The Influence of Teacher’s Conception of Teaching and Learning on Their Teaching Practice

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Abstract. The study aims to investigate the teachers’ conceptions about the teaching and learning and the influence on their practice. The subjects were two mathematics teachers who taught in the 7th grade junior high school students in Sukoharjo, Central Java with diverse mathematical ability. The data was collected through observation and interview. The triangulation was conducted to validate the data. Then, the data were analyzed using three stages, namely, data reduction, data display, and drawing the conclusion. The results showed that there were different teachers’ conceptions about the teaching and learning of the two teachers. The first teacher following the traditional model where he plays as a source of knowledge. The students are passive learners who receive knowledge from the teacher. In teaching practice, the teacher presents the material with the expository method. Learning emphasizes the student’s skills to operate the calculation. Conversely, the second teacher conceptions’ in line with the constructivist pattern where she plays as a facilitator and student guide in the learning process. The students are active learner where they discover the knowledge collaboratively. The learning activities involve group discussions and presentation. The results suggest that there is an influence on the teachers’ conceptions and their teaching practice.

1. Introduction

Teacher quality is the most important factor that influences the success of student learning [1]. The implementation of the 2013 curriculum (K-13) in Indonesia requires teachers who can play a different role than the previous curriculum. In the K-13, teachers must be able to change their roles from knowledge sources to become facilitators for students in discovering the knowledge. The learning approach must change from teacher-centered to student-centered. In addition, the teacher must also encourage students to change from passive learners to become active learners. In other words, the success of implementation of the curriculum is strongly influenced by the teacher abilities to play their role as required of the curriculum in teaching practice in the classroom.

There are various factors that affect the teachers in the teaching practice in the classroom. Researchers have been studying factors that affect the approach or strategy of teachers in classroom practice. Knowledge of the concepts of subject-matter is able to encourage teachers to use innovative learning approaches [2]. Teachers who have knowledge of the subject-matter, the understanding of the students, as well as instructional strategies are able to develop the cognitive abilities of students,
curriculum implement, and manage learning effectively [3]. Besides the knowledge, the conception of the teacher is also a factor that influences the teacher practice of learning in the classroom. According to [4], the conception of teaching and learning is the teacher beliefs about the proper ways or methods to implement teaching and learning. In this case, it also includes a conception of the role of teachers and students in the learning activities.

Although the teacher has the same knowledge as other teachers, it could be that the learning strategies used will be different. It would occur if the conceptions the teacher about the subject matter, teaching and learning are also different [5]. Teachers who have a conception that the teacher is a source of knowledge will tend to use traditional model or lectures in their learning. In this model, students become passive learner who only accepts what is conveyed by the teacher [4]. The learning process occurs in the traditional model is teacher-centered learning. Conversely, teachers who have a conception that the students must be active in the learning process tend to use learning that promote the students to think critically and work collaboratively. Knowledge in this conception can be obtained through discovering or inquiring process. Therefore, the learning process must be able to drive the student to discover knowledge. Such a model is referred to as a constructivist model (e.g. [4]).

Some studies have conducted research on teacher conceptions of teaching and learning [4], [6–10]). The results of the research indicate that the teacher's conception of teaching and learning influences how the teacher determines learning plan [8] and the strategies used by the teacher in learning (e.g. [4], [7], [9]). The study shows the importance of teacher conceptions regarding teaching and learning in relation to the learning strategies chosen by the teacher in learning. In addition, the study of teacher conceptions is also important to investigate the extent to which teacher conceptions have an impact on the implementation of the K-13 especially the learning strategies used by the teacher.

Based on the description above, the research questions are formulated as follows: 1) how is the teacher's conception of teaching and learning? and 2) what is the relationship between the teacher's conception and the teaching practice in the classroom? Based on the research questions, the purpose of this study is to investigate: 1) the teacher's conception of teaching and learning, and 2) the influence of teacher's conception on their teaching practices in the classroom.

2. Method
This research is a qualitative study with a case study design. The study was conducted on two teachers who taught grade VII at two different state junior high schools (SMP Negeri) in Sukoharjo, Central Java. The first teacher taught the students with high mathematics abilities (SMP Negeri 1 Mojolaban). While the second teacher taught the students with low mathematics abilities (SMP Negeri 3 Grogol). The score of the mathematics ability of VII grades students is obtained from the average mathematics score on new student admissions (PPDB) online in 2018 in Sukoharjo Regency.

