

In this article, the Japanese's experience in exploring creative models and in promoting creative thinking is presented. In the first section, a management model employed in some Japanese factories is illustrated. Takahashi's (1993) view on the Japanese's creativity is highlighted. In the second section, development of creative thinking in Japan in the twentieth century is discussed. The Japanese's indigenous techniques of creative thinking are presented in the third section. Lastly, the Japanese's experience in cultivating creative thinking is analysed from the educational perspective.

From Imitators to Innovators

Total Productive Maintenance is an innovative version of *Preventive Maintenance* (Ganea 1996; Ganea & Tan 1996). The latter was introduced from the United States to Japan (1950s) and was transformed into *Productive Maintenance*, adapting the Japanese's culture of productivity in the industries after World War II (1960s). It accommodated full participation — the Japanese workers' culture. It was then called *Total Productive Maintenance* (1980s). Existing culture of a society such as behavioural styles and working styles were referred and were infused creatively into the new model.

Total Productive Maintenance is one of the many examples of innovative models in Japan. After a century of learning and improving, the Japanese experienced a metamorphosis, from imitators to innovators (Tatsuno 1990). During the Meiji Era, they imported science and technology from the West. New technology was introduced as a means to improve their living and international status. In summary, development of creative thinking in Japan underwent three transformations:

1. As "dependent" learners, the Japanese accepted new models from the West (1900-1960).

2. As "independent" learners, they modified these models according to their needs (1960-1980). They attempted to generate creative techniques that suited their behaviours and that fostered productivity.

3. As innovators, they strive for a conducive social and cultural environment for creative thinking (1980-today).

Sozosei or *sozoryoku* (creativity) is a common term in modern Japan. Takahashi (1993) in his introduction to a book *Sozoryoku Jiten* (Dictionary of Creativity) denied that the Japanese are good at imitating, or are people who imitate. He argued that the Japanese have invented a variety of electronic goods of high quality and efficiency. Imitation alone could not lead them to this success. The Japanese are confident in their creative abilities. They are aware of the types of creativity that they are good at, and the kinds of creativity that they should foster. Creative thinking, according to Takahashi, involves the production of new values based on integration of various types of information or *joho*. When solving a problem toward a certain goal, creativity is an ability that generates appropriate ideas. It is an ability to produce new social and cultural (including personal) ideas or products. Creative thinking exists in every society. Takahashi affirmed that creative ability interacts with existing information in order to achieve its optimum.

Development of Creative Thinking in Japan

Onda (1986) examined creativity research in Japan that took place from the Meiji Era to 1980s. His article "Trends in creativity research in Japan —History and present status" is significant for English language readers. He claimed that *Zen* meditation is a cultural feature of the Japanese. He

related it with creativity and convinced that *Zen* facilitates intuitive thinking. His argument can be challenged by a question: How many people practise *Zen* in the contemporary Japan?

Akiyama (1983) analysed development of creative research from 1900 to 1982, and divided it into four phases. The author edits his analysis and suggests the fourth and fifth phases, from 1983 to present (see Table 1 and Tan 1995). In the first phase (1900-1949), the Japanese explored models of creative thinking in the West. There were some local publications.

During the second phase (1950-1965), there was an increasing interest in investigating characteristics of creative thinking. Guilford's (1959) model of intellect and factor analysis as well as a series of Utah conferences were two evidences. Guilford proposed various types of cognitive processes. His work is significant even until today because it helps us to understand intelligent and creative thinking processes. During this period, a few books were published in Japan. Practicality of creative thinking in the technological field was emphasized. Economy in Japan in the sixties recovered gradually from the great loss during World War II. In order to upgrade their living, the Japanese adopted productivity-oriented economy, emphasizing technological innovations and inventions.

During the third phase (1966-1979) in 1974, the first invention club was established. Subsequently, a number of invention clubs were set up aiming to promote creative thinking among children. The Japan Institute of Invention and Innovation (JIII) and the local Board of Education supported this activity. Invention clubs were usually situated in primary schools, local cultural centres, local science centres, or local museums. School children who were members were guided by school teachers, retired teachers, advisory teachers of the Board of Education, as well as engineers and technicians working in the industries. A few indigenous techniques emerged. Among them, there were the Kawakita Jiro-Method (KJ-Method) and the Nakayama Masazuka-Method (NM-Method).

