**ME– 07**

# The Characteristics of Teachers' Contingent Dominant Scaffolding in Teaching and Learning Mathematics

Anwar[1], Ipung Yuwono[2], Edy Bambang Irawan[2], Abdur Rahman Asari[2]
[1]Study Program of Mathematics Education, Syiah Kuala University
[2]Doctoral Program of Mathematics Education, State University of Malang
anwarramli@unsyiah.ac.id

***Abstract*—** The purpose of this study is to investigate the characteristics of teachers' scaffolding in teaching and learning mathematics carried out by two teachers showing contingent dominant interaction. The characteristics were obtained by examining the conversations fragments between teachers and students during the provision of scaffolding. The fragments of conversation which were recorded by a video recorder were then transcribed for data analysis. The result shows that although the two teachers had the same contingent dominant interaction, they expressed different approach to contingencies characteristics in their scaffolding activities consisting of analytic and intuitive. In addition, the teacher using analitic contingent dominant interaction is likely to provide scaffolding more strictly and deeply in providing learning assistance to students compared to that of the teacher using intuitive contingent dominant interaction.

***Keywords:*** *analytic, characteristics, contingent dominant, intuitive, scaffolding*

## I. INTRODUCTION

Scaffolding has been in great demand in the field of mathematics education of recent studies [1], [2], [3]. The study of scaffolding strategies in geometry found that the involving student participation is the scaffolding strategy that frequently used by teachers [1]. The study of scaffolding used by two mathematics teachers with different teaching experiences found that scaffolding conversations appeared to have a positive impact on the learning and scaffolding using manipulative tool frequently appeared to have a positive feelings about using materials [2]. Furthermore, [3] tried to apply the idea [4] which introduced the scaffolding in mathematics as a "tool-for-result" and as a "tool-and-result" to distinguish the two dialogues of teachers-students in elementary school. However, all those studies have not yet examined in detail regarding the provision of scaffolding by teachers during dialogue. Therefore, the contingency of scaffolding as a match between what the teachers and students understood as a dialogue [5], should be studied further in the integrated concept in teaching and learnin [6].

Scaffolding is one of the characteristics of effective teacher-initiated teacher-student dialogue on the learning of mathematics. It deals with the ways in which teachers use dialogue to scaffold students' understanding. According to [7], few of the studies provide evidence that such characteristics actually led to promotion of students' conceptual understanding of mathematics. Actually, dialogues between teachers and students when scaffolding can eveal the extent to which teachers approach to students' understanding. So, through dialogues, the teachers' characteristics associated with scaffolding given can be known.

Patterns of the contingent teaching when scaffolding in social science, i.e. contingent and non-contingent have been introduced in [5]. However, the characteristic of mathematical content that is abstract and requires deductive thinking implies different approach to facilitating student learning than approach to learning social sciences. Refer to [5], the study on contingency patterns of interaction in the context of mathematics teaching and learning when teachers provide scaffolding to students showed three patterns of interactions, namely: the contingent dominant, the non-contingent dominant, and the pseudo-contingent [8]. Of course, effective teachers would want to have a contingent dominant interaction in the teaching and learning. So, the study of the characteristics of teachers' contingent dominant interaction when scaffolding is more interesting than the study of characteristics of teachers' non-contingent dominant or pseudo-contingent interaction. However, the study about it has not been revealed by researchers yet. Therefore, the research is needed to investigate the characteristics of teachers' caffolding in learning and teaching mathematics carried out by teachers showing contingent dominant interaction. The results of this study are indispensable for future research in uncovering the

thinking processes of the contingent dominant teachers when scaffolding in teaching and learning mathematics.

