Constraints of high school mathematics teachers in teaching distance and angle material in three dimensions

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Abstract. The study aims to describe the obstacles of high school mathematics teachers in teaching the distance and angle of the three dimensions materials. This research is a descriptive exploratory study with a qualitative approach. We collected the data using interviews and questionnaires. The subject was 11 mathematics teachers of SMA, SMK, and MA in Semarang City and Demak Regency. The data was analyzed by looking for themes and determining inter-theme relations to gain an understanding. The findings are as follows. First, obstacles faced by mathematics teachers to teach the distance and angle of the three dimensions materials are teachers’ limited professional competence, students’ difficulties in understanding the concept, students’ difficulties in thinking, and the need for proper learning media. Second, some efforts made by teachers to overcome and expect obstacles happened namely discussing problems with other senior teachers, preparing and learning the materials that require special attention, using visual media, provides exercises with many types, close to psychology with students, and testing various proper teaching models and methods of three-dimension materials.

1. Introduction
Mathematics is one subject that must be studied both from elementary school level to high school level. Mathematics is an abstract object, but it is a pillar of knowledge relevant to various sciences. Mathematics learning is divided into several branches of material such as; arithmetic, geometry, algebra, trigonometry, calculus, and statistics. The status of a country’s development as measured by the Human Development Index showed that there is a positive relationship between students’ academic achievement and the quality of how the teachers teach the students[1]. Therefore, the need for good cooperation between teachers and students so that learning objectives can be achieved.

In implementing learning, not everything can go according to the plan that has been designed by the teacher in the Lesson Plan (RPP). The factors can come from the teacher himself or the students. One obstacle that is usually experienced by the students is that they feel difficulty in understanding mathematical concepts. As a result, they constrain the teachers to convey the advanced concepts, so that the allocation of the time needed becomes much more and the learning process becomes less effective and efficient. But if those obstacles are not immediately resolved, it will affect the next material that requires the preconditions of the concept.

Geometry is one branch of Mathematics this is not only related to mathematics but also science beyond mathematics, which is easily connected with everyday life [2]. The focus of teaching geometry
is enable students to overcome real-life problems through the construction of knowledge and not just be recipients of information[3]. The Computer-Based National Exam (UNBK) result of High School on Science Department 2019 in Semarang City showed that the percentage of the students who correctly answered the Geometry and Trigonometry test was the lowest when compared to the other 3 test materials, that was 44.16[4]. The UNBK results of Vocational High School in Semarang city, the UNBK results of High School in Demak Regency, and the UNBK results of Vocational High School in Demak Regency consecutively were 32.57, 34.10, 30.25. Based on these results, it is necessary to conduct an evaluation and improvement in geometry learning. Some difficulties faced by students were not fully mastered the concepts related to problems and concepts related to geometry[2]. The concept of mathematics is a basic thing that must be understood so that mathematics is not just a calculation of numbers and formulas.

Based on the research, some errors made by students in answering three-dimensional questions: 1) misunderstanding the concept of the position of two crossing lines, the position of two intersecting lines, the concept of two points distance, the distance from point to line, the distance of point to the plane, the distance of two crossing fields, and the distance of two parallel fields, 2) the difficulty of understanding the concept of angles with angular conditions between lines cut through the plane and angles between two intersecting fields, and 3) operating and analytical errors in understanding the geometric conditions that are asked so they draw the wrong conclusions[5]. The development of spatial thinking skills through teaching geometry and spatial sense needs to get more attention. This is in line with Bishop who stated that “geometry is not the study of proofs! Geometry is the study of spatial relationships that can be found in the three-dimensional space we live in and on any two-dimensional surface in this three-dimensional space” [6]. This statement means that geometry contains not only proof but also spatial relations in three dimensions. Although the three dimensions have been taught, the reality shows that the material is not exactly mastered by the students. There are still many students who have difficulty learning the Three Dimensional, especially at the high school level. The difficulties of students learning because of lack of motivation led to a lack of understanding of mathematical concepts and difficulty in solving Mathematical problems [7].

