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The Implementation of Mathematics Learning in the Context of 21st Century Skill Competencies in Junior High Schools

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Abstract - The 21st Century skills considered being able to strengthen social and intellectual capitals commonly abbreviated as 4C: Communication, Collaboration, Critical thinking and problem solving, and Creativity and innovation. Operationally, this 4C can be described as a way of thinking, including: creating, innovating, being critical, solving problems, making decisions, and pro-active learning. It also includes ways of working, communicating, collaborating, working in teams so that they can support and develop 21st century skills, namely information technology, digital networks, and literacy. The 4C concept is expected to be implemented in Indonesian schools and thus, Indonesian students are equipped with these virtues, namely communication, collaboration, critical thinking and problem solving, as well as creative and innovative. Mathematics learning activities in junior high schools in Indonesia are expected to be able to empower all students' potencies which can encourage the achievement of competencies and specific behaviors so that each student is able to become a lifelong learner and learning society is realized. Thus, teachers, by developing learning tools and media, are expected to be able to implement innovative learning (student-centered), and a teacher's role is no longer as a transfer of knowledge, but as a facilitator who helps students learning, so that students are able to master the various expected competencies.

Keywords - communication, collaboration, critical thinking, problem solving, creative and innovative

I. INTRODUCTION

The 21st Century skills that are considered to be able to strengthen social and intellectual capitals are usually abbreviated as 4C: Communication, Collaboration, Critical thinking and problem solving, and Creativity and innovation. Operationally, the 4C is elaborated to four step categories, namely: *first, how to think*, including creating, innovating, being critical, solving problems, making decisions, and pro-active learning. *Second, how to work*, including communicating, collaborating, working in teams. *Third, how to live together* as a global and local citizen at the same time. And *fourth, tools for developing 21st century skills*, namely information technology, digital networks, and literacy skills. There will be excellent outcomes for human resources if this concept could be implemented in schools and Indonesian students were equipped with these virtues, namely communication,

collaboration, critical thinking and problem solving, as well as being creative and innovative.

In line with what was described above, more comprehensively Fadel (2009:47) initiated the concept of a rainbow of skills and knowledge as core subjects or main competencies that must be developed in the context of 21st century education. The rainbow of skills and knowledge is presented in Figure 1.

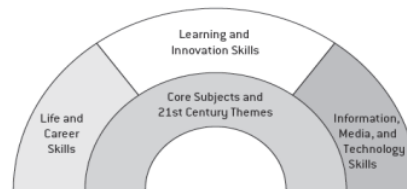


Fig. 1: The 21st Century Rainbow Skills and Knowledge (Trilling & Fadel, 2009: 47)

Based on the rainbow of skills and knowledge developed, Trilling & Fadel (2009: 48) explained that the main skills that must be possessed in the context of the 21st century are learning and innovation skills. These skills relate to the ability to think creatively and the ability to solve problems, the ability to communicate and collaborate, and the ability to be creative and innovate. These skills are believed to be the main skills that can respond to life's challenges from the economic, social, political and educational dimensions. Therefore, the learning process should be oriented to equip students with these skills in addition to providing students with certain scientific knowledge.

The ability to think creatively and to solve the problems as the modern learning orientations more broadly will equip students with other smaller skills surrounding them, such as skills to use various reasons effectively, to think systemically, to consider and make decisions, and to solve problems. Communication skills are intended to equip students to be able to communicate for various purposes clearly and effectively, in terms of speaking, writing, reading, and listening, while collaboration skills are to equip students to be able to collaborate with others so that students will be able to work effectively in group, to negotiate effectively, and be able to appreciate the role of others in the group. Further, the ability to be creative and innovate is intended to equip students to be able to

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think creatively, work creatively with others, and to be able to produce various innovations.

Based on 21st century skills competencies as stated by a number of experts, the Ministry of Education and Culture has made a number of breakthroughs to improve the quality of education in order to be able to produce graduates who are ready to compete globally in the future. One of the initial breakthroughs was to implement the 2013 curriculum. In other words, the application of the 2013 curriculum was aimed at answering the challenges of the era in education, namely to create competitive, innovative, creative, and collaborative graduates who have noble character.

In order to achieve these goals, it must be acknowledged that education is not only to develop knowledge based on the core subject of learning but also to make students have creative, critical, and communicative abilities as well as good character.

In order that learning mathematics can facilitate the growth of 21st century skills, tasks and exercises associated to the material already taught must be conditioned to the intended skills, such as assignments and exercises provided in the form of projects carried out both in groups and individually. Then, the results of the project are presented in front of the class by the students and this is to encourage them practice collaboration and communication skills.