## II. THEORETICAL FRAMEWORK

### A. *Effective Mathematics Teacher*

Effective teachers will be able to understand and apply various strategies to help the students improve the learning outcomes [9]. Generally, mathematics teachers help students by means of dialogue either as individuals or groups related problem or a math assignment. The dialogue can be initiated by the student or the teacher. Dialogue can occur when a student asked about mathematical objects which are being facilitated by teachers (concepts, principles, or procedures) that have not understood by students yet. Dialogue can also occur because teacher read the conditions of the students psychologically who are deadlocked in their duties. However, based on observations of the researchers, the dialogue often occurs when teachers allow students asking while doing exercises. Assistance provided by the teacher when this dialogue is meant as scaffolding in this study.

Why dialogue? According to [6], the dialogue is one key to the success of scaffolding. Through dialogue, there will be a balance of what was presented by teachers with the students' understanding. Added by [3] that knowing mathematics is helping students through dialoging and doing. Therefore, scaffolding and dialogue in learning mathematics are closely linked to one another. Both of these have the same origin sourced from psychology education as proposed by [10]. Therefore, an effective mathematics teaching and learning must necessarily dialogue.

### B. *Scaffolding in Learning Mathematics*

Scaffolding is part of the learning strategies that require the teacher's role to facilitate student learning [11]. Through scaffolding, students are expected to have independence in learning the material that is facilitated by teachers [12]. At the end of the scaffolding, the teacher's responsibility has been left entirely to the students so that students are able to perform their duties independently [5].

Practically, the provision of scaffolding on math learning can be different from one teacher to another According to [13], there are teachers who are able to provide scaffolding in a certain way, but the teacher was unable to give any other way. For teachers who have the knowledge, skills and experience to facilitate lesson well, then they will be able to guide students towards in deep understanding. Of course, it differs from teachers who have less knowledge, then he will have a hard time helping the students. Therefore, the provision of scaffolding is very dependent on the knowledge, skills, and experience of teachers in providing scaffolding [14].

### C. *The Contingency of Scaffolding in Teaching and Learning Mathematics*

Contingency is a requirement for scaffolding [5]. If a teacher gives the scaffolding to students contingently then the scaffolding should be gradually reduced so that the teacher's responsibility should really have been transferred to the students. Assistance given by the teacher to the student should be appropriate to the level of students' understanding. In other words, when scaffolding, teacher need to show the interaction that adjusts assistance given to the condition of the students.

Knowing the contingency of teachers' scaffolding means that analysing of the fit between teachers' help and the students' understanding. It can be done by teacher using D (Diagnostic strategies), I (Intervention strategies), and C (Checking of diagnosis). In analysing the diagnostic strategies, teachers focus on: (a) the posing of diagnostic questions and (b) the reading of student work, to discover the level of the student's ability to perform without assistance. Checking of the diagnosis means verifying whether teachers have understood the students correctly or not. Checking of diagnosis will give teachers more information on understanding and students' strengths. In the intervention strategy is simply defined as a strategy used to support the student by giving the feedback, hints, instructing, explaining, modelling, and questioning (assisting) [5]. Refer to [5], the interaction learning math teachers are naturally contingent dominant still hard going [8]. Observations [8] to the math teachers in Malang, only 10% of teachers demonstrated contingent diminant learning interactions. These conditions would have to continue to be sharpened as consideration for teachers or decision-makers to improve the process of teachers' scaffolding in the classroom. Therefore, efforts to investigate the characteristics of teachers' contingent dominant scaffolding needs to be done to enrich the science, especially how teachers provide scaffolding to students contingently.

## III. METHOD

Researchers surveyed 25 mathematics teachers in Malang since 2015 and found two contingent dominant mathematics teachers in scaffolding, i.e. AD, and DW. AD (male mathematics teacher) had a

master degree and four years of teaching experience in Senior High School. DW (female mathematics teacher) had a bachelor degree and four years of teaching experience in Madrasah Aliyah. Both teachers taught trigonometry subjects for the 10th grade.

The research data in the form of a dialogue transcription teachers and students when scaffolding obtained from video of learning. The fragments of conversation which were recorded by a video recorder were then transcribed for data analysis. Analysis of data using qualitative method. For the purposes of data analysis, researchers encode any statements or questions in the dialogue with the code fragment aforementioned, i.e. D, C, or I, refers to Appendix F in [15]. At the same time, researchers play the video to see teachers' scaffolding according to the context of the problem. Because of many fragments, researchers only focused on analyzing the most representative fragments corresponding context of the problem and occurs naturally in the material scope of trigonometry.