From 1980 to 1985, there was an increasing cross-disciplinary interest in creativity research. Numerous models that fostered creative thinking were proposed. It is believed that every individual possesses the potential to think creatively in one or more domains (Gardner 1983). Every individual has his (her) conceptions of existing phenomena including creativity and intelligence (Sternberg 1985a, 1985b). Creativity

research adopted a *multiple* approach, investigating interaction of various factors as well as integrating interests and methods in various fields. There were discussions on conducting inter-disciplinary research on creative thinking.

In 1983, the first issue of an annual series *Sozosei Kenkyu* (literally translated as Research on Creativity) was published by the *Nihon Sozo Gakkai* (the Japan Creativity Society). Multi-disciplinary research is the key feature of the *Nihon Sozo Gakkai*. The 12 volumes of *Sozosei Kenkyu* documented creative thinking of various fields such as philosophy, anthropology, education, technology, industries, and enterprises. Besides its inter-disciplinary feature, the *Nihon Sozo Gakkai* initiates international understanding. In 1996, it published the first issue of a series of English publications "The Journal of Japan Creativity Society".

The last phase (1986 to present) is a consolidating stage. Whilst the Japanese are searching for excellent models of creative thinking at the national level, people of other parts of the world are gazing at their economic models. The success of the Japanese in economy and technology attracts attention of the world. The myths of their success stimulate foreigners' interests in investigating Japanese thinking and behaviours. At the school level, there has been an annual invention exhibition organized by the JIII and the *Mainichi Shimbun* (Daily News) since 1941. Gifted young inventors are awarded opportunities for international experiences. For instance, in August 1994, JIII sponsored eight Japanese participants who joined the Malaysian Invention and Design Exhibition. Four of them were prize-winners of a School Children's Invention Exhibition hosted by the JIII. At present, the *Monbusho* (Ministry of Education) attempts to promote creative thinking through curriculum reform. Enterprises encourage brainstorming. Universities initiate research activities. The ultimate aim of these efforts is to create a conducive environment for creative thinking.

THE JAPANESE'S INDIGENOUS CREATIVE TECHNIQUES

The key to the success of Japanese economic and technological systems lies in the Japanese's competence to match "imported" knowledge with her indigenous needs. The acceptance and accommodation of new knowledge were done at the level of suitability to the Japanese society (Lorriman 1995). In the 1960s and 1970s, a group of social scientists in the West searched for various behavioural and thinking patterns in other

Table 1: Development of Creative Thinking in Japan

Phase 1 (1900 to 1949): **Exploration**
• Analysis of models of creative thinking in the West. • From 1930, there were publications on invention, creativity, discovery by some Japanese researchers.
Phase 2 (1950 to 1965): **Transformation**
• Guilford's factor analysis, Utah conferences and divergent thinking. • A few publications of creativity by Japanese psychologists.
Phase 3 (1966 to 1979): **Invention**
• Introduction of creative engineering from the USA to Japan. • Inventions of the KJ-Method and the NM-Method.
Phase 4 (1980 to 1985): **Inter-disciplinary interest**
• Increasing interest in creativity from various disciplines, e.g. neurology, and technical field. • Creativity exists in every society. • Every individual possesses creative competence in one or more domains. • Establishment of the *Sozosei Kenkyu* Journal.
Phase 5 (1986 to today): **Consolidation**
• Establishment of the *Journal of Japan Creativity Society.* • Increasing interest of foreigners in Japanese models.

cultures. It is believed that each culture possesses unique and universal features. No judgement should be made on these features. Similar as well as different features of various cultures should be regarded as variations. Coincidentally, Tsunoda (1978) discovered the unique function of the Japanese's brain. He concluded that the Japanese tend to operate using the left-hemisphere more than the other nations. The existence of few vowels in the Japanese language is regarded as the cause of this difference. It is not the genetic factor but the linguistic factor that brings forth this uniqueness. This finding, together with the cross-cultural movement, might have exerted influence on the Japanese's search for creative techniques that were suitable for their behavioural and thinking patterns.

