Describing Soft Skills Attributes

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Describing Soft Skills Attributes of Senior High School Teacher in Mathematics Learning

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Abstract. The implementation of education in primary and secondary schools in Indonesia follows the standard process set by the government. One of the learning principles used is to balance between physical skills (hard skills) and mental skills (soft skills). Therefore, teachers have an impact in their role to develop students' soft skills. The purpose of this study was to describe the development of soft skills of a teacher in mathematics learning at SMA N Kertosono, Indonesia. The researchers as the main instrument with supporting instruments, observation sheets on the implementation of learning in class and interview guidelines. Credibility of data by using triangulation methods and data analyzed in depth to get a description of the soft skills development of high school mathematics teachers in learning. The results showed that the teacher developed soft skills in mathematics learning: (1) verbal mathematical communication, giving different intonations on the preferred mathematical object, pointing to the mathematical object in question, and marking by circling or boxing the mathematical object described; (2) problem solving, guiding students with coherent steps to begin to identify the things being asked, looking for possible answers by testing in detail, making detailed problem solving, checking the results of solving problems that have been done and concluding the answers generated; and (3) critical thinking, asking students to be careful, dare to give an assessment of the teacher's work, and dare to express opinions in learning.

INTRODUCTION

The implementation of education in primary and secondary schools in Indonesia follows the standard process set by the government. One of the learning principles used is to balance physical skills (hard skills) and mental skills (soft skills) [1]. This shows that the government has directed the learning process carried out towards developing soft skills. This is in line with the expression that teachers must change their learning approach from teacher-centered learning to student-centered learning [2]. The implementation of learning in the classroom has characteristics that are in accordance with the characteristics of students, teachers and materials. Each student has a learning speed and learning style that is most appropriate for him, applying the right learning for each student who has different characteristics becomes a formidable challenge [3]. So that in every learning that is applied the teacher must be able to provide an activity that can be accepted and understood easily by students and can bring up the hard skills and soft skills of students.

Schulz concluded that educators have a responsibility to train students' soft skills [4]. This indicates that a teacher can have a positive impact on developing students' soft skills. Teachers must provide soft skills attributes in the mathematics learning process. The teacher as an example for students, it is his nature to provide examples of soft skills

which are then transmitted to students through classroom learning. Soft skills are needed by teachers in learning, because with soft skills teachers can grow the soft skills of students. Soft skills can be transmitted through teacher behavior in learning. Likewise in learning mathematics, the soft skills of teachers can also have an impact in growing the soft skills students. Some attributes of soft skills that can be developed through learning by teachers are mathematical communication, problem solving, critical thinking, time management, stress management, and teamwork. The teacher's role is to develop themselves and be able to model good values to students [5]. In addition to teachers instilling concepts when learning, teachers must also be able to train students to be able to manage emotions and be able to become good problem solvers [6]. Therefore, it is time for teachers to develop their soft skills so that they can also provide examples of good values to students. The quality and ability of the teacher is the most important aspect in the achievement and ability of students [7].

The learning process cannot be separated from the activities made by the teacher, and the teacher's activities are also actually not fully accepted by the students, so the teacher must be able to develop learning activities [8]. Some of the soft skills that can be developed are communication, critical thinking, teamwork, and self-awareness [9-11]. From several attributes of soft skills that have been carried out in previous studies, the focus in this research is verbal mathematical communication, mathematical problem solving and critical thinking. Regarding mathematical communication, because the object of mathematical study is abstract, it requires its own skills in learning. In addition, mathematical communication is an important part of mathematics education [12]. Through communication, a person can convey ideas, clarify understanding related to the concept being discussed. Mathematical communication includes verbal and non-verbal communication. Furthermore, NCTM [12] also reveals the communication standards to ensure that mathematics learning activities are able to develop students' abilities are: 1) Composing and integrating mathematical thinking through communication, 2) Communicating mathematical thinking logically and systematically to fellow students, teachers, and others, 3) Analyzing and evaluating other people's mathematical thinking and strategies, 4) Using mathematical language to express mathematical ideas appropriately. When learning, the teacher's verbal communication appears when how the volume of the teacher's voice is, how the teacher gives various intonations which will be one way to make it easier for students to learn mathematics. The results of previous studies showed that the research subject underlined the mathematical object that was being delivered, gave a strong intonation and the subject's voice could be heard by all students in the class [13].