Geometry discusses the relationship between points, lines, planes, and solid figures and things that arise because of the correlation of lines and fields, such as angles and distances. The development of mathematics teaching in geometry impacts logical reasoning that has not yet been achieved because it is fragmented by less systemic geometry. The impact is the lack of mastery of three-dimensional geometry at various levels. We can see this from the results of the Mathematics activities in implementing TNA (training need assessment), assessment, monitoring and evaluation reports on implementing training and experience of the lecturers in carrying out training and communication activities between teachers and lecturers. The Center for Development and Empowerment of Educational Educators and Personnel (PPPPTK) in carrying out their duties and functions refers to the three main pillars of the Ministry of National Education: 1) Fair distribution and expansion of educational access; 2) Quality improvement, relevance, and competitiveness; 3) Strengthening governance, accountability, and public image to be a smart and competitive Indonesian people. An example of the results of P4TK activities is, in the development of standard tests, calculating the distance between two lines in a particular cube was answered correctly only by 16.7% of the 193 mathematics teachers from 11 provinces[8].

The teachers must have pedagogical competence, personality competence, social competence, and professional competence[9]. Professional competence in mathematics teachers is mastering conceptual and procedural knowledge also their interrelationships in arithmetic, algebra, geometry, trigonometry, measurement, statistics, and mathematical logic[9]. Whereas Mathematics Teacher Competencies in SMP/MTs, SMA/MA, SMK/MAK, among others, use the concepts of geometry, use the concepts of calculus and analytic geometry. Adolphus [10] said that Problems of Teaching and Learning of Geometry in Secondary School are the foundation of most mathematics teachers in geometry is poor, the students cannot solve problem although similar examples are given, the teaching and learning environment is not conducive (lack of infrastructures and basic facilities for learning), altitude of
students towards learning is very poor, they lack the willingness and readiness to learn, the teachers lack commitment due to lack of motivation.

The research conducted by [11], high school mathematics teachers have various motivations that are influenced by intrinsic and extrinsic factors. These intrinsic factors are teacher knowledge, experience, quality in teaching, and job satisfaction. There are 13 aspects of core competencies of mathematics teachers, one of which is the competence to use the geometric concepts. Mathematics subject especially space geometry gives contribute to developing reasoning and communication skills, besides developing the students’ spatial responsiveness and solving various problems in space geometry.

After the teacher knows the difficulties faced by students, they can consider these difficulties to make improvements in the learning process or remedy teaching. Some researchers have discussed the difficulties faced by the students when studying geometry material, but no one has examined the difficulties of learning geometry from the teacher’s side. Based on research, teachers lack the aptitude to connect geometry with real-life situations; difficulty processing knowledge of geometry; and lacks basic geometrical knowledge, expertise and logical thinking skills[3]. The strategy that has been applied by several teachers to solve the obstacles when implement continuing professional development (CPD) in disadvantaged areas is to add insight by searching for literature to increase knowledge, asking fellow teachers who have more knowledge and experience[12]. Because many teachers who have difficulty in teaching materials Three Dimensional Geometry materials so, it is necessary to research “The Constraints of High School Mathematics Teachers in Teaching Distance and Angle Materials in the Three Dimensions”.

2. Research Methods

In this study, we used a descriptive analysis with a qualitative approach. Researchers choose a qualitative approach to analyze ongoing phenomena and describe systematically, accurately, and openly about the object under study. We collected data from respondents through interviews and questionnaires. To ensure the validity of the data obtained in this study, researchers conducted more careful and continuous observations, triangulation of data, and references used. This study uses a qualitative approach using phenomenology, to describe and find some constraints faced by high school mathematics teachers in teaching material about distance and angle in three-dimensional. The population in this study were high school mathematics teachers in Semarang City and Demak Regency. The sources of the data were 11 high school mathematics teachers in Semarang City and Demak Regency. Semarang was represented by seven teachers and Demak Regency was represented by 4 teachers. These schools are SMA Al-Uswah Semarang, SMK Ibu Kartini Semarang, SMA Ibu Kartini Semarang, SMA 9 Semarang (2 teachers), SMK Ashkhabul Kahfi Semarang, SMA 2 Ungaran, SMA 1 Gubug, MA NU Demak, SMA 1 Demak and SMA 1 Karangtengah.

In the early stages of the research, the researcher has done a selection of the problems that was analyzing the difficulties in high school teachers to learn the material of distance and angle in the three dimensions. The researcher compiled a questionnaire research instrument based on a literature study and developed it to find out information about factors that could allegedly be the cause of difficulties for teachers to teach three-dimensional geometry to students and efforts that would be used by the teacher to solve the problem. Data on interviews and questionnaires were then reduced and presented in tables and their subtitles were searched in relatively small groups. Furthermore, the researcher searches for the theme in each subtheme. According to Sugiyono [13], data reduction is the process of selecting and simplifying data such as summarizing data, coding, searching for the themes, and creating clusters.

