

**IMPROVING OF PROBLEM SOLVING ABILITY OF
SENIOR HIGH SCHOOL STUDENTS THROUGH APPLICATION OF TPS BASED ON
E-LEARNING IN MATHEMATICS LESSON
(Case Study on Students at Semarang - Indonesia)**

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ABSTRACT

Following the development of learning technologies including the use of e-learning is a necessity. For developed countries, the use of e-learning is clearly not a problem. But for developing countries such as Indonesia, the use of e-learning is a separate problem. These problems are related to the need to fulfill the educational facilities such as electricity networks, the internet, the purchasing power of the people/students, and human resource capacity. Apart from school readiness to provide all the facilities and infrastructure at any school, this paper studies about the growth of Senior High School (SHS) students' skills in problem solving through the application of the Think-Pair-Share (TPS) based on e-learning in mathematics lesson. When the expected results can fulfill the wishes of the people, then the use of e-learning is expected to reduce pro and contra in Indonesian society about the use of e-learning in the learning activities, particularly in developing countries such as Indonesia.

Key Words: *Think-Pair-Share, e-learning, mathematics learning.*

1. Introduction

In developing countries with vast territory and geographical location which filled by thousands of islands and mountains such as Indonesia, the equalization availability of electricity networks and internet are separate issues. On the other hand, following the development of learning technologies including the use of e-learning is a necessity.

For developed countries, the use of e-learning is clearly not a problem. But for developing countries such as Indonesia, the use of e-learning is a separate problem. These problems are related to the need of fulfillment of educational facilities such as electricity networks, the internet, the purchasing power of the people/students, and human resource capability.

Apart from school readiness to provide all the facilities and infrastructure at any school, this paper studies about the growth of Senior High School (SHS) students' skills in problem solving through the application of the Think-Pair-Share (TPS) based on e-learning in mathematics lesson.

Issues to be discussed in this paper are as follows:

- 1) Can the application of TPS based on e-learning in mathematics lesson improve the problem solving skills of SHS students?
- 2) What are the encountered constraints when implementing of learning based on e-learning in mathematics at SHS?
- 3) How to improve the human resources so that the learning based on e-learning in mathematics at SHS can run effectively?

2. Learning with the Use of TPS based on e-learning in Mathematics Lesson at SHS

1) TPS Learning and Its Application

Learning with the use of TPS technique had been done by educators in some countries such as Japan, Arab, Malaysia, Australia, and so on. This is partly done by Kitaoka (2013), Jebur, Jasim, & Jaboori (2012), and Othman (2012). TPS was chosen because it has several advantages. These advantages, according Bowering & Leggett (2007) and Kothiyal (2012), are: (1) Students are trained to learn in a group activity/collaboration which consist of 4-5 students, which is preceded by the independent and responsible individual learning in the

group (think). (2) To train students to be able to communicate with their friends in order to obtain the exact solution (pair). (3) To train students to bravely present his/her findings (share), both share in the group and share in the classical style.

Furthermore, Lom (2012) and Khalid & Halten (2012) stated that TPS learning is one of cooperative learning types for active learning which is very effective and is a widely used learning in higher education. Azlina (2010) and Lom (2012) stated that in principle the TPS learning steps are (1) **Think** - students think about the task and how to solve it individually. They will have time to write down their own ideas or responses before discussing it with their partner. Then, step (2) **Pair** - paired with a partner in a group, students must form a pair. Teachers need cues from students to share their answers with a partner. Each pair of students then discuss their ideas about the tasks and their previous ideas. It is expected that each pair will be able to conclude and produce a final answer. Then they must move to step (3) **Share** - the teacher asks the couple to share their answers to the group, then, to the whole class. Here, class discussions will take place, in which each group will facilitate class discussion to find similarities or differences in responses or opinions of the various groups.