The data is collected through observation and interviews. Each teacher was observed three times in algebraic material and followed by an interview. In the observation activity, the researcher uses observation guidelines and field notes to record important events that arise in learning. Learning activities are also recorded using videotape. The recordings are used to clarify the events that arise in learning activities with the results obtained in the observation guidelines and field notes. In learning activities, the teacher uses design and learning artifact that are arranged by themselves without intervention or request from the researcher. Thus learning takes place naturally in accordance with the habits of teachers teaching in class.

The interviews were conducted twice namely pre-observation and post-observation. Pre-observation interviews are conducted to investigate the teacher's conception of teaching and learning. The outline of the question in pre-observation interviews are as follows: 1) what do you think about the meaning of learning?, 2) what do you think about the meaning of teaching?, 3) what abilities should the students own after learning algebra?, 4) what is the best way for students to learn mathematics especially algebra to achieve the abilities as formulated?, and 5) what is the role of the teacher in the learning so that the students can achieve the abilities as formulated?
After the observations, the teacher is interviewed to clarify the events that occur in learning activities related to teacher learning strategies and student learning activities. The semi-structured technique is used to interview where the researcher determines the outlines the questions so that the interview is more focused on the information which wants to obtain. Furthermore, the data from observations and interviews were analyzed by comparing the data from the two techniques to obtain a pattern of relationships between teacher conceptions and classroom learning practices.

3. Results

3.1. A case of Mr. Dwi

Mr. Dwi teaches at SMP Negeri 1 Mojolaban which is a school with the average score of students mathematical ability is high. The average math score of grade VII students at SMP 1 Mojolaban in PPDB online in 2018 is 79,15. The score is the third highest score in Sukoharjo Regency in PPDB online in 2018. He has nearly 14 years of teaching experience. The education background of the teacher is a bachelor of mathematics education and a master of education administration. Mr. Dwi is a state civil servant (Aparat Sipil Negara) and has a professional educator certificate.

Based on the pre-observation interviews, Mr. Dwi has a conception that learning is a process of knowing something from before that is unknown. As he stated, "in my opinion, learning is a process that previously did not know then became known". His conception about learning more emphasis on the cognitive activity which is focused on "operate the calculation" or numeracy skills. It was shown on his statement about the student's abilities to be reached in learning algebra that is, "Operate the calculation in form of algebra which involves the summation, subtraction, division, and multiplication carefully". Mr. Dwi’s conception of the best way for the students to learn mathematics is similar to the previous. According to him, the effective way of learning mathematics is by practicing solve a lot of questions as he stated, "lots of practice to solve the algebra questions". His conception of the teacher role is a person who "transfer of knowledge" because the teacher is considered to have more knowledge about the subject matter than students. Mr. Dwi stated, "teaching is the process of transferring knowledge from people who have understood to the people who do not understand". According to him, a teacher can help students to achieve the abilities correspond to the learning objectives of the subject-matter by providing explanations and monitoring students in doing the assignments given.

Mr. Dwi's conception about teaching and learning is manifested in the teaching practice in the classroom. In learning, the teacher begins by explaining the material briefly followed by giving examples of varied questions (Figure 1). For example, in an operation of algebraic fractions, the teacher gives an example of solving a problem from a simple form to a more complex form as the following

\[
\frac{a}{4} + \frac{a}{5} + \frac{5a}{6} - \frac{a}{2} + \frac{5}{a} + \frac{2}{a} + \frac{a+2}{5} + \frac{3a+1}{3} - \frac{a+2}{5} - \frac{3a+1}{3}
\]

The teacher guides the students to solve examples of the problems systematically. Furthermore, the students are asked to write the examples that have been written on the board. The teacher said, "so that you are more skilled" the teacher asks students to work on the questions in the mathematics package book individually. Then, the teacher asks students who have finished working to write the answers on the board (Figure 2).

The classroom learning activities placed the teacher as a learning resource for students. The teacher presented the topic of subject-matter in the whole according to the curriculum. Then students recorded what the teacher wrote on the board. Thus the learning process that occurs is the transfer of knowledge from the teacher to students. This learning activity is consistent with the concept of teaching that is owned by the teacher. The emphasis of learning activities is on calculation skills which are involved arithmetic and algebraic form. This shows the tendency of teachers to bring the students to achieve procedural knowledge from the subject-matter. This is also in accordance with Mr.Dwi's conception.
that after learning algebra the students must be able to operate the form of algebra which involves the summation, subtraction, division, and multiplication carefully.

Figure 1. The teacher explains the material

Figure 2. Students write their answers on the board

The events that arise in learning activities are confirmed through interviews. Regarding the strategy of learning, Mr. Dwi said that the expository learning strategy was more effective in teaching mathematics materials in the curriculum. This is due to the material in grade VII of K-13 is quite a lot and the learning time is limited. In addition, according to the teacher, learning using active or creative learning models as recommended in K-13 requires a long time to implement. This resulted in limited time to present the entire material in the curriculum. In addition, the learning objectives so that students have the ability in solving problems are become difficult to be achieved.