Data analysis was done by determining the relationship between the themes to gain the understanding using the Bogdan & Biklen model [14]. Bogdan & Biklen said that the qualitative data analysis is an effort carried out by working using data, organizing the data, sorting it into manageable units, synthesizing it, finding the patterns, discovering what is important and what’s learned and deciding what can be told to others. The presentation of the data carried out after the data reduction
process was completed and it was obtained in the form of combining the information that has been obtained in the form of narrative text by presenting the questionnaire results and discussing the data through comparing and looking for the similarities. A theory that is related to the interpretation of the researcher towards the answers of the informants is also presented. The final step of the research process was the step of drawing conclusions according to the observation and the data obtained.

Data collection in this research was conducted for seven weeks, two weeks in November 2018, two weeks in December 2018, and three weeks in June 2019. In this research, the researcher as the main instrument. Interpersonal relationships are used to gain an understanding of teachers’ obstacles in teaching distance and angle material in three dimensions. Distance and its teaching-learning process in this case including the concept of distance between two points, a point and a line, a point and a plane, two parallel lines, a line and a plane parallel to that line, two parallel planes, and two crossing lines. Angles in three-dimensional spaces include the angle between two lines, the angle between lines and fields and also between two fields.

3. Results And Discussion

According to the interviews that had been conducted, we grouped them according to the two themes which are the interview material that had to be checked again, then subtracted and searched for sub-themes. After that, the conclusions which got by connecting the themes. From the results of the interview in this research, the researcher found two themes to find out the difficulties faced by mathematics teachers in teaching the material about distance and angle in the three dimensions, (1) the obstacles; and (2) efforts to overcome the obstacles. We present each theme as follows:

3.1. Obstacles in Teaching Distance and Angle Materials in Three Dimensions

Students have learned various basic geometry objects, such as points, lines, planes, and a solid figure. In secondary schools, the level of difficulty in the material is increasing, and the scope is getting wider. In learning geometry, it aims to develop the ability to understand concepts and reasoning, develop students' spatial responses and solve various problems. Even though the 2013 curriculum had been implemented that’s obstacles were unavoidable. All teachers state that they often experience obstacles both in terms of teacher professionalism, the ability of students, and supporting facilities.

The informants including beginner teachers (the teaching experience is less than five years) experienced limitations in developing the competencies of teacher professionalism, such as to master the teaching material. Teachers who have more experience in teaching will easily manage the learning process and improve professional competence. All the informants here are still honorary teachers, so it is still rare or even never attended the material training and training about the 2013 curriculum. However, because of they still young so, the desire for learning is still high and being creative to do innovation in learning. The positive impact is that it can improve the academic quality and the ability of students sustainably.

The teacher has difficulty making students imagine the distance formed in the three dimensions. When students work independently, they are confused in deciding what steps to do to find the distance asked, so in working on the problem there must be a trick-step that will be used. It occurred the diverse reactions of the students when they did not understand the material; indifferent students ignored the teacher when he taught the material, there were students that responsive to ask questions, some of them were waiting for the teacher’s response to ask something, and the students that were confused so they wanted the lesson ended soon. When the students experienced those obstacles in learning, the students usually tend to think all the material in mathematics lessons is difficult and unpleasant. As a result, students only accept what the teacher says without an initiative to ask. This caused some difficulties for the students to an abstract distance and angle in three dimensions, especially when presented in a two-dimensional image.

Lack of a proper understanding of the concept and the weakness of material prerequisites is one of the fundamental factors of the difficulty to teach distances and angles in three dimensions. When students are asked to work on more complex questions, such as determining the distance between the
plane and plane in the three dimensions, the students experienced the difficulties. These difficulties include determining what strategies we should use, determining the concepts needed and determining the steps that must be done first in solving the problem. Especially if the solution must determine which is a line perpendicular to the plane in the three dimensions. This is not something easy for students when they do not understand the basic concepts. Because, to determine a distance, the students must first look for elements perpendicular to each other. As a result, the interest, enthusiasm, and motivation of students to understand the material are reduced. Lack of interest in learning activities caused by students’ views of distance and angle material on the three dimensions is less useful for life.