2) Implementation of E-learning in Mathematics Learning

Nowadays, the use of e-learning or Information and Communication Technology (ICT) has penetrated almost all developing countries as well as Indonesia. E-learning becomes a learning tool. Supposedly, the use of e-learning or ICT has already integrated in everyday learning. This is confirmed by Jamieson-Proctor, Burnett, Finger & Watson (2006) which said that: "The integration of information and communication technology (ICT) has become a high priority across Australian schools, just as it has in schools internationally."

In the use of e-learning, teachers may not only demonstrate or use the computer as a tool for typing but also use it to teach a complex matter, and the teachers must remain proactive in accordance with the characteristics of the students. Students should be told, why it should be done. Higgins & Mosley (2001) said that: “but that it is much more complex and proactive, and requires a clear emphasis on addressing not just 'how' to do it, but on 'why' it should be done.”

In learning of mathematics, students need to be trained to learn to find by themselves through the utilization of computer/internet. Related to learn to find by themselves Hillman (2003) wrote that the beginning point for learning is a problem in which the student wants to resolve.

In addition, teachers are educators. When utilizing e-learning as a medium of learning, teachers can also convey the values of good character. Beliefs and perceptions not only about e-learning or ICT itself, but it also needs to be associated with a good approach between teachers and students' personal and remain in professional scope in teaching the material to the students. Phelps & Maddison (2008) said that: “It is argued that effective e-learning or ICT professional development for teachers must take account of teachers' values, attitudes, beliefs and perceptions not only regarding ICT, but in relation to teachers' own approaches to reviews their personal and professional learning.”

Students with limited school facilities and infrastructure, it is still possible to develop their creativity, ideas, and their role in accordance with the level of their ability. It is expected that e-learning or internet and web pages can improve students' role in supporting these ideas. This is supported by the opinion of Ashford (2002), Brown (2002), Neylon (1996), as well as Taylor (1999) who concluded that internet and web page construction can all play a role in supporting students' artistic expression.

Observing of supervising and duties of General Directorate of Primary and Secondary Education, Ministries of Education and Culture of Indonesia about school operations in Indonesia and various of expert opinions on the benefits of learning based on e-learning, then the use of computer/internet as an education media deserves to be studied. In fact, in the community or in the workplace, mathematics, computers, and the internet are very required. Hannell (2007) wrote: "Mathematics has always been one of the most significant issues in an individual's life. Children need mathematics when they graduate from school or when they start working."

In general, math lesson may cause students' anxiety when not given in accordance with the ability of the students. Associated with anxiety of the student, Mercer & Miller (1992) wrote that: "Problems with mathematics at schools frequently result in failing at school and high levels of anxiety." Through using of computer/internet, the anxiety is expected to be lost or reduced and can facilitate the students to understand the teacher's lessons, including math. If school mathematics is well-designed, then served with using a computer/internet, it is expected that the students will have a positive attitude toward mathematics or other subjects. Associated with this positive attitude, Tok & Keskin (2012) wrote: "The students' who have more positive attitudes towards mathematics enable them to be more successful in mathematics courses." Therefore, the learning based on e-learning deserves to be supported and escorted carefully.

Base on observations and interviews with mathematics teachers as a preliminary study for the preparation of this paper, the learning based on e-learning has many obstacles. requirements needed in the implementation are : (1) a strong hotspot especially in classrooms that will be used for learning, (2) needs the preparation of teaching materials and

Student Worksheet in accordance with the content of the curriculum, (3) training for candidate of e-learning Admin , (4) training for teachers, and (5) training for students.

Admin training to support learning activities base on e-learning is required, so that the Admin in a school (2 or 3 teachers) may: (1) create a User Name and Password of users (teachers and students), (2) replace/find the User Name and Password of users (teachers and students) who forget or trouble, or (3) change the program. Non-ICT teacher training is needed for teachers to be able to: (1) know how to upload the subject matter, the media, lesson plan, and so on, (2) know how to upload the evaluation (test items), or the similar activities, and (3) can operate e-learning in the context of learning.