Another important thing in learning mathematics is about problem solving [12]. The teacher must be able to package the problem solving given so that students can become good problem solvers. This is also stated in the secondary school education process standards [14]. Problem solving is also one of the attributes of soft skills so teachers need to develop problem solving in the learning process. The indicators of the teacher's soft skill attributes for problem solving are (1) identifying the given problem, (2) making restrictions on the given problem, (3) determining alternative problem solving, (4) determining problem solving procedures, (5) determining the results of problem solving, (6) provide opportunities for students to make conclusions, and (7) opportunities for students to make suggestions/recommendations from the results of problem solving produced.

In the implementation of the learning process, problem solving activities are closely related to critical thinking. Every step of problem solving will include critical thinking [15]. This starts from the teacher to bring up critical thinking which is also one of the attributes of the teacher's soft skills. Furthermore, it can develop to foster students' critical thinking. Indicators of soft skill attributes in critical thinking are (1) assessment of students who can identify elements in the material being discussed, (2) assessment of students who can evaluate assumptions or allegations of the material being discussed, and (3) related assessments. clarity and interpretation of students' statements and ideas. Based on this background, the author describes the results of his research on the development of soft skills for high school mathematics teachers in learning.

Recently, several scholars have conducted research related to soft skills, considering that one must have a balance between hard skills and soft skills. Previous research has shown that the seven attributes of soft skills can be raised by prospective teachers and teachers when learning [11,16-18]. Teachers can elaborate the learning process through the development of their soft skills. The research that has been done mostly describes the emergence of soft skills without any confirmation to students regarding the emergence of these soft skills. This research will focus on soft skill attributes only for verbal mathematical communication, problem solving, critical thinking. This was also revealed by previous researchers, that the soft skill attributes that are often raised by teachers are these three things [19,20]. However, the difference is that in this study the researchers also described student responses and there was clarification regarding the appearance of soft skill attributes to students.

METHODS

This study used a qualitative research approach. A qualitative research approach with a descriptive type of research was chosen because it is relevant and allows to achieve the objectives set in this study. The purpose of this study was to describe the development of soft skills of mathematics teachers in learning in high school. Researchers reveal and obtain information on the development of soft skills of high school mathematics teachers in learning through direct observation in learning and in-depth interviews. Researchers explore the soft skills that are developed through expressions, speech, writing, and behavior carried out by subjects in learning mathematics. Researchers describe the data obtained based on actual facts.

The research subject is a mathematics teacher at SMAN 1 Kertosono, Indonesia. The reason for choosing this subject is the teacher who carries out face-to-face learning. The main instrument in this research is the researcher himself and there are 2 supporting instruments, namely: observation guide and interview guide. Observation guidelines are used to observe directly when the subject is learning, so that researchers will get an overview of the subject in developing their soft skills. The second research supporting instrument is the interview guide. The researcher used semi-structured interviews to reveal more about the soft skills development carried out by the subject in learning. Broadly speaking, interviews were conducted to obtain information on what the subject had done in developing soft skills in learning. Collecting data to reveal the subject in developing soft skills in learning, in the first stage the researcher made direct observations when the subject carried out mathematics learning in class. The implementation of the observations was also recorded with a camcorder in its entirety. Furthermore, interviews were conducted to confirm the results of observations and reveal things related to the research objectives in depth. Triangulation in this study was carried out by comparing the data from observations and interviews. After the data is credible, then data analysis is carried out with data reduction, namely categorizing the research data and then presented in accordance with the research objectives, namely describing the development of soft skills for high school mathematics teachers in learning.

RESULT AND DISCUSSION

The research was carried out by observing directly when the subject carried out face-to-face learning, so that it involved students who received learning. In addition to receiving learning, students also filled out a questionnaire as a comparison of data from the subject. The following is the development of subject soft skills in learning.