Besides the time limitations, according to Mr. Dwi, students at SMP Negeri 1 Mojolaban prefer learning with the expository method and lots of practice in working on various questions. The use of learning models sometimes makes the students unable to understand the core of the material being studied. The use of media is also less effective because most students have been able to think abstractly. So, they are able to understand the material being taught without media or visual aids.

3.2. A case of Mrs. Marwi

Mrs. Marwi is a teacher at SMP Negeri 3 Grogol, a school with an average student's low mathematical ability. Based on the PPDB online in 2018, the average mathematics score of new students in grade VII in SMP Negeri 3 Grogol is 43.11. She has almost 8 years of teaching experience. The educational background of the teacher is a bachelor of mathematics education. She is also a state civil service and has a professional educator certificate.

Mrs. Marwi's conception about teaching and learning can be described from the results of interviews before learning observation (pre-observation interview). She stated that "learning is a process or effort of someone to increase knowledge and experience that can be useful in daily life". According to the teacher, learning is not only a process of seeking knowledge alone but also the process of developing one's own personal experience. The search for knowledge and development of one's experience would be useful for their lives both now and in the future.

Mrs. Marwi’s conception about the notion of learning consistent with his views on how to learn mathematics that is best for students to be achieved the learning objectives. She stated that the best way to learn is, "using the cooperative method, for example, the problem of base learning and concrete media. So that students can be directly involved in the learning process. Not just a textbook". Students, according to Mrs. Marwi must be active in learning, "students must be active in learning activities". The teacher’s conception of learning emphasizes the importance of the learning process for discovering knowledge. The collaboration model encourages students to share knowledge, for example, students who know or understand can explain to students who do not understand. Students can exchange opinions or ideas and ask questions to other students or teachers in solving problems.
The ability to cooperate and convey ideas is very useful for the lives of students both now or in the future.

Mrs. Marwi’s conception of learning is also shown by her opinion about the ability of students to be mastered after learning mathematical material. For example, she stated that the ability that must be mastered by students after learning algebra was "able to explain and understand the algebraic forms, solve problems related to the subtraction, addition, multiplication, and division of the algebra". There are three important points raised by the teacher deals with the abilities of students expected after learning mathematics, namely explain, understand, and solve problems. These three points show that the conception of learning of the teacher is not only encouraging the students to have skillful in solving problems procedurally but also able to explain and understand mathematical concepts and solve problems conceptually.

Furthermore, Mrs. Marwi put forward the conception of teaching in his statement that, "teaching is conveying information or subject-matter to students so that able to understand and apply the subject-matter that has been received". Teaching according to the teacher emphasizes the process so that students are able to understand and apply the material presented. Here, the understanding here is not only being able to solve problems procedurally but also being able to explain and understand mathematical concepts. In other words, students are driven to solve the problems using their conceptual knowledge. The role of the teacher in learning according to Mrs. Marwi is a facilitator and student guide as stated, "the teacher facilitates the students in delivering material. They also guide students who have difficulty in understanding the material ".

Mrs. Marwi’s conception about teaching and learning affects the teachers' activities in learning practices in the classroom, especially in determining the teaching strategies. The teacher uses cooperative learning models in presenting learning material. For example, in algebraic multiplication, the teacher uses colourful square and rectangular paper media that must be arranged so that it can illustrate the concept of multiplication of algebraic forms. Students in groups are given questions about the multiplication of algebraic forms. By using the media provided by the teacher, students are asked to determine the results of the operation of the algebraic multiplication and then to write it on paperboard (Figure 3). The next learning activity is that students are asked to present tasks that have been done in groups in front of the class (Figure 4).

Student learning activities in the class showed that collaboration in groups is useful to complete the tasks given by the teacher. Students discuss and convey problem-solving ideas in groups. These activities indicate that students are actively involved in the learning process. This is consistent with Mrs. Marwi’s conception about learning that students must be active and involved in the learning process. Furthermore, students are also given the opportunity to explain the results of a group with other students. According to the teacher, the ability to explain the topics learned to others is one indicator of the students understanding of the material. The role of the teacher in this learning activity is to become a facilitator so students can understand and master the subject matter. In addition, the teacher also clarifies the results of the student's work and guides students who have difficulty in completing the task.
After completing the learning, Mrs. Marwi was interviewed about the learning activities carried out. Regarding the learning strategy, she stated that "cooperative learning promotes the students more directly involved in working together. So some students easily understand the material. Other students are guided by peer tutors. Conversely, in the conventional method, the students only hear and write but they don't understand the material". However, she stated that not every learning is suitable for using cooperative learning models. The learning models are used to teach concepts at the beginning of the topic. While the problem-solving material more often uses the expository method and a lot of practice questions.

