Effect of didactical dialogue to enhance learning quality

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Abstract. One of the factors that determine the learning quality is the relationship that exists during the learning process. The relationship is the didactical dialogue and collaboration that occurs among students. Didactical dialogue and collaboration will happen when classroom interaction between teachers and students can critically interrogate the topic of lesson, express and listen to multiple voices and points of view, and create respectful and equitable classroom relations. The purpose of this study is to analyze and describe didactical dialogue that occurs among students and collaboration among students in sharing task activity during learning process. Sample was collected in one of private senior high school in Bandung. Data was taken from the transcript results, the student dialogue is analyzed which section shows the didactical dialogue and the collaboration among students ctivities. Through this study, the deepness and spaciousness of students thinking was influenced by teachers capability to conduct the lesson, for instance how to elicit students idea by using question, how to give feedback from the response and how challenging the task designed by teacher. Didactical dialogue and collaboration among students show that quality learning process.

1. Introduction

The quality of education in Indonesia is still relatively low, as evidenced by the results of research Trends in International Mathematics and Science Study (TIMSS) and Program for International Student Assessment (PISA). Based on the achievement of PISA 2015, Indonesia is ranked 69 out of 72 countries following TIMSS. Indonesia is included in the low category of the ability of Indonesian students in science lessons and still at the stage of knowing some basic science facts in everyday life [1]. The low science achievement of Indonesian students internationally indicates the ineffectiveness of science learning in Indonesia.

One of the factors causing ineffectiveness of science learning is learning process in Indonesia which is still much teachers centered [2]. Student learning activities on teacher centered learning usually only listen to and record the concepts provided by the teacher without going through the process of thinking more broadly and deeply to the concept [3]. In addition, the lessons learned also do not reflect the 21st century science learning. 21st century learning requires learners to be students who have the skills to learn and innovate which includes critical thinking and able to solve problems, creative, innovative and able to communicate and collaborate. Where communication and collaboration is so important.

One way to improve the quality of learning is to apply collaborative learning. Innovative collaborative learning is found to be effective in improving students’ understanding [4]. Collaborative learning according to Sato is a study conducted in groups aimed at encouraging students to find the diverse opinions or thoughts that arise from each individual in the group [5]. Sato also suggests the relationship of mutual learning is a two-way learning and there is a positive reciprocal relationship that provides benefits for students to understand learning materials and to achieve common goals [5].

Collaborative learning is done with the formation of a learning community that is the vision and philosophy of school reform [5]. In the learning community ensure the learning rights of every student...
without exception, improving the learning quality and simultaneous achievement between quality and equality of learning but not only students but also teachers in the classroom [6]. In collaborative learning, there are varied learning activities that are individual, group interaction, interaction between groups, and class activities. This provides the possibility for each student to do the learning process optimally so that their learning rights are more secure [6].

Sato argues that collaborative learning is not only beneficial for students with low academic ability, but collaborative learning can also ensure students with higher academic ability for the better[7]. Collaborative learning has two benefits: the first is a method to improve the ability of students who do not understand or have not understood a subject matter perfectly. Second is in collaborative learning activities interaction occurs among students in groups. The purpose of group activities is the exchange and interaction of different thoughts, opinions, and interpretations of the learning materials and tasks assigned. In the collaborative interaction occurs among students who have the ability to understand more with students who lack the ability to understand. In the interaction activities the students mutually express their opinions and ideas without reluctance. In the interaction process occurs the relationship of mutual discussion and mutual learning. In this interdisciplinary relationship foster communication skills that emphasize on how to establish relationships with other parties. The mutual learning activities of the students meet and know different viewpoints with themselves or diverse thoughts, so that influenced and consequently their mind becomes stronger or deeper. Activities in collaborative learning are designed in two types: sharing task and jumping task. The material on the sharing task is the basic material that should be mastered by all students and the material in the jumping task is a useful material to improve students' understanding with higher level of ability.