1. Verbal mathematical communication

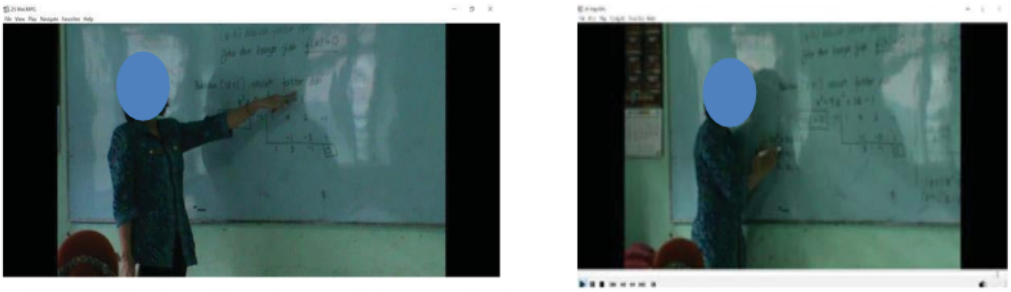

FIGURE 1. The subject shows verbal communication

Based on the results of observations, it appears that the subject gives different intonations on the preferred mathematical object. More than that, the subject also refers to the mathematical object in question. Subject indicates that will prove whether $(x + 1)$ is a factor of the given equation? The subject points to $f(-1) = 0, ax^2 + bx + c = 0$. The subject also gave a mark by circling the mathematical object being explained namely -6. The subject's voice is also very clear with a sentence structure that is easily understood by students. The following is an excerpt of interviews with research subject.

Researcher : Why do you say you will prove whether $(x+ 1)$ is a factor of a given equation while referring to the word factor?

Subject : oh, ya… I pointed to the word factor so that students' concentration was focused on what I explained.
Researcher : Why did you mark it by circling the number -6? Pointing $f(-1) = 0, ax^2 + bx + c = 0$.
Subject : Yes, because I want my students to really understand and pay attention to what I am explaining.

The results showed that the subject met the indicators of verbal mathematics communication in the learning process by emphasizing the important parts of mathematical concepts. Although the subject did not explain the new material, but only discussed problem solving, the subject emphasized the important part of the problem solving step. The emphasis is seen with the subject raising the intonation of the voice when asking whether $(x + 1)$ is a factor. The subject also gives a circle mark on the important part of the problem so that students pay more attention to the part indicated by the subject. The way the teacher speaks in a high tone will make students more attentive and can increase student involvement in the learning process. So that students will increase their activities to be able to pay more attention to the teacher in the learning process. In accordance with the results of other studies which also revealed that students' attention can be drawn by using high voice intonation [21]. This is in line with the results of Hidayati's research [13]. The research subject underlines the mathematical object being delivered, gives a strong intonation and the subject's voice can be heard by all students in the class.

2. Problem solving

The subject provided a factoring material problem and can be solved by identifying the algebraic form first.

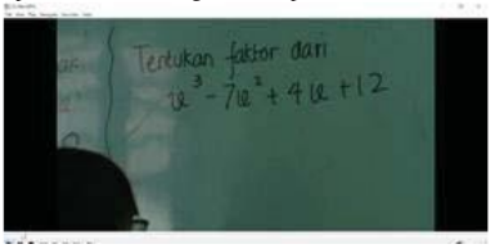

FIGURE 2. Subject gave factoring problem

Based on the results of observations, it was shown that the subject seemed to be giving students problems to determine the factors of $x^3 - 7x^2 + 4x + 12$ using Horner's rule. Next, the subject asked students to solve the problem by first identifying the ones shown in Figure 3.