## IV. RESULTS

General information about the learning interaction fragments by two contingent dominant mathematics teachers in this research is presented in Table 1.

TABEL 1. GENERAL INFORMATION ABOUT TEACHERS' CONTINGENT DOMINANT SCAFFOLDING IN TEACHING AND LEARNING MATHEMATICS

| Teacher | Problems | Scaffolding Contingency Strategies Used by Teachers | | | Characteristics of Teachers' Scaffolding |
|---|---|---|---|---|---|
| | | *Number of Diagnostic Strategy (D)* | *Number of Intervention Strategy (I)* | *Number of Checking of Diagnosis Strategy (C)* | |
| DW | Determine sine $270^0$ | 4(18,18%) | 13(59,09%) | 5(22,73%) | - Performing diagnostics strategy by questioning<br>- Implementing intervention strategy dominantly<br>- Doing checking of analysis strategy in less rigorous and less deep<br>- Encouraging students toward procedural understanding<br>- Often implementing the strategies by requesting "go on", less asked for justification, and failed to give feedback on the students' answers<br>- Emphasizing the dialogue to encourage students to focus on getting the answers than thinking processes<br>- Using "tool-for-result" approach dominantly<br>- The conclusion: Teacher uses an intuitive approach |
| AD | Determine sin $(90-\theta)^0$, known sin $\theta = a$, $a \neq 0^0$. | 8(24,24%) | 9(27,27%) | 16(48,48%) | - Performing diagnostics strategy by reading the student's work and questioning<br>- Implementing checking of analysis strategy dominantly<br>- Conducting checking of analysis stricly and deeply<br>- Encouraging students toward a conceptual understanding<br>- Often implementing the strategy by using the question "why", asking for justification, and providing feedback by commenting on the students' answers<br>- Emphasizing the dialogue that encourages students to get answers thoughtfully<br>- Using "tool-and-result" approach dominantly<br>- The conclusion: Teacher uses an analytic approach |

### *A. DW's Description of Teaching Interaction*

The following fragment is DW dialogue with students in developing contingency learning interactions when doing trigonometry exercises, i.e. when students asked for the value of sine $270^0$.

Fragment 1

*Line 1: S: Here Mis ...do I take $90^0$ or zero? If I mean that in $270^0$ ...looking for sine $270^0$... is it minus 1 ... or should I remain the same as that of what I take, that is sine $90^0$, so you know ...?*
*Line 2: T: What do you mean with how to take the $90^0$? [D]*
*Line 3: S: I mean that will I take sine $90^0$, so you know Mis?*
*Line 4: T: yes ...*
*Line 5: S: Why don't we take $0^0$ Mis ... but ...*
*Line 6: T: You make sure ...that $270^0$ that you want...what quadrant will you take! [I, Instructing]*