The learning quality is the state of learning that leads the students to be active during the learning process and able to think with high-order thinking skills. Masaaki says that the factors that determine the learning quality are: (1) the quality of the tasks assigned to the student or the lesson plan, (2) learning in the established relationship (dialogue and collaboration) and (3) liveliness, enthusiasm, cognition and student emotion [8]. The first factor is the quality of tasks assigned to students should be an interesting task for students that must be able to make students challenged to learn it because the material has a high level of difficulty. The second factor is learning in the intangible relationship that is dialogue is the keyword. Dialogue does not mean just communicating with other student, but when someone is faced with a challenge or subject matter and ultimately produces a self-thought and collaboration is a collaboration that intertwines among students to solve a problem by combining each other's thoughts. Collaborative learning has a positive effect on students' cognitive development. The third factor is the liveliness, the spirit, the cognition and the emotions of the students is what students learn at the time of the lesson, how the motivation and the spirit in the learning process. Based on the above background description, this study aims to determine the effect of didactic dialogue that occurs during the learning process in terms of collaborative activities and students' dialogue in improving the quality of learning.

2. Method
The research was conducted at one of the high schools in Bandung, Indonesia. The subject is 36 students of grade XI Science Program. The subject selection is based on advice from the chemistry teacher. Research method is qualitative descriptive. The lesson was videotaped and transcribed. From the transcript results, the student dialogue is analyzed which section shows the didactical dialogue and the collaboration among students in sharing task and jumping task activities. The research was conducted on the topic of factors affecting reaction rate.

3. Result and Discussion
Implementation of didactic design of collaborative learning sharing and jumping tasks on the topic of factors affecting reaction rates aims to improve the learning quality. Improving the learning quality is viewed from the dialogue and collaboration that occurs among students during the learning process. Therefore, the learning analysis and self-reflection based on the implementation of didactic design has been done. Lesson design collaborative learning sharing and jumping tasks are implemented in class XI
MIPA 2 with 36 students. Students are divided into 9 groups with each group of 4. Each group consists of 2 male students and 2 female students. Sato stated that studying together in small groups consisting of a maximum of 4 people is the most powerful means to stimulate learning [5]. The core activity consists of three activities sharing task that will be done by students in small group consisting of 4 people who in the group there are high academic ability as a leader.

In the initial activity, the teacher conducted a demonstration experiment on the effect of surface area on the reaction rate. In this demonstration activity, teachers first introduce the tools and materials used. Then the teacher invited students to dialogue interactively by asking questions during the demonstration. The teacher asks 2 students to come forward to do the experiment and the other students are directed to face forward watching the experiment. Here is a dialogue during the experiment demonstration:

03:18 Teacher: this can be seen by the result of the experiment, how is the difference?
03:26 S3: the one expands the one silent just bu.
03:30 Teacher: so which is the faster reactions?
03:34 SS: powder.
03:46 Teacher: Why are the powders faster?
03:56 S5: it's smaller shape
03:56 S4: Smaller particles bu
04:04 S6: easily dissolves as it is smaller

Based on the above dialogue students already understand that different sizes or particles can affect the rate of reaction, but students have not yet understood on the relationship of surface area. Students also have not been able to explain further why the difference in size or particle can affect the rate of reaction. In terms of attitude and spirit, during a practicum demonstration, student motivation looks high where students look interested in experiments performed by their friends.

Collaborative learning in small groups of sharing tasks can help students generate confidence and become a means of improving their academic ability. In activity sharing tasks seen that students have a high curiosity, mutual learning, sharing thoughts through communication that can build their own concepts in completing the task given. In small groups all students have the same learning rights without exception, demanding that each student participate in completing the assigned task. This can bring about a sense of responsibility and curiosity, communicative, mutual respect and confidence in conveying their thoughts. In line with Sato, learning activities are known as sociocultural practices through interactive communication that form active and collaborative reflective learning [5]. During the learning process the students are more active in discussing with their group of friends. Collaborative learning can stimulate and enable students to be active in meaningful learning. From the learning video transcripts it can be seen that students share their thoughts about collisions between particles that occur in two reactions that are affected by the surface area. The teacher did a classical discussion to confirm the effect of surface area on the reaction rate and the relationship between surface area and collision theory among the particles that occurred.

