

CHAPTER 1

Introduction

1.1 Historical Background

Nowadays, the world has turned to be more industrialized and modernized by scientific and technological progress. This progress was brought about by intense competition in the economic domain in order to have an advantage over other competitors. As a result, many countries gave more attention to human resource development, as social capital, and they are enthusiastic to prepare their populations for the future competition. Competency of the new age population is not only being learned and experienced in a particular discipline, but must also include being competent in the application of possessed knowledge which will serve the nation's development agenda. A path for the future, which will be used for preparation of the population, therefore, might be different from the past. It is evident that students who are successful in academic performance might not necessarily be successful in seeking a job or holding a job until their retirement (Kay, 2010), because knowledge obtained separately from each subject is not enough for success in the labor market. To the contrary, students who are competent in handling or coping with changing situations that constantly occur, and who can adopt to the changes are more likely to succeed in life in the 21st century.

Therefore, education in the 21st century needs to operate under this context. Besides learning in academic matters, students should learn to be lifelong learners, including being able to expand their knowledge into other domains creatively. In addition, they should have life skills, learning and thinking skills and information technology literacy. They also need to understand about the new context of the world in the 21st century, in accordance with initiative of the Partnership for 21st Century Skills (2009) and enGauge 21st Century Skills (Lemke, C., Thadani, V., & Martin, C. , 2003). Such knowledge and skills will help students to understand how the world has changed and they will be more

apt to live their lives happily. Moreover, they will be able to make better use of information technology to enhance their communication skills.

Improved learning and innovation skills are among several desirable attributes that learners in the 21st century would gain by following the initiatives of the Partnership for 21st Century Skills. These skills can be divided into 4 sub skills or 4C's as follows; Critical thinking and problem solving; Creativity and innovation; Communication; and Collaboration. In a study by Vichan Panich (2011), he found that learning subject content and simultaneously relating to them critical thinking, problem solving and creative thinking skills resulted in higher academic outcome than those who were solely focused on the contents.

The teacher plays an important role in the learning process by providing students with various experiences which can help develop thinking skills and problem solving skills, and could lead to more creativity. Students need to develop a process of learning by themselves. For instance, from Gagne's learning theory pertaining to the problem solving process, when a student can apply a higher level of skill to a complex problem, the student will be able to solve problems by comparing them to other similar problems (Kamane, 2010). However, one of the most important challenges that teachers have is the limitation in the learning process management which should be complied to strictly, with the National regulation on education (1999). In other words, teachers cannot manage the learning process towards the goals wishing students to have subject contents, skills in learning process, and desirable characters (Inprasitha, 2008).

Mathematics is one of the core subjects that are important in the development of a human's cognitive thinking, including development on human's creativity, rational thinking, systematic thinking, analyzing and problem solving skills. In addition, it is a basis for further study in scientific and technological fields. The nature of Mathematics conforms to needed skills of a 21st century population. For example, critical thinking and problem solving skills which require advanced thinking processes to interpret and analyze, would lead to quicker and better solutions. According to research reports on Mathematics and Science examinations at international level, e.g. Trends in International Mathematics and Science Study (TIMSS, 2011), and Programme for International Student Assessment (PISA, 2009), the tests focus on ability in advanced

thinking processes such as analyzing, criticizing, and rationalizing processes in order to solve Mathematics problems. The research revealed that in TIMSS, Thailand's ranking had constantly dropped down (from 1995-2011, in measurements taken every 4 years). Eight grade students had ranked number 51 out of 65 countries in PISA which is held every 3 years beginning 2000.