Appropriate learning models and media are needed so, it can expect the difficulties of the students and help teachers to teach distance and angle material. Teaching media using props may be needed to embed the basic concepts of geometry. This is following Van Hiele’s theory in learning geometry to reach a higher level, students must master the material at the previous level. The use of props is not the only basic step to understanding the material, but the teachers can also use other interactive media such as PPT, flash media, and Geo Gebra applications. Common obstacles in learning the three-dimension are divided into two. If there is a picture of the three dimensions, the students do not understand the relationship between points, lines, and planes. When they are given the conditions that must be done, students are less skilled in drawing up the three dimensions according to the conditions or needs. The following are some examples of teachers’ statements that support the theme of the causes of obstacles in teaching.

"It is very difficult to ask the students to imagine the distance formed in three dimension, and when the students work independently they are confused in determining what steps that they should take to find the distance asked, so in working on the problem there must be a fishing pole steps to be used "(Teacher 1)

"The low motivation to learn causes difficulties to the students in understanding the material and applying the existing formula ..." (Teacher 3)

"The difficulties faced by the students arise when they had to solve the problems that require more reasoning" (Teacher 6)

"To facilitate the teaching-learning process about distance and angle through interactive PPT, I need an LCD, but it is not available yet in each class and the portable LCD is limited so it is often used for other subjects" (Teacher 8)

"I just have started teaching for two years so I have never attended training in curriculum or material training." (Teacher 9)

"In my opinion, children are more difficult to imagine how the intended form and the KD used by our school only discuss distance, but at the time of the National Examination there appeared three-dimensional angular material ..." (Teacher 11)

| No | Sub-theme                                                                 | Relation between sub-themes                              |
|----|---------------------------------------------------------------------------|----------------------------------------------------------|
| 1. | The teaching experience is still few, so the mastery of the material is not too good. | Limitations of teachers' professional competencies to master the material |
| 2. | Difficulty conveying material.                                            |                                                          |
| 3. | The teacher has not received the 2013 curriculum training and material training |                                                          |
| 4. | The difficulty of arranging alternative contextual learning related to the use of distance and angle in three dimensions. |                                                          |
| 5. | Students have difficulty understanding the material and applying the formula to the problem | Students have difficulty understanding the concept |
| 6. | Students have difficulty finding the initial concept.                     |                                                          |
| 7. | Students cannot work on non-routine questions                              |                                                          |
| 8. | Motivation and interest of students to learn and follow learning well     |                                                          |
9. Students have difficulty reasoning material related to images
10. It is difficult to make students imagine the distance formed in three dimensions
11. Difficulty understanding the geometry objects because of process reasoning abilities of students in the object image
12. The need for learning media assistance using LCD, but each class is not yet available LCD
13. The need to use props to build space to embed the concept.

3.2. Some Efforts to Overcome The Teacher’s Obstacles in Teaching Distance and Angle Materials in the Three Dimensions

Based on some obstacles faced by teachers in teaching the material about distance and angle in three dimensions, we need several efforts to reduce and overcome the obstacles that arise. For instance, by exchanging ideas with the senior teachers or with the teachers who have already attended the training. The goal is to get advice on how to understand the characteristics and how to convey the correct concepts to students in the teaching process. Teachers are expected to be inspired to create an interesting learning process, and the learning objectives can be achieved well. Evaluation and reflection at the end of each meeting are needed so that the teacher can improve the quality of his teaching. Although each student has different reasoning abilities, at least the teacher can bridge every level of ability of the students.

The first attempt made by the teacher when giving daily problems is asking students to imagine our position in a cube or block room. It allows the students who do not understand the material, to ask the teacher because of shame, fear, and worry that what will they conveyed is wrong so that other friends will laugh at them. Learning with the discussion method is needed. The teacher already knows various learning models that can be used in mathematics learning, but not all of them are suitable to be applied in three-dimensional material. In choosing the teaching strategy that will be used, various things must be considered by the teacher. These considerations include material characteristics, characteristics of the students, and the learning objectives. Most teachers prefer to use discussion learning model, Contextual Teaching and Learning (CTL) and Problem Based Learning (PBL) as the media, because the model is easy to understand, favored by the students, so learning becomes more active when it is compared using the lecture method in which the teachers talk more and students become passive. Teachers are said to have excellent teaching skills if they can choose models, strategies and teaching-learning methods appropriate to the material characteristics and the characteristics of students.

