The implementation of thinking actively in a social context learning model to improve the ability of mathematical literacy and self-efficacy of junior high school students

W Septiyana*, E C M Asih and D Dasari
Department of Mathematics Education, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia

*wiekaseptiyana@student.upi.edu

Abstract. The TASC learning model emphasizes on the process of thinking and acting, so that the students can feel and grow the desire to learn and know the purpose of learning activities undertaken. Students’ literacy skills in formulating, applying, and interpreting problems in everyday life need to be developed to cope with community changes. That ability involves self-confidence derived from self-efficacy. Thus, the purpose of this study is to compare the improvement and the achievement of self-efficacy of the students with two models of learning in one of junior high school in Indonesia. The experimental class used the TASC learning model and the control class used the usual learning model which is scientific approach. Each class has 30 participants. Based on the result of the study, the improvement and the achievement of self-efficacy of students with TASC learning model are significantly better than the students with the usual learning model. The experimental class students are used to explain the problem-solving step with the reason or the form of a detailed representation, while the control class does not describe it completely so it is more often forgotten to include a unit of length or unit area in the answer.

1. Introduction
One of the important goals of mathematics education is literacy skills [1, 2]. Mathematical literacy is one of the literacy capabilities that are integrated into the realm of content in learning [3]. Literacy skills can enable mathematical knowledge and understanding effectively to deal with and overcome modern challenges [2]. Unlike the knowledge of the complex understanding of mathematical content, mathematical literacy deals with a deep understanding of mathematical mastery so that it can be applied in the form of appreciation in real life. Mathematical literacy becomes one of the essential skills possessed in life. De Lange stated that school mathematics is focused on mathematical content, while mathematical literacy is directed at how to use mathematics in everyday life [4]. The role of mathematical literacy involves more procedures for the implementation of knowledge, competence and confidence to be applied in the practical world. It is important to master one in order to predict, interpret data, solve everyday problems, provide reasons in numerical, graphical, and geometric situations and communicate using mathematics [5]. Essential
Competencies in mathematical literacy include problem-solving abilities, reasoning, connections, communication and mathematical representation [6].

One form of evaluation of the achievement of mathematical literacy ability can be considered with the participation of Indonesian students on the assessment of mathematical literacy by PISA in 2003, 2006, 2009, 2012 and 2015 the average of Indonesian students achieving 360, 391, 371, 375, and 386 respectively. The scores were below the ideal average in 2003 with 500, a score of 498 in 2006, a score of 496 in 2009, a score of 494 in 2012 and a score of 490 in 2015 [7-11]. Weak achievement is supported by the analysis of Haswati’s research which stated that students are still weak in answering mathematical literacy [12]. This is also reinforced by the results of preliminary study of researchers in junior high school students to find students' mistakes in applying mathematical concepts related to literacy [13]. Students have not been able to relate the concept of calculating the volume of tubes to the type of pizza food. Some of these things become interesting for the researchers to study the learning model to achieve good results of junior high school students' literacy skills.

The ability of mathematical literacy can be supported by students’ self-confidence derived from self-efficacy which refers to one’s belief and judgment of self-capacity to carry out the necessary actions in achieving certain types of performance [14]. Lane & Lane research stated that self-efficacy can overcome the intellectual demands of the academic program of 11.5% [15]. In addition, it can predict mathematical performance [16]. Students with high self-efficacy can help to create a sense of calm in facing the difficult tasks and activities, as well as to the contrary. Bandura suspected that self-efficacy can be developed from four sources in learning activities, including mastery experience, vicarious experience, social persuasion and physiological states [17].

Based on these problems, this study compares the improvement of literacy and self-efficacy skills through two learning models. The research questions that will be answered in this research are whether the improvement of mathematical literacy ability and the achievement of self-efficacy of students who get the TASC learning model is better than the students who get regular learning.

2. Method
This research is a quasi-experimental research with non-equivalent control group design. The population in this study covers all students of grade VII in one of junior high school in Bandung Indonesia, then taken the sample by purposive sampling technique. Purposive sampling was used with consideration relating to the time and condition of the research subject in accordance with the considerations and recommendations of the school where the study took place. The total number of samples are 60 participants consisting of 30 students as the subjects of the experimental class given the treatment of TASC learning model and 30 students as the control class subjects given the usual model of teachers do in schools with a scientific approach. Both classes were given a topic of learning about triangle and quadrilateral material for four weeks. Each class divided into six times face to face in the duration of 3 x 40 minutes as much as 3 times of learning and 2 x 40 minutes as much as 3 times of learning.