From the reports above, there is an attempt to create a new learning process that combines the subject contents with the development of thinking skills together. In fact, there are many kinds of learning processes that promote such learning skills. For example Project-Based Learning. Furthermore, Open Approach is another example that emphasizes problem-based Mathematics study, which was developed in Japan (Nodah, 2000 cited in Inprasitha and Loipha, 2004). This learning process is interesting because it allows a student to develop learning subject's content while they simultaneously develop learning skills that are necessary in Mathematics. In other words, this is the development of academic outcome by focusing on the problem solving process so that students can have success in both learning content while developing thinking skills. Teachers, who enthusiastically use this approach to combine learning contents with making use of students' ideas, will hereby help students to develop their thinking process gradually and constantly. Students could explain solutions in accordance with their supporting ideas and understanding (Nopparit, 2011). The Open Approach comprises of 4 steps (Inprasitha, 2010); posing open-ended problems, students' self-learning, whole class discussion and comparison, and summarization through connecting students' Mathematical ideas emerged in the classroom. Characteristics of the classrooms that implement this approach will be stressed on discussion among the various and diverse ideas of students, and then elaborated through group experience with classmates along with a proper suggestion from the teacher. Therefore, such classroom could open space for sharing their interests based on Mathematical discussion and communication. This is the main point of the development of Mathematical skills in accordance with The Basic Education Core Curriculum B.E. 2551 (A.D. 2008) which encourages more collaboration amongst students and to prepare them for co-existence in the 21st century.

Today, nations and other organizations pay more attention to educational development than in the past. They wish to build up competency of their populations and to catch up with the changing world. Thailand is no exception because in 2015, Thailand will enter the ASEAN Economic Community (AEC) (Ministry of Education, 2011). This will be an opportunity to broaden educational opportunities. Development of the country's infrastructure and communication technology will be needed to support the development of education and the quality of educational management as well. This will increase the prosperity of ASEAN economies in a peaceful and sustainable manner. Moreover, it will increase mutual understandings amongst the 10 ASEAN countries; Thailand, Indonesia, Malaysia, the Philippines, Singapore, Brunei, Vietnam, Laos, Myanmar, and Cambodia.

Thailand, as one of the founding countries of ASEAN, has a commitment to development in all aspects to achieve the common goals of ASEAN. The Ministry of Education has committed to developing human resources to serve both the ASEAN and the world community by the year 2015. Therefore, the desirable attributes of Thailand's young generation are determined by 4 basic skills (Ministry of Education, 2011). The first 3 of which are as follows; ability to solve problems in a peaceful manner; ability to live and work with other people; ability to use information technology in creative ways. From analyzing the 3 skills above, I find that these skills are compatible with learning and innovation skills proposed by the Partnership for 21st Century Skills as mentioned earlier. This is a result of developing a curriculum to conform to international requirements. Schools should be developed to meet international standards. So, Wiengjatee Wittaya School, under the Secondary Educational Service Area Office 35, is one that has a policy pertaining to curriculum development in order to conform to the international standards. In order to do that, the school attempts to develop learning processes in teaching Mathematics focusing on enhancing the learning process and advancing thinking skills. From the guideline on pedagogy for becoming international, for becoming a member of the ASEAN community, and for becoming citizens of the world in the 21st century, the curriculum could be developed and could be successfully implemented through collaboration with various parties.

The collaboration among colleagues should concentrate on developing their abilities to use various strategies to reach diverse students and create environments that support differentiated teaching and learning (Olabuenaga, 2010). Teachers needed to engage in professional activities that enhanced their learning as practitioners as well as facilitators of instructional change (Wehling, 2007 cited in Brathwaite, A., 2011). The professional development is one of support systems belonging to 21st Century Skills framework (Partnership for 21st Century Skills, 2006). It must be created to help students master the multi-dimensional abilities that students find difficult to obtain 21st Century Skills without the teachers who have well-trained instructional knowledge in this area (Ledward, B. C., & D. Hirata, 2011). “Lesson Study” is the main form of professional development (Fernandez, C. & Yoshida, M., 2004, Stigler & Hiebert, 1999, Ban Har, 2013, Marsigit, 2007). Lesson study is a Japanese model of professional development, which teachers would be engaged in, to improve the quality of their teaching and enrich students’ learning experiences (Fernandez, C. & Yoshida, M., 2004). It focuses on collaboration among teachers in researching subject contents, learning styles, problem resolving methods, and methods to increase understanding among students. These guidelines are for improving teaching and learning Mathematics in the classroom (Yoshida, 2004). In Thailand, Lesson Study was first implemented in 2002 by The Center for Research in Mathematics Education (CRME) Faculty of Education, Khon Kaen University. Teachers participated together in at least 4 activities (Naruemon Inprasitha, 2009) they were; co-operate planning, learning management and observation, reflection, and self-reflected summary.