The Japanese's indigenous creative techniques emerged during the third phase (1966–1979). The Kawakita Jiro-Method or the KJ-Method (Kawakita 1983) and the Nakayama Masazuka-Method or the NM-Method (Nakayama 1983) were two examples. From 1973 to 1989 (Takahashi 1993), the KJ-Method was the second most frequently used method (49%–75%) in the Japanese enterprises after brainstorming (57% –87%). The NM-Method (20%–26%) was next to the KJ-Method. It improves brainstorming sessions through the use of cards. Participants write their ideas on cards which are then arranged according to the theme of a discussion and/or to the needs of a target group. Cards reduce the "openness" of ideas. They minimize the opportunity of being too revealing in a group. The NM-Method makes use of "image-oriented" thinking patterns of the Japanese. Familiar images are employed to represent problems. Participants associate functions of these images with the problems. These associations help them to generate solutions.

THE JAPANESE'S EXPERIENCE IN CULTIVATING CREATIVE THINKING: SOME IMPLICATIONS FOR EDUCATORS

It took more than half a century for the Japanese to internalize new knowledge and to invent indigenous creative techniques. About ten years ago, there was a proposal for a new school curriculum, emphasizing creative thinking and independent learning in Japan. For a culture that stresses social cohesion, changes can only take place with the presence of social consensus. Full commitment and total participation are key features of Japanese social and technological innovations. In addition, continuous improvement and hard work are two essential factors that determine the success of innovative and creative inventions.

What can we learn from the Japanese's experience? We should convince ourselves that every individual possesses the potential to be creative in one or more domains. Participation of all members is essential for promoting creative thinking. Introducing higher order thinking to curriculum does not ensure that the culture of thinking is implanted into the mind of the young generation. Every individual should regard any change of social and pedagogical emphasis as a personal commitment. The national board of examination, teacher-training institution, higher institution, ministry of education, school principals, teachers, pupils, and parents should participate intensively in designing and in carrying out the new curriculum.

Examination workload and dependency of children on adults could hinder creativity (Takahashi 1993). Learning from the Japanese's experience, we should revise our school curriculum and assessment. Curriculum that allows students' active participation in discovering new knowledge should be introduced. Minor technological improvements and social innovations should be rewarded. Students are encouraged to discover new knowledge independently. Teachers and students should have frequent interactions. Teachers are facilitators who establish a conducive thinking and learning environment. Flexible pedagogical methods should replace traditional teacher-centred instruction. Social commitment of experts of various fields to institutions and clubs that promote creative activities should be encouraged. Participation of school children in invention clubs or institutions should be recognized. Invention clubs or institutions should adopt the *Nihon Sozo Gakkai*'s principles: Serving inter-disciplinary interest and organizing regular publications. Teachers' as well as lecturers' creative instructions and classroom activities should be documented.

Development, manifestation, and appreciation of creative performances are bound to social and cultural influences. Studies across cultures show that there are various types of problem solving behaviours. Whilst Japanese students tend to propose solutions in terms of a series of steps, German students prefer to generate a straight forward answer (Tan 1995). Teachers should be conscious of various behavioural, thinking, and learning styles of the students. Understanding that, teachers should select pedagogical techniques that befit students' learning and thinking styles. Students should be encouraged to internalize new knowledge in an innovative way.

Conclusion

Csikszentmihalyi (1996) believes that it is more effective to change conditions that stimulate creative thinking than to teach people creative techniques. Instead of asking what we can learn, we should ask how we can learn from the Japanese's experience in cultivating creative thinking. We should adopt the Japanese's life-long learning and continuous improving attitude. Incremental improvements demand patience and commitment. Continuous improvement is a form of innovation. All innovations involve hard work and full commitment. All individuals of the concerned group should explore new models and new knowledge. We possess the potential to be creative in one or more than one field (Gardner 1983, 1993, 1995, 1996; Sternberg & Wagner 1989; Sternberg et al. 1995; Sternberg 1996). To promote creative thinking, we should participate actively in knowledge acquisition and in integrating new knowledge into the existing models creatively.

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