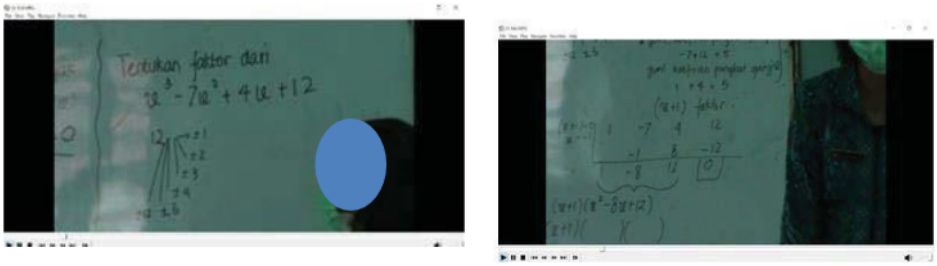

FIGURE 3. The subject asked students to identify way to solve problem

The subject gave the students some time to try to finish. The subject trained students to identify possible factors of $x^3 - 7x^2 + 4x + 12$ by finding the factor of 12. Next, the subject guided students to add up the coefficients of polynomials, is it equal to zero, if not, then $(x - 1)$ is not the requested factor. The next step is to find the number of coefficients to the even and odd power, if the numbers are the same, then $(x + 1)$ is the factor we are looking for. Because $(x + 1)$ is a factor, the subject invited students to look for other factors using Horner's rule. It can be seen in the next picture that the subject gives students an alternative, they may directly use factoring or keep Horner's rules to look for other factors. Subjects with coherent steps invite students to begin to identify the factors they are looking for and are very clear. Next, the subject guides students to find the final result as shown in Figure 4.

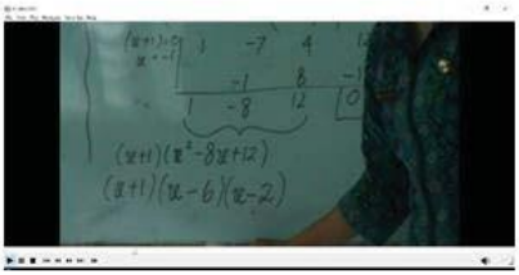

FIGURE 4. Subject found the result of factoring

Subjects guide students with coherent steps to begin to identify the things being asked, look for possible answers by testing in detail, make detailed and very clear problem solving, examine the results of solving problems that have been done and conclude the answers generated so that students can follow learning well. The subject hopes that students can solve other problems given at least with the steps that have been conveyed during learning. This is also supported by the following interview excerpt.

Researcher : What do you think that is the way to invite students to solve the problems you give?
Subject : Because this is my first-time giving Horner's rule material, I feel the need to help students first. My hope is that when I give another problem, students can solve it by at least following what I have said.

The results showed that the subject met the attribute indicators of problem solving soft skills. This can be seen with the subject inviting students to identify the given problem, making restrictions on the given problem, determining alternative problem solving. The subject suggests completing the Horner way first. The subject gives time for students to try out the possible factors resulting from the algebraic form. The subject step is to provide opportunities for students to experiment with possible factors with the aim of making students able to solve problems with their own thinking. The subject must think of several alternative answers or students' thoughts when solving problems. Therefore, the subject must be able to give students the freedom to choose problem solving strategies [22]. Subjects also met other indicators of the soft skill attribute of problem solving, namely determining problem solving procedures, determining problem solving results. The problem solving process carried out by the subject was carried out with a systematic approach. This can be seen from the subject's activities starting from identifying what is known, choosing the appropriate method to finding results. Solving this problem systematically, will make the learning outcomes obtained by students increase [23].

3. Critical thinking

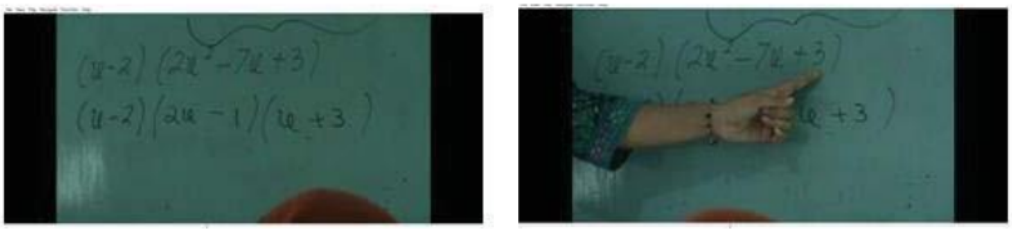

FIGURE 5. Subject posed questions each through the solution steps

It can be seen in Figure 5, the subject wrote down the factor of $2x^2 - 7x + 3$ is$(2x - 1)(2x + 3)$. After that, the subject asked the students to check whether the written answer was correct? The subject tried to help the students by pointing to the number 3 and saying it was positive for 3, and the students were given time to re-examine the answers to the factor $2x^2 - 7x + 3$ that had been written by the subject.