Training to the students needed so that students can: (1) participating in learning activities base on e-learning, (2) learn how to download the subject matter, media, or that the similar, and (3) know how to do the evaluation (test items) on-line, or that the similar. Constraints on the ground are: (1) there were areas not reached by the electricity network, (2) was not affordable Internet, (3) constrained by the cost of procurement, maintenance, and technicians.

3) Implementation of TPS based on e-learning for Mathematics in Senior High School

Othman & Othman (2012) and Slone & Mitchell (2014) had applied TPS based on e-learning. Referring to their experience then for purposes of study in this paper, the authors in collaboration with mathematics teacher of Senior High School 1 Bae of Central Java - Indonesia, and had been conducting a Classroom Action Research (CAR). Teacher Partner accompanied by a team of researchers conducted the learning use TPS based on e-learning in mathematics lesson. Considering the schools in a small town in Indonesia are not all familiar with e-learning then it required training to teachers and students.



Fig. 1: Teacher partner was trained e-learning.



Fig. 2: Students were given an explanation of learning mathematics was taught through the application of TPS based on e-learning

Furthermore, after all the infrastructure and facilities are met, teachers and students are ready to implement learning based on e-learning, then the implementation of mathematics learning through the implementation of TPS based on e-learning can be begun.



Fig. 3: Learning by applying TPS based on e-learning was begun.

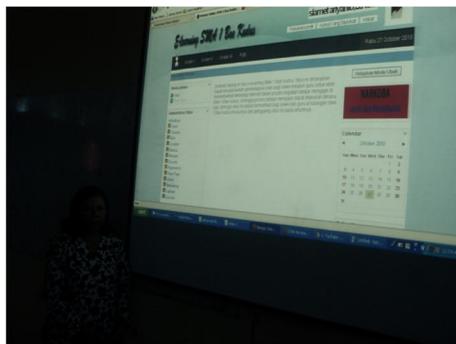


Fig. 3: One of the slides of learning action base on e-learning

In a CAR to support the study of this paper, the authors conclude that: (1) the application of learning using TPS based on e-learning in mathematics lessons can increase independency and student learning activities; (2) the application of learning using TPS based on e-learning in mathematics lessons can improve problem-solving abilities of students.

From observations and interviews during the implementation of CAR, also acquired the following additional information. In implementing of mathematics learning base on e-learning encountered the following constraints. (1) Before the lesson base on e-learning begins, should be preceded by training on e-learning to the Admin staff, teachers, and students. (2) Not all computers can be used optimally, because some computers troubled. (3) The Internet is still less stable, still need maintenance.

3. Conclusion

From the study in this paper, we can conclude as follows:

- 1) Application of TPS (Think-Pair-Share) based on e-learning in mathematics lesson can improve independence, activities, and skills of problem solving of Senior High School students in Central Java - Indonesia.
- 2) The obstacles encountered when implementing the learning of mathematics based on e-learning in Senior High School are: (1) infrastructure and facilities for computer and internet

still need to be optimized, (2) the need of the schools' support and local governments to optimize the use of computers along with its internet with sufficient number of computers and the strong internet.

- 3) To improve human resources so that the learning of Mathematics based on e-learning in Senior High School can run effectively, we need to hold training related to learning based on e-learning to computer technicians, teachers, Admin of e-learning, and the students.

4. Recommendation

Recommendations can be given based on this preliminary CAR are as follows.

- (1) If the infrastructures and facilities for learning based on e-learning has been available, then the learning based on e-learning in the school can be immediately implemented.
- (2) Teachers/lecturers should be able to use e-learning combined with a certain learning techniques, such as TPS.
- (3) If a school had been conducted a learning based on e-learning, then the existence of a good computer technicians is indispensable.

References

Ashford, J. 2002. *The arts and crafts computer: Using your computer as an artist's tool*. Pearson.