In this research, researcher interested in creating a Mathematics curriculum in order to prepare students to be knowledgeable and skillful in the 21st century. This curriculum emphasizes the learning process that facilitates the students learning and innovation skills. These skills are comprised of, critical thinking and problem solving, creativity and innovation, communication, and collaboration, (the 4C’s). The Open Approach will be implemented. This process includes collaboration with other teachers in school through the application of lesson study.

1.2 Objectives of the Research

1.2.1 To develop Mathematics Curriculum to Promote Learning and Innovation Skills of 21st Century through the Application of Lesson Study.

1.2.2 To study the results of using Mathematics Curriculum to Promote Learning and Innovation Skills of 21st Century through the Application of Lesson Study.

1.3 The Scope for the Research

1.3.1 Physical scope is Wiengjedee Wittaya School

1.3.2 Scope on target group covers the following:

1) Participants in the processes of developing Mathematics Curriculum to Promote Learning and Innovation Skills of 21st Century through the Application of Lesson Study were the school executives included Academic vice Director, Chief of Academics Affairs, Chief of Research and Human Resources Development, Chief of Curriculum and Instruction, Mathematics Department Chair, and mathematics teachers.

2) Participants who used Mathematics Curriculum to Promote Learning and Innovation Skills of 21st Century were mathematics teachers of Wiengjedee Wittaya School.

1.3.3 Scope on the contents covers the following:

1) Learning and Innovation skills, or 4C's, including critical thinking and problem solving, creativity and innovation, communication, and collaboration.

2) Fundamental mathematics contents for grade 7 in the first semester of year that aligned to core standards.

1.4 Definitions of the Key Terms

Mathematics Curriculum means Mathematics Curriculum of Wiengjedee Wittaya School in grade 7 that the research team develops to Promote Learning and Innovation Skills of 21st Century. Using open approach for students learning.

Lesson Study means the Japanese innovation of professional development that encourages teachers to participate in the activities such as discussion, observe the class,

and reflection. Three steps of lesson study consisting of the following steps; collaboration in research lesson design (Plan), collaboration in research lesson observation (Do), and collaboration in reflection or post-discussion (See). The lesson study was applied in two respects; curriculum development in overall perspective and applies lesson study in developing each lesson plan.

Development of Mathematics Curriculum through the Application of Lesson Study means using Taba's model (Taba, 1962 cited in Ornstein, C. A. & Hunkins, P. F., 2009) and apply Lesson Study (Inprasitha, 2010) to construct the curriculum that consists of collaboratively designed research lesson(Plan), collaboratively observing the research lesson (Do), and collaborative reflection or Post-discussion (See).

Learning and Innovation Skills of the 21st Century means the skills that students should have in 21st century as described by the Partnership for 21st century skills which consisted of critical thinking and problem solving, creativity and innovation, communication, and collaboration, or 4C's.

Open Approach means innovative teaching method which emphasized the development of thinking skills through non-routine problems of Open-ended problems; process is open, end product is open, ways to develop are open. The four steps are posing open-ended problems, students' self-learning, whole class discussions and comparisons, and summarization through connecting students' mathematical ideals emerged in the classroom.

The results of using Mathematics Curriculum mean the effects of using Mathematics Curriculum to Promote Learning and Innovation Skills of 21st Century in students' Learning and Innovation Skills of 21st Century during the process and after finish the process.

1.5 Benefits of the Study

1.5.1 Students were gained skills by promoting Learning and Innovation Skills of 21st Century. They were more confident in expressing their opinions.

1.5.2 School will be a community of learning where teachers will have chances to

exchange academic ideas with each other.

1.5.3 Getting a sample of mathematics curriculum to promote Learning and Innovation Skills of 21st Century

1.5.4 Producing a guideline for developing the curriculum to promote other 21st Century Skills.

1.5.5 Building a new academic culture in school as a professional learning community.



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