II. DISCUSSION

The 2013 curriculum and also the 2017 revised curriculum still emphasize the importance of 21st century skills which are considered being able to strengthen social and intellectual capitals, and are commonly abbreviated as 4C: Communication, Collaboration, Critical thinking and problem solving, and Creativity and innovation. However, the fact is that it is not easy to implement a good concept, especially in those schools with different variants, such as in teacher quality, leadership quality, and also the quality of information and other supporting facilities.

Further, it is acknowledged that the concept of 4C, when implemented in learning mathematics in schools, emphasizes the student-centered learning and not teacher-centered learning. It is very important that the government changes its strategy by issuing documents dealing with more operational procedures for the implementation of 4C in schools, in the classrooms, and even in the proses of teaching for each subject. This is not intended to make teachers lose their creativities but this is to inspire teachers with better implementation of the 21st century skills.

This century requires the transformation of education as a whole and the quality of mathematics teachers who are able to advance the knowledge, training, equity of learners and students' achievements is a must. According (5) Hernawan (in Hidayat and Patras), among the characteristics of the 21st century are: the increase of interaction between citizens of the world both directly and indirectly, more information available and can be obtained, the expansion of intellectual horizons, the emergence of openness and democratization in both politics and economics.

Further (5) Hidayat & Patras stated that the education needed in the 21st century is according to Patrick Slattery in his book entitled "Curriculum Development In The Postmodern" in which:

1. Education must be directed towards social change, community empowerment, liberation of mind, body and spirit (referring to the concept developed by Dorothy)
2. Education must be based on 7 main points (referring to the concept developed by Thich Nhat Hanh), which is not bound by theory, ideology, and religion.
3. Education that makes the teacher feel prosperous in learning activities (refer to the concept developed by Dietrich Bonhoeffer)

The Education that builds the competency of "partnership 21st Century Learning" is a 21st century learning framework that requires students to have skills, knowledge and abilities in the fields of technology, media and information and also to have learning, innovation and life skills.

The competency of "partnership 21st Century Learning" refers to the format of education of the 21st century that was proposed by Hermawan (2006), namely:

1. Cyber (e-learning), learning is done by optimizing the use of technology.
2. Open and distance learning where the 21st century learning can be done with a distance learning model, which is carried out by utilizing information and communication technology assistance
3. Quantum Learning, which applies learning methods that are adapted to the work fields
4. Cooperative Learning, learning that uses groups as an effort to foster cooperation and collaboration between learning components.
5. Society Technology Science, an interdisciplinary concept that is applied to integrate problems in science, technology and society.
6. Accelerated Learning, which develops the ability to absorb and understand information quickly so that it can improve learning abilities more effectively.

Further, the students in the 21st century need to own at least four competences, namely: ways of thinking, ways of working, tool for working and skills for living in the word. The descriptions of those competences are as follow:

1. Way of thinking. A way of thinking that is some thinking abilities that must be mastered by students to face the 21st century world. The ability to think includes: creative, critical thinking, problem solving, decision making and learning.
2. Ways of working. The abilities of how the students have to work with a global and digital world and some of them are the abilities in communication and collaboration.
3. Tools for working. Someone must own and master the tools to work. The mastery of information and

communication technology (ICT) and information literacy is a must. Without ICT and information sources, people will find difficulties in develop their work.

4. Skills for living in the world. The ability to live life in the 21st century, namely: citizenship, life and career, and personal and social responsibility.

To implement the 21st century skills, in mathematics learning, students' activities should be more dominant in proving and applying mathematical concepts, so that there is a transformation of skills prepared by the teacher to students through direct learning activities.

To facilitate the growth of the 21st century skills thorough mathematics learning, tasks and exercises within the course material must be addressed and contained the 21st century skills, such as the assignments and exercises provided in the form of projects carried out in groups and individually (independently). For example, in the elementary school level, the proof and application of the geometry concept to the problem of area and circumference to construct geometry, and in the secondary school level, the proof and application of the phytagorean formula. The implementation of the proof project is to help improve critical and creative thinking skills. Then the results of the project need to be presented in front of the class to practice collaboration and communication skills.

III. CONCLUSION

The effective communication occurs when the message conveyed by the communicator is received well by the communicant. Collaboration is the ability to work together, work together, adapt to various roles and responsibilities; work productively with others; put empathy in its place; respect for different perspectives. Critical thinking is the ability to reason, understand and make complicated choices; understanding the interconnection between systems, compiling, disclosing, analyzing, and solving problems.

Creativity and innovation are the abilities to develop, implement, and convey new ideas to others; being open and responsive to new and different perspectives. Creativity is also defined as a person's ability to create new mergers.

Those are the descriptions of the 4C concepts which are expected to be integrated in mathematics learning in the 2013 revised curriculum. The Mathematics learning at the junior high school level is an integrated learning with all subjects. The packaging process is carried out by means of developing learning tools according to the demands of the 2013 revised curriculum. By making such those efforts, it is expected that the quality of Indonesian human resources in the future will increase.

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