Azlina, N. A. Nik. "CETLa: Supporting Collaborative Activities Among Students and Teachers Through the Use of Think-Pair-Share Techniques". *International Journal of Computer Science Issues*. 2010. Vol. 7, Issue 5, pp. 18-29.

Bowering, Margaret, *et al.* 2007. "Opening up Thinking: Reflections on Group Work in a Bilingual Postgraduate Program". *International Journal of Teaching and Learning in Higher Education*. Vol. 19, No.2, pp. 105-116.

- Brown, I. 2002. New radicalism for art education: Embracing change. *Australian Art Education*, 25(1), 62-64.
- Hannell, G. 2007. *Success with inclusion: 1001 teaching strategies and activities that really work*. UK: Routledge.
- Higgins, S. & Mosley, D. 2001. Teachers' thinking about information and communications technology and learning: Beliefs and outcomes. *Teacher Development*, 5(2), 191-210.
- Hillman, Wendy. 2003. Learning How to Learn: Problem based Learning. *Australian Journal of Teacher Education*. Volume 28 | Issue 2.
- Jamieson-Proctor, Burnett, Finger & Watson, 2006. *Journal of Educational Technology*, 22(4), 511-530. <http://www.ascilite.org.au/ajet/ajet22/jamieson-proctor.html>.
- Jebur, Muntaha Sabbar, *et al.* *The Effect of Usig Think-Pair-Share Technique on EFL Students' Achievement in the Course of General English*. Pp 823-838.
- Khalid, Adeel, *et al.* 2012. "Enhancing Learning at The Polytechnic University: Interactive Classroom Techniques". *International Journal of Polytechnic Studies*. Vol. 1, No. 2.
- Kitaoka, Hisaya. 2013. "Teaching Methods that Help Economics Students to be Effective Problem Solvers". *International Journal of Arts and Commerce*. Vol. 2, No. 1, pp. 101-110.
- Kothiyal, Aditi, *et al.* "Effect og Think-Pair-Share in a Large CS1 Class 83% Sustained Engagement". *ICER'13*. 2013. SanDiego, California, USA.
- Lom, Barbara, "Classroom Activities: Simple Strategies to Incorporate Student-Centered Activities within Undergraduate Science Lectures". *The Journal of Undergraduated Neuroscience Education*. 2012. 11(1):A64-A71.

- Mercer, C & Miller, S. 1992. Teaching students with learning problems in math to acquire, understand, and apply basic math facts. *Remedial and Special Education*, 13, 19-35.
- Neylon, J. 1996. *I couldn't do my homework, the cat ate my mouse*. *Artlink*, 16(2 & 3), 54-56.
- Othman, Mahfudzah and Muhaini Othman. "The Proposed Model of Collaborative Virtual Learning Environment for Introductory Programming Course". *Turkish Online Journal of Distance Education*. 2012. Vol. 13, Number 1, pp. 100-111.
- Phelps, Renata and Maddison, Carrie. 2008. ICT in the secondary visual arts classroom: A study of teachers' values, attitudes and beliefs. *Australasian Journal of Educational Technology*. 24(1), 1-14.
- Slone, Norah C and Mitchell, Nathanel G.. "Technology-based Adaptation of Think-Pair-Share Utilizing Google Drive". *Journal of Teaching and Learning with Technology*,. 2014. Vol. 3, No. 1, pp. 102-104.
- Taylor, S. 1999. *A computer convert's story*. *EQ Australia*. Accessed 22 Maret 2013.
http://www1.curriculum.edu.au/eq/archive/prior2002/eq_99/taylor.htm.
- Tok, Şükran & Keskin, Adem. 2012. The Effect of Fast Draw Learning Strategy on the Academic Achievement and Attitudes Towards Mathematics. *International Journal of Innovation in Science and Mathematics Education*, 20(4), 1-15, 2012.

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