# The development of think together about science in society (TToSS) learning model to increase critical thinking skill in science lesson

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**Abstract**. This article discusses of how TToSS learning model is used to increase the critical thinking skill in science. The critical thinking is an skill to think rationally in assesing something in which before deciding or doing something. Critical thinking is a thinking skill that can be trained, so that this skill can be learn and developed. The development model used in this research is the 4-D development model. The question used in the experiment is development question that refers to train the critical thinking of students that is suitable with their age development. The first sintax model of TToSS is Think Alone; a stage of giving the illustration of the problem to stimulate the critical thinking skill of the students. The second stage is Think Together; the student with his/her group discusses about the problem given. The third stage is Share and Discuss, in this stage the students do the presentation of the result of the group discussion with entire groups in the classroom. The fourth stage is Evaluating; in this last stage the teacher evaluates all the activities during the lesson and corrects all misconception that might occur on the presentation and discussion.

## 1. Indtroduction

The changing of eductional paradigm that formerly called learning is an education process where the classroom study which is centered to the teacher, becomes a study that is centered to the students. Students centered learning motivate the students to be active learner on the learning process [1].

The changing of educational paradigm based on, one of it; is demand from the 21st century learning that requires development in ways of thinking, ways of working , tools for working and skill for living [2]. To improve those skills, the students need to actively participate in learning process, because all those demands will not be able to be fulfilled maximally if the students become passive participants in learning process.

Needs an innovation in the education world to fulfill those requirements. The innovation that should be done has to pay attention to the several aspects such as the development of the learners as one of it.

The average age of junior high students is 12 years old, in which in this age, based on Piaget's theory in [3] explains that this stage is formal operation stage where the learners experience the development of thinking skill simbolically and able to understand something meaningfully without needing a concrete object or visual object. The authentic caracterization of science consists of four elements: process (scientific process), product (scientific knowledge), attitude (scientific attitude) and technology. The process in the science means scientific activity to descript nature phenomenon so that it can be discovered the science products such as facts, principles, laws, or theories which can be used to add to the knowledge that already being possessed [4].

One of the ways to make an innovation is to develop learning model to maximize classroom learning process actively [5]. Think Pair Share (TPS) learning model is one of the cooperative learning models which is designed to develop pattern of interaction among students, this model also increases students' learning process effectively. Think Pair Share is one of the cooperative learning models which is methodically implemented with the teacher who gives the question to the students and limits the time to answer the question, then the students work in pair with their deskmate to discuss the result of their answer, and lastly the students communicate their collaboration respons with all the students inside the class [6].

The problem which is used in this learning model has to be relevant with the recent development, in this case, it needs special approach to determine the problem and the solution. Thus, Science Environment Technology and Society (SETS) is implemented [7]. The students have to know what is science, how does science work, how the knowledge built, how to connect it into the society and what is the profit to do those things. That is why it is important to give the task to the students about science problem and its relation with the society, in hope to give knowledge of contextual problems in society and to find out the solution of those problems [8]. Thus, based on the statement, TPS learning model and STES approach can be combined to be a new learning model.

Dynamic learning model means along with the world recent development, learning model is able to continue to develop. Renewal of the learning model is needed in demand of the 21st century [9]. There are 4 sintax development in this model, which are think alone, think together, share and discuss, and evaluation. Think alone or first phase is giving illustration of the problem that will be discussed in the class. In Think together phase is discussion activity with group about the problem given. In Share and discuss phase, the representation of the group will present the result of the group discussion in front of the class and do the question-answer activity with other groups in the class. The last phase is Evaluation, in this phase the teacher evaluates the learning process and corrects the missconceptions which might occurs in learning process.

Critical thinking is an important skill that must be owned by everyone. This skill is also one of the 21st century skill that has to be developed by the teachers [10]. Someone who is able to think critically is someone who is able to discover new ideas, makes decision in hard situation, and understands the relationship between theory and practice. Due to the statements, the development of critical thinking skill becomes a thing that is needed to be given attention by every education institutes [11].

Based on several researches in social science, it is known that students that graduate from various countries do not have the skill to compete in global scale due to the lack of critical thinking skill. The survey result 2015 of TIMSS in science, Indonesia ranked in 36 from 49 countries, and the result study of PISA in 2015, Indonesia ranked 69 from 76 countries.

## 2. Method

The research in this study is research development. Research development is a research that produce a specific product. In this case, the product is in the education field and the result of the product is learning model. The research development in this study uses 4-D development learning model which consist of definition stage (Define), design stage (Design), development stage (Develop) and dissemination stage (Disseminate) that develop by [12]. The development of this leearning model is introduction study which tested in the small scale and big scale, and continued to the dissemination stage. The subject in this

research in TToSS learning model to increase critical thinking skill in science learning, while the respondence of this research are 8th grade junior high students and science teachers.