According to Mrs. Marwi, the use of relevant learning media is also very important to provide visualization of mathematical concepts so that to be more easily understood by students. She stated that "students are more interested in learning when using interesting media, such as colorful media". Students are more easy to understand the material if they taught using interesting media or props. Students will take longer to remember the concepts taught using media. When using the expository method, the teacher must explain the material repeatedly so students can understand the material.

Based on the description of the research results, the teacher's conception and learning practices in the classroom of the two teachers can be summarized as presented in Table 1 below.

Table 1. Summary of the teachers’ conceptions and teaching activities

| Teacher  | Teacher Conceptions                                                                 | Teaching Practice Activities                                      |
|----------|-------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Mr. Dwi  | Learning is processing to know                                                       | Explain the of subject-matter briefly                            |
|          | The goals of the students' learning are to have the ability or skills to calculate   | Provides examples to solve the questions systematically           |
|          | The best method to learn is a lot of practice or drill the problem or questions       | Provides exercises of questions with varying degrees of difficulty|
|          | Effective learning is individual rather than group                                   | Teacher-centered learning                                         |
|          | Teaching is a process transferring of knowledge                                       |                                                                  |
|          | The role of the teacher is helping the student by explanation and monitor the steps of students work |                                                                  |
4. Discussion

There are two models of teacher conceptions of teaching and learning, namely traditional and constructivist models [4]. In the traditional model, the teacher is viewed as a source of knowledge. Students are considered as a passive learner who receives the knowledge. The learning process places more emphasis on receiving information or knowledge from teachers or books. Whereas constructivist models emphasize learning in the process of active learning, discovery, and collaboration.

Based on Table 1, Mr. Dwi's conception is categorized as a traditional model. According to him, the role of the teacher is a source of knowledge by explaining the material to students entire and in detail according to the curriculum. In learning, students spent more time to take notes and solved questions. In other words, the learning approach is teacher-centered learning. On the other hand, Mrs. Marwi's conception can be classified as a constructivist model. According to her, the role of the teacher is as a facilitator and guides the student. In learning, the student's activities were a discussion in a group and presentation in front of the class. The teacher guides the discussion and presentation process. Her approach in learning is a student-centered.

The results show the consistency of the relationship between the teacher's conception of learning and teaching and their teaching practice. Teachers with traditional learning conceptions showed the learning characteristic of the traditional model in their teaching practices, namely teacher-centered learning. While teachers with constructivist learning conceptions also indicated in their learning practice, namely student-centered learning. In other words, the teacher's conception of teaching and learning influence their teaching practice. The results of this study reveal the empirical evidence the influence of teacher conceptions on classroom learning practices. It also confirmed the other studies (e.g. [7], [8], [10], [11]).

The results suggest that there is a different conception of junior high school teachers regarding teaching and learning. There are also different teachers strategy in teaching practice. In K-13, teachers are recommended to use the scientific approach in their learning. There are various learning models such as problem-based, discovery, inquiry, and project-based learning. The students in K-13 are expected to have the 4Cs abilities namely critical thinking, creativity, communication, and collaboration [12]. Therefore, the success of the implementation of K-13 is strongly influenced by the teacher conception about teaching and learning. As a result, teachers need to change their conception of teaching and learning to be able to implement K-13 successfully. However, it is not easy for teachers.

5. Conclusion

The results of the study demonstrate two models of teacher conception of teaching and learning, namely, traditional and constructivist. The teacher with traditional model states that the learning
processes to know, the goals of students learning is to have skills and the calculation abilities, the best
learn mathematics is by a lot of practice to solve the questions, teaching is a process of transferring
knowledge, and the role of the teacher is helping student by explanation and monitor the steps of
student work. Whereas the teacher with constructivist model states that learning is a process to
increase knowledge and experience, the goal of students learning is able to explain and understand the
subject-matter and solve the problems, the best method to learn is active learning which is students
involved actively in the learning process, effective learning is cooperative learning, teaching is
conveying information and matter to students in order to be understood and applied in daily life, and
the role of the teacher is as a facilitator in delivering material and guides the students. The results also
suggest that the influence of teacher conception and the teaching practice. The teacher with the
traditional model carried out teacher-centered learning and played as a source of knowledge. In
contrast, the teacher with the constructivist model performed the student-centered learning and played
as a facilitator or mentor in discovering knowledge.

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