The second sharing activity is the experiment of the influence of concentration on the reaction rate. In this activity the students are directed to be able to design the experiment of concentration effect on the reaction rate in collaboration with the help of the teacher. Here's the dialogue that took place during the experiment design process:

01:14 Teacher: you write down what tools and materials are needed
01:54 Teacher: for the worksheet, do you already understand?
01:56 SS: yes
01:57 Teacher: For experiment 1, what tools do you need?
2:03 SS: Erlenmeyer, spiritus
02:23 S8: Third leg
02:56 S9: Balloons,
02:56 S10: CaCO₃ powder
03:01 Teacher: What materials are used?
03:01 S7: HCl 2M
03:04 S9: 1M
03:05 S11: 1M and 2M
03:15 S12: CaCO₃
03:28 Teacher: What other materials are used?
03:35 Teacher: there is a solution of HCl, CaCO₃.
04:27 S12: CaCO₃
04:33 Teacher: For experiment 1, what does the different?
05:11 S5: Concentration of HCl
05:16 Teacher: Now you are designing the first experiment procedure.
Here's the dialogue that happened to the boron group when designing the experiment:
05: 18 S1: So what is this erlenmeyer filled?
05:18 S2: HCl
05:18 S1: The concentration is the same or different?
05:18 S2: Different, one 1M and 2M second
05:28 S1: If the balloon content is the same as not?
05:55 S3: Different
05:55 S2: same one each containing 3 grams of CaCO₃ powder
05:58 S3: Why is the balloon contents the same?
05:58 S1: the experiment influence the concentration, so it's just a different concentration.

From the dialogue can be seen that the students are actively involved in sharing activities. Collaboration is created between teachers and students in solving existing problems, but it also creates collaboration among students in designing these lab activities. Student activity in the activities of sharing task 2 can be seen in Figure 1.

Figure 1. Student activity in learning process

The third "sharing tasks" task is to experiment with the influence of temperature on the reaction rate. This experiment is an anticipation of student barriers that can not explain the relationship of temperature to collisions between particles that occur. In experiment the influence of temperature to reaction rate. Students can clearly understand that if a reaction is carried out at high temperatures then the reaction rate is faster than the type of reaction carried out at room temperature. Students can also explain that when a reaction is done at high temperatures the particles move faster so that the reaction rate is faster.

In the activity sharing task 3, there is one group that get different results. Based on experiments conducted by the chlorine group obtained results that the reaction made at room temperature faster than the reaction done at a temperature of 50 ° C. This is in contrast to the concept of the effect of temperature on the rate of reaction, where as the temperature of a reaction rises, the reaction rate increases.

One of the students in the chlorine group felt strange with the results of experiments obtained by the group. The student told a group of friends that the reaction should be done at 50 ° C faster than the reaction carried out at room temperature. The student then asks for the results of the next group experiment. The dialogue takes place as follows:
41: 30 S1: it feels strange, it should be a faster heated one, but it is not heated even faster.
41: 45 S2: iayyah, or are we wrong in experimenting?
42: 00 S1: It's true the step of our experiment.
42: 05 S3: or indeed the reaction is not heated faster?
42: 11 S1: let me ask the other group
42:15 S1: aeni, how the results of your third experiment? Which reaction is faster?
42: 18 S4: My group's result is heated reaction faster
42: 22 S1: So it means my group result of the experiment is wrong.

Based on the above dialogue can be seen that students in the chlorine group feel strange with the results of the experiment. They are not convinced that the unheated reaction is faster than the heated one. Student 1 finally decided to ask the group next to her. Based on student activities we can know that there is interaction between students in groups and students between groups. It shows a collaboration between students in the learning process to solve existing problems. With the collaborative learning pattern the students are directed to not directly ask the teacher if they encounter difficulties but the students are directed to conduct discussions and collaborations with friends of one group or with other groups.

Based on the results of the learning transcripts, the overall collaboration that occurs on the students during the learning process looks good. Here are some pictures of collaboration activities that appear in the learning process. Activity listening to opinions and thoughts of friends is the beginning of learning activities. Each student listens to the opinions or thoughts of his or her friends who then think to each other deeply. Student collaboration can be seen in Figure 2.

![Student collaboration activities in sharing task](image)

**Figure 2. Student collaboration activities in sharing task**

Based on the results of the learning video analysis, students seem to work together well, help each other, learn from each other, and share their thoughts through communication to be able to build their own concepts by completing the assigned tasks. Students grow and show some characters such as respect for achievement, communicative, tolerance, caring, and curiosity. As Sato says, learning activities are known as sociocultural practices through interactive communication that constitute active reflective learning and collaboration [7].

4. Conclusion

Based on learning analysis and teacher self-reflection, collaboration and dialogue among students during sharing tasks on the topic of factors affecting the student centered reaction rate that facilitates the learning rights of each student, sharing occurs through collaborative dialogues among students or students with teachers. Through sharing activities can lead to collaboration among students and enhance
discussion among students to solve the problem. It is clear that didactical dialogue that occur on learning process is improve the quality learning.

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