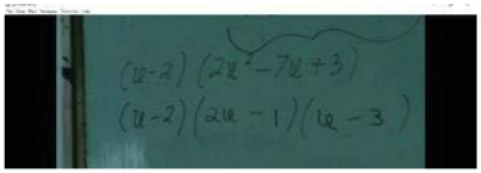

FIGURE 6. The final result of problem solving

After that, one of the students answered that the factor was $(2x-1)(2x-3)$. The subject then gave the opportunity to the student to explain the answer given. The student then explained that it was a multiplication of 1 and 3 because both min means the result is positive 3. If the previous one was min 1 and positive 3 the result was min 3. Thus, I think the factor is $(2x-1)(2x-3)$.

Subjects give appreciation with good words to students who answer correctly. Subjects develop critical thinking in learning by asking students to be careful, dare to give an assessment of the teacher's work, and dare to express opinions in learning. Subjects will also give additional points to students who actively ask and know answers during learning. This is also supported by the following interview excerpts.

Researcher	: What did you think of asking students to check the answers you wrote on the board earlier?
Subject	: At first I wanted to make sure that the students paid attention to what I said, so I made the wrong answer first.
Researcher	: Then?
Subject	: I want to train students to have the courage to correct my answers, it was not easy at first, so I tried to give instructions first, so that students can easily understand which ones should be corrected.
Researcher	: After there are students who dare to give corrections like this, what do you think next?
Subject	: I always have my own notes, and I will add points at the end to students who dare to give responses, not only in the form of correcting answers, but also those who dare to give answers, responses as well as questions during learning.

Based on the results, the subject meets the attribute indicators of critical thinking soft skills, namely the subject of assessment to students who can identify elements in the material being discussed by giving praise to students. The subject gives students the opportunity to evaluate the assumptions or conjectures of the material being discussed, this can be seen from the subject letting there be wrong answers on the blackboard and asking students to look at the wrong things and asking students to correct them. Subjects also gave rewards in the form of additional points to students who were active in class. Here, the subject becomes a good observer and assessor for his students. Subjects must provide motivation to be able to suppress students' negative attitudes [24,25]. Subjects are also able to overcome problems in learning. Solving learning problems by identifying mistakes made by students when solving math problems, encouraging students to think critically and assessing the solutions that students produce [26].

The development of soft skill attributes of the subject in the form of verbal communication, problem solving and critical thinking in high school is in accordance with the characteristics and psychology of high school students who have reached the level of formal operational thinking [19,27]. Other soft skill attributes also need to be further developed so that learning can produce students who have good soft skills and hard skills.

CONCLUSION

This research found the way of teacher in developing soft skills in mathematics learning. For verbal mathematical communication, the teacher gives a different intonation on the preferred mathematical object, points to the mathematical object in question, and gives a sign by circling or marking a box on the mathematical object being explained. For problem solving, the teacher guides students in coherent steps to begin to identify the things that are asked, look for possible answers by testing in detail, make detailed and very clear problem solving, examine the results of solving problems that have been done and conclude the answers generated so that students can follow learning well. The subject hopes that students can solve other problems given at least with the steps that have been conveyed during learning. For critical thinking, the teacher asks students to be careful, dare to give an assessment of the teacher's work,

and dare to express opinions in learning. Subjects will also give additional points to students who actively ask and or answer during learning. The researchers recommend that further research can be explored each soft skill attribute in the learning process and can be provided an assessment of the soft skill attribute.

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