The indicators of mathematical literacy ability tests used were mathematically formulating problems, applying concepts, facts and mathematical reasoning and interpreting, using and evaluating mathematical results. In addition, self-efficacy questionnaire indicator observed in this research is mastery experience, vicarious experience, social persuasion and physiological states. Mathematical literacy test was used to be tested before and after treatment to obtain student n-gain, but a self-efficacy mathematical questionnaire was provided only after the treatment was completed precisely before the student answers the literacy skill test provided. It aimed to measure the level of self-efficacy of students in facing math problems. The test instrument in the form of a description problem was tested and analyzed with the technique of validity, reliability, difficulty level, distinguishing power and has been tested to experts in the field. Similarly, self-efficacy questionnaires were also tested with validity and reliability. Questionnaire Likert scale was
compiled by dividing into positive statements with a range of 1 - 10 scores and negative statements with a score range of 10-1[18].

The pretest and posts obtained were calculated normalized gain (n-gain) to determine the increase of students' mathematical literacy ability, then the rate of improvement will be differentiated by the following classification [19]: (1) n-gain> 0.7 (high criterion) ; (2) 0.3 <n-gain ≤ 0.7 (medium criterion); (3) n-gain ≤ 0.3 (low criterion). Based on the data normality test, the n-gain score data of mathematical literacy capability obtained from both classes included non-distributed data so that the data were tested by Mann Whitney U-test one tailed statistical test, while the self efficacy of the students was normal distribution using independent sample test t-test one tailed.

3. Results and discussion

3.1. Results

The n-gain data of the mathematical literacy and self efficacy test were analyzed using descriptive statistics to obtain results as in Table 1.

|               | Data                        | Group  | SMI   | The highest score | The lowest score | \( \bar{x} \) | S    |
|---------------|-----------------------------|--------|-------|-------------------|------------------|-----------|------|
| N-gain Test   | Mathematical Literacy       | Experiment | 13    | 1,00             | 0,50             | 0,75      | 0,21 |
|               |                             | Control  | 13    | 1,00             | 0,00             | 0,62      | 0,28 |
| Scale of Self | efficacy Questionnaire      | Experiment | 200   | 169              | 87               | 135,20    | 20,04|
|               |                             | Control  | 200   | 155              | 96               | 123,20    | 16,09|

Based on the results of the descriptive analysis in Table 1, it is explained that the average increase in mathematical literacy ability and the achievement of self-efficacy of experimental class students is better than control class. The improvement of students' mathematical literacy ability of experimental class is classified by increasing with high criterion, while improvement in control class is medium category. This result is supported by Mann Whitney one tailed test results obtained asymp.sig of 0.36. Based on the result of the test, it can be concluded that the improvement of the mathematical literacy ability of the experimental class students who obtained TASC learning is better than those who get regular learning. Not only that, the achievement of self efficacy obtained from the questionnaire deployment shown in Table 1 also illustrates the average level of students' confidence in their ability to answer the experimental literacy test of the experimental class higher than the control class. The results are corroborated by the independent sample t-test one tailed test obtained asymp sig 0.08, so it can be concluded the achievement of self-efficacy experimental class is better than the control class.

3.2. Discussion

In the experimental and control classroom, group discussion learning method was used in which each group consists of at most 4 people. In each lesson, each group in both classes is given a student worksheet. The experimental class received a student worksheet designed with a contextual approach then presented in accordance with the syntax of the TASC learning model. The control class was given a student worksheet with a scientific approach adopted from the student package book then presented as usual learning.

Learning with the TASC learning model is superior which can be seen from the classroom learning process. Students are more able to do something to be involved, and feel empowered to complete the task so that there is more interaction, sharing and cooperating than in learning using ordinary learning. Student
involvement is meant in measuring, drawing and creating. Meanwhile, the task given in ordinary learning in the form of activities that do not give a lot of students to try something because more directed to the process of observation something presented. Learning that builds thinking ability comes from student’s experiences so as to develop mastery [20]. Here is one of the literacy questions that includes mathematically formulating indicators.