Table 2. Results of Reduction related to Efforts to Overcome The Teacher’s Obstacles in Teaching Distance and Angle Materials in the Three Dimensions

| No | Sub-theme | Relation between sub-themes |
|----|-----------|-------------------------------|
| 1  | The teacher asks for advice from senior teachers and who have taken part in teaching training to overcome obstacles in the classroom | The teacher makes various efforts to overcome the obstacles of applying distance and angle material. |
| 2  | The teacher prepares the material carefully and studies the parts of the material that need special attention. |                              |
| 3  | Teachers need a psychological approach so students dare to ask questions |                              |
| 4  | The teacher needs to try and test various models and learning methods that are in accordance with the three-dimensional material. |                              |
When the students have been explained about the material but they still do not understand the material, the teacher will repeat the basic things or prerequisites needed. In the next stage, the teacher gives quizzes, practice questions and other forms of questions that are not routine. The students are also given the task to draw up the three dimensions (beams, an irregular triangle pyramid, regular rectangular pyramid, four regular planes, and three rectangular perpendicular limas) independently. Some examples of the teacher statements support the theme of efforts to overcome the obstacles in teaching the material about distance and angle in the three dimensions as follows.

"The students that I teach dislike the classroom atmosphere that’s too focused but they prefer learning with humor but does not leave material” (Teacher 2)
"... by using a variety of teaching-learning models children are more interested in learning, with group discussions the children become more open to expressing their opinions when experiencing difficulties, and using learning media such as PPT.” (Teacher 4)
"... asking the students to understand an image by explaining slowly so that students can imagine and appear in children's abstraction” (Teacher 5)
"The effort that I have taken to overcome this problem is that each group is assigned to make three dimension props from iron wire, or wood and bring colorful threads to make lines or fields which they know if students have begun to determine the distance or angle, slowly the three-dimension props began to be abandoned, and students began to practice working on the problem by drawing up the three dimensions that they know on the paper.” (Teacher 7)

3.3. Discussion
In learning activities, the teacher is a determining factor in how students will gain knowledge, experience, and skills. In reality, we cannot avoid obstacles that might arise in the learning process. Therefore, we need efforts to reduce and overcome the obstacles that arise. Because not all the teachers have received training so they need discussions with teachers who have often taken part in training and are more experienced. The aim of that activity is the teacher can get a lot of additional knowledge, including knowledge of teaching methods that have just been developed in the world of education. Other supporting factors also influence the knowledge of students. Prospective teachers must be careful of challenging geometric concepts so they can provide students with a better understanding of concepts. The professional competencies of high school mathematics teachers in Kuantan Singingi District, Riau has a greater influence on students’ learning motivation than pedagogic[15]. Based on the results of research on the obstacle of mathematics teachers, pedagogical competencies and professional teacher competencies are more dominant.

The results of the study showed that measuring the ability of prospective teachers using geometric concepts shows that some teachers have a limited understanding of concepts [16]. Therefore, it is necessary to improve the performance by adding textbook references and getting used to non-routine questions. Although the non-routine problems sometimes led to students dissonant (a person feel any inconvenience)[17]. Teacher must mastering the concepts, structure, and way of thinking the field of the subject matter, especially geometry[18]. According [19] which discussed the perception of the difficulty of learning geometry concepts in mathematics for high school students in Ekiti State, Nigeria stated the reasons the students feel difficulty in learning geometry is the teacher teaching methods (33.40%), unavailability of teaching materials/allocations insufficient time (27.00%), students gender (12.00%), complexity (16.80%), concept misunderstanding (10.80%). Learning difficulties are conditions in the learning process that are characterized by certain obstacles in achieving the learning outcomes. The students have a good ability to understand the geometric concepts if they can provide examples and non-examples of a concept, develop the necessary and sufficient requirements of a concept, and choose procedures.

Teachers who are unsure of their own ability to teach geometry will have fewer possibilities when deciding about using the teaching approach [3]. Teachers need a deep understanding of all aspects of geometry so they can present and explain geometrical concepts and show how they relate to other mathematical topics. To understand and solve problems related to the angle and distance, the students
must have many basic competencies. The prerequisites knowledge which needed to master the angular problems in a dimensional space are three of them: students can use special characteristics that apply in the certain flat shapes, determine the relationship position between points, lines and plane, determine lines parallel to the line perpendicular, and can use the Pythagorean theorem and the concepts of trigonometric comparisons and basic formulas. Whereas to master the problems related to distance, students must have the ability of prerequisites such as using special characteristics that apply in plane, determine the relationship position between points, lines and plane, determine the projection of a point of a line, determine the projection of a point in the plane determine line projections in a plane, and can use line conditions perpendicular to the plane and implications of the perpendicular lines of the plane.