## 3. Result

### 3.1. Think Together about Science in Society learning model

This research is reseach development that produce the new learning model, which is TToSS learning model that is developed 4-D. The stages of learning activity in TtoSS learning model is the fusion of shortage and over excess of TPS (Think Pair Share)-type cooperative learning model and STES (Science Tchnology Environmentand Society) approach. The sintax of the TtoSS learning model is:

**Tabel 1**. The Sintax of TToSS learning model

| Learning Model Phase | The activity of TtoSS learning model |
|---|---|
| Think alone | a. The students are given the illustration of the problem that will be discussed in the lesson.<br>b. Individually, the students think about the problem that is given.<br>c. The students build innitial knowledge about the problem that will be discussed.<br>d. Individually, the students write down the questions, and opinions that appear from the illustration of the problem that is given by the teacher. |
| Think together | e. The students make a group of pair with their deskmate<br>f. The students are given worksheet contains problem development that related with science, technology, environment dan society.<br>g. The students actively and together with their groups discuss about the problem that is given, give arguments, dan find out the solution of the problem. |
| Share and discuss | h. The representation of the group present the result of the discussion in front of the class.<br>i. The other groups compare it with their own result.<br>j. Discussion session is filled with question-answer activity between presenter group and audiences.<br>k. The teacher conducts the discussion process and organize class situation to stay conducive. |
| Evaluation | l. The teacher evaluates the learning activity from think alone stage until presentation and discussion.<br>m. The teacher corrects the missconception that might occurs in the learning process.<br>n. Together with the teacher, students make learning conclusion and continue to do the excercise. |

## 4. Discussion

### 4.1. Learning model system of think together about science in society (TToSS)

The learning system in TToSS are:

#### 4.1.1. Social system

In the social system in learning model TToSS, teacher is a facilitator who gives the guidance to the students during the learning process. Moreover, there are interactions among students during the discussion (Think together phase), and interactions among groups during the presentation (Share and discuss phase). Also, there are interaction between teacher and students through feedback given by the teacher to the students. Thus, it is hoped that those interactions are able to help to develop the students' critical thinking skill [13].

### *4.1.2. Reaction principle*

The teacher is a facilitator; thus always gives positive response in every students' opinion and answer, helps every students/groups who have difficulty in the learning process by instruct them to read the supporting materials or every other sources of informations that are able to help the students to understand the lesson. In the eyes of constructivistic, the students are actively participate to form the knowledge, form the meaning, question the clarity, have critical attitude, and create the justification of the problems.

### *4.1.3. Supporting system*

The supporting system which is needed in TtoSS learning model is all of learning sources that is needed in learning activity such as worksheet, moduls, viewer, internet, etc.

### *4.1.4. Instructional impact*

The expected result of instructional impact in TtoSS learning model is the increase of critical thinking skill such as able to build concept and comprehension in analizing issues or problems that occurs in society which is appropriate with 21$^{st}$ century learning.

### *4.1.5. Escorting impact*

Escorting impact in TtoSS learning model are: 1) Able to work together inside the group, 2) Respect other people opinions, 3) Able to deliver opinions bravely, and 4) Understand the connection of science and the problems that occurs in environment and society.

### *4.2. Critical thinking* skill *in TToSS learning model*

In TToSS learning model, the critical thinking skill can be trained in every learning activity. The first sintax; Think Alone, in this stage the critical thinking skill of each students are stimulated by giving the illustration of the problem that will be discussed later in the lesson, then the students write down every questions and opinions that appears into their minds after the teacher explains about the problem. Second sintax; Think together, in this stage the critical thinking skill of the students is being developed by discussion activity in group, students are given the worksheet contains of science related problems, technology, environment and society. In the discussion activity, there will always occurance of agreement and disagreement, in relation to that process the students will bravely give their opinions, thus it helps the students to think critically of the problem given [14]. The  third sintax is Share and discuss, in this stage the critical thinking skill is developed by the presentation skill of the result discussion of the group, then in the question-answer session, the students who have different opinions about the problem are able to help to develop the critical thinking skill of the other students. The fourth sintax is Evaluation; the critical thinking skill in this stage is developed from the process of doing the evaluation exercises which is specifically developed to train the critical thinking skill of the students. Critical thinking can be increased through every stages of TToSS learning model

## 5. Conclusion

TToSS learning model is developed by TPS-type cooperative learning model and STES approach. TToSS learning model has four sintax, which are: think alone, think together, share and discuss, and evaluation. There are social system, reaction principle, supporting system, instructional impact and escorting impact in TToSS learning model. The critical thinking skill can be found in every sintax of TToSS learning model which is developed from; 1) The opinions and questions from the illustration of the problem which is given in think alone phase, 2) Discussion; contests the opinion within the members of the  group in think together phase, 3) Presentation from the representative of the group and question-answer phase in share and discuss sintax, and 4) In evaluation phase by doing the exercise on the worksheets which is specifically developed to train critical thinking skill of the students.

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