Problem 1

Mutia bought a packet of chocolate-flavored wafers whose surface was rectangular. The thickness of the packaging contents is the same as the thickness of the wafer. If one pack contains 5 wafers of the same size, the base is square and the circumference of the wafer base is 12 cm. What is the base of the wafer packaging?

The results of the experimental student's answers to the initial ability of the two classes in the statement are shown in Figure 1 and the student control answers in Figure 2.

Both answers were taken from students who have high initial ability. From the answers both show the right and complete results, there is only comparison in formulating the problem mathematically. The result of the experimental class from the student's answer in Figure 1 shows the student's process in solving the problem by representing the image. In addition, students describe each reason of the selected step. While in Figure 2, students formulate problems in the operation of the count. Overall, in this question the student has an error in formulating the width and length of the rectangular wafer packing from the circumference of one of the known wafers. In addition, errors were found in formulating five wafers to form a rectangle according to the base of the packaging. Here is a form of literacy questions related to applying concepts, facts, procedures and mathematical reasoning (employing).

Problem 2

Figure 3 shows three types of risoles with the same thickness and contents of the risoles. The price of each risoles is Rp 2,500.00. Characteristics of the three types of risoles can be seen in the following table. If Santi wants to buy risoles for an event, which risoles are better chosen to get more risoles content? Explain your opinion.
In the aspect of applying the concepts, procedures, facts and mathematical reasoning most of the students of both classes responded correctly, but some found mistakes in applying the procedure and drawing conclusions. In the experimental class there are 2 students who make mistakes, including mistakes in choosing procedures and draw conclusions. Meanwhile, in control class, it was found consisted of 7 students who made mistakes including miscalculations, procedures and only rewrite the problem. In Figure 4 is presented one of the answers of the experimental class students who performed the correct procedure, but wrong in drawing conclusions. The control class error in applying the concept is shown in Figure 5.

Based on Figure 4, the experimental class students have been able to choose the procedure to be used, but wrong in determining the final conclusion of the question asked. Different errors found in the control class, Figure 5 indicates that the student chooses wide area procedures while traveling. Then the unit price of risol is divided by the total area and circumference of the risol base, so the result is concluded as many acceptable risoles. The error is suspected because the student has not understood the difference in circumference and area of a flat build.

Furthermore, in the aspect of literacy in interpreting, integrating and linking real situations to mathematical concepts (interpreting) is measured through the following questions.

Problem 3
By connecting the midpoint of each side of the square ABCD is obtained by EFGH diamond as shown in Figure 6. If the area of the diamond is $8 \text{ cm}^2$. Is it true that the area of the shaded area is the same as the area of the diamond? Give your reason.

![Figure 6. Square.](image)

In this aspect, the students' answers to the experimental and control classes differ in revealing the relation of each situation on the problem to the concept. The results of the students' experimental class responses are shown in Figure 7 and the results of the control class answers are shown in Figure 8.

![Figure 7. Sample answer no 3 experiment class.](image)

![Figure 8. Sample answer no 3 control class.](image)

Based on Figures 7 and 8, both classes can interpret the problem-solving steps presented by linking each of the situations presented. The advantages of the experimental class students' answers can be to present each selected step with the reasons understood and to include the appropriate and complete unit area, while the control class students respond with the proper completion procedure but are not equipped with the correct broad unit.

Based on some analysis of students' answers to mathematical ability, experiment class students are better at outlining the answers completely with the reasons. It is trained since classroom learning that gives students space to express opinions in solving problems. It is like Davies's opinion that TASC learning model can help students to stay focused, allowing students to demonstrate with peers so that they can support each other and accept criticism. It makes students more courageous in taking decision in solving problems. In addition, experimental classroom students are familiarized to assess performance and set the best targets for each given assignment, especially in the student worksheet. The findings of this finding indicate that students' self-confidence derived from self-efficacy against self-efficacy can be directly proportional to the results of students' mathematical literacy skills.
4. Conclusion

Based on the results of the analysis in the previous section, it can be concluded that the students' mathematical literacy skills provided by the TASC learning model is better than the students who received regular learning. Students in the experimental class can be more complete in solving the problem with accompanying the reason of the selected step. Furthermore, the self-efficacy of the experimental students is better than the control class because students are accustomed to doing the math process to find out the learning materials and active thinking in the group to solve them, so that students can be more confident in dealing with mathematical questions.

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