Mason et al. in [19] revealed some factors that influenced difficulties for the students in learning geometry, include: lack of evidence by the students, lack of prerequisite knowledge, low reasoning skills in geometry, an understanding of the geometric language usage, lack of visualization skills, the teacher’s teaching methods, unavailability of teaching materials, lack of evidence by students, and gender differences. In solving the distance problems, the initial presentation can use a complex problem context and not easily solved. But the important thing is to provide an understanding of which one is the distance and why it needs to be calculated. In solving the problems to train the ability of students to look for strategies, such as solving the problem into simpler parts.

The geometry of the three dimensions studied by students is abstract so that students have difficulty in understanding three-dimensional geometry material. The students who have not been able to understand the basic concepts will be constrained to the next concept, even an error occurs when answered test questions. Students who lack understanding ability will find it difficult to develop concepts so the teacher must always encourage them. The impact is on students’ motivation and their interest in learning. Students are difficult in doing reasoning if the material related to images, difficulty in imagining or imagining distance formed in three dimensions, and difficulties in understanding geometric objects that are influenced by planting students’ reasoning abilities on object images. Mathematical reasoning is drawn logical conclusions, provide explanations with models, facts, traits, and relationships, expect the answers and process in searching the solutions, use patterns and relationships to analyze the mathematical situations, compile and study conjectures [20]. Therefore, if the teacher improves pedagogical competence and professionalism, the difficulties of students in understanding concepts and reasoning can be overcome properly.

The teachers’ mastery of teaching material to be delivered is a determinant factor of successful learning. One of the basic teaching skill components is the ability to master mathematics content[21]. The teacher needs to prepare the material and study the parts of the material that need special attention. Even though the teacher understands the material outside the head, the teacher must keep reading the teaching material before teaching as the preparation stage. Rereading the material encourages the teacher to prepare the other supporting things related to the material. If the teacher does not master the ways to prepare and plan good teaching, the result is that the teaching target cannot be achieved optimally.

Findings of Sunzuma’s research[3], show that the main challenges were lack of geometry content knowledge, lack of understanding of learning approaches, lack of competence and confidence in teaching geometry. In the other hands, the factors that cause the difficulty in learning the three dimensions of prospective students of mathematics teachers in Sekolah Tinggi Keguruan dan Ilmu Pendidikan Bina Bangsa Getsempena (STKIP BBG) was the low aspect of interest, talent, and intelligence of the students because of the low mastery of three-dimensional geometry of a prospective student of mathematics teachers at previous education levels [13]. In terms of external factors, learning difficulties are influenced by the incompatibility of the methods used with the initial abilities of STKIP BBG mathematics teacher candidates and the condition of the study room.

The effort to overcoming obstacles are asks for advice from senior teachers and who have taken part in teaching training to overcome obstacles in the classroom, prepares the material carefully and studies the parts of the material that need special attention, need a psychological approach so students
dare to ask questions, needs to try and test various models and learning methods that are in accordance with the three-dimensional material. Exchanging ideas with the senior teachers or with the teachers who have already attended the training will get advice on how to understand the characteristics and how to convey the correct concepts to students in the teaching process. The benefits to be gained by the teacher are to add insight into good teaching methods, as well as to get an idea of how to overcome problems in the classroom. Although each student has different reasoning abilities, at least the teacher can bridge every level of ability of the students.

The teacher giving daily problems and provide students the opportunity to learn, so the students who do not understand the material can ask the teacher and have discussions with their peers. Although not all the children have direct courage to ask the teacher because of shame, fear, and worry. Recommendations for designing learning activities to develop student levels of geometrical thinking in learning geometry is designed by linking learning topics at the end of each level to the next level[22]. The teacher already knows various learning models that can be used in mathematics learning, but not all of them are suitable to be applied. The skills of teachers in choosing and using appropriate teaching methods affect the strengths and weaknesses of the method. These considerations include material characteristics, characteristics of the students, and the learning objectives. The choice of learning method or model, must suitable for the material to be taught, the density of the material that must be delivered, the time allocation available and the supporting infrastructure available.

4. Conclusion

Difficulties for high school mathematics teachers when teaching distance and angles in the three dimensions are the limitations of the teacher’s professional competence to master the material, students have difficulty in understanding the concepts, students have difficulty in reasoning, and appropriate learning media. Various efforts to overcome and expect the obstacles that arise from the teachers are by exchanging ideas with more senior teachers and discussing with the teachers who have often followed the training, preparing carefully and studying parts of material that require special attention, using visual media, giving practice with some questions that would make the students feel close to the teacher psychologically, and testing the various models and teaching methods are in accordance with the three-dimensional material.

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