*Line 7: S: It is the third or the fourth, Mis ...*
*Line 8: T:The third or the fourth ... certainly you make sure ....whether to take the third or the fourth quadrant? [I, Questioning]*
*Line 9: S: Yes it is ...Mis ... [the student is getting confused with a slight laugh]*
*Line 10: T: Don't be confused ... chose it! ... [I, Instructing]*
*Line 11: S: Oh ...*
*Line 12: T: Choose one! ... [I, Instructing]*
*Line 13: S: [pause] ... if in the third quadrant...it becomes $90^0$...[student thinks aloud]*
*Line 14: T: e e ...*
*Line 15: S: If I take the fourth quadrant...it becomes $0^0$... [student thinks aloud]*
*Line 16: T: e e ... ok come frward, which one... is it right? [D]*
*Line 17: S: Yes*
*Line 18: T: Now choose one ... so ... let's say .. if the third quadrant is chosen .. do we use the angle? [I, Feedback, Hints]*
*Line 19: S: $90^0$ ...*
*Line 20: T: yes already ... we use the angle of $90^0$ ...do not use the zero one .. [I, instructing]*
*Line 21: S: [students paused]*
*Line 22: T: If we take the zero ... do we..use $270^0$ minus zero, if so, is it you mean? [D]*
*Line 23: S: Not ..I mean ... right ... like this anyway Mis ... [students tried to explain the meaning of the question with drawing] It's $270^0$ ...*
*Line 24: T: em*
*Line 25: S: if we are right with this way ... $90^0$ ...*
*Line 26: T: em em*
*Line 27: S: Mis, from this $90^0$ ... but if we follow the portrait...we have $0^0$...here.*
*Line 28: T: Please try to count it... calculate it ..compare it ... let's see...what quadrant do we take?... [I, Questioning]*
*Line 29: S: The third*
*Line 30: T: The third quadrant... try ... how? [C, Instructing]*
*Line 31: S: This is sine...it means ...minus 1, right? [student explains about the third quadrant]*
*Line 32: T: em ..*
*Line 33: S: If here is cosine [student shows four quadrants,] meant that ... zero*
*Line 34: T: Cosine ... how would it be cosine?. [C]*
*Line 35: S: Sine is zero*
*Line 36: T: How does sine become zero? [D]*
*Line 37: S: Zero*
*Line 38: T: zero ..please go on...try to write it ...yes write it... I'm confused too ... write in two ways ... how does the first way...and how does the second way...which way to have the correct answer? ... [I, Hints]*
*Line 39: S: [students write the answers on a blank paper, sin $270^0$= -sin $90^0$)]*
*Line 40: T: [Teachers pay attention to the students' work] Please write how you found $90^{0...}$The way can be displayed... please! [C, Questioning (assisting)]*
*Line 41: S: [students delete what she wrote and write the new answer]*
*Line 42: T: em em ... [teachers pay attention to the students' work] Try the second way ... [C, Questioning (assisting)]*
*Line 43: S: [students write the second way] oh yes yes Mis ... [Students stop his work because they feel satisfied to the answer]*
*Line 44: T: Try to continue ... to convince the answer .. [I]*
*Line 45: S: [students continue completing the work]*
*Line 46: T: [Teachers pay attention to the work of students] sine is minus 90 ... keep anyway? No such effect ...*
*Line 47: S: Yes yes yes*
*Line 48: T: If you want to exclude from the limit ... earlier or later ... no problem ... but you should be consistent ... seen from the characteristics..what is potitive...what is...[I, Instructing]*
*Line 49: S: Negative*
*Line 50: T: It is the same, isn't it? [C]*
*Line 51: S: Yes yes yes ...*
*Line 52: T: Well, this is minus sine $90^0$[Teacher reminded to use minus sign (-) before sine $90^0$] Is it the same? Take one only ... [The teacher left the student] [I, Hints]*

Based on the fragment above, DW applies diagnostic strategies (lines 2, 16, 22, 36), intervention strategies (lines 6,8, 10, 12, 18, 20, 28, 35, 37, 39, 44, 48, and 52), and checking strategy analysis (lines 30, 34, 40, 42, and 50) when the scaffolding. However, DW uses the intervention strategy dominantly. DW is more focused on how to find the results. DW uses intuitive approach to the provision of scaffolding. In view of this, a mathematical intuition is not associated with formal reasoning. Namely, DW presents a mathematical problem in how to find the answers immediately, without need to have justification or formal analysis. The researchers mentioned DW as classical intuitionist [16]. Even if there is to discover students' knowledge as a support, such as the question; "Why?", "How do you know that?", are still rare. DW often does the interactions like that. This conformed to the findings [17] that teachers rarely explored right naturalness of students problem.

DW rarely conduct an investigation into what is being done by students. In other words, the assistance provided by DW less deep to explore the knowledge of students. DW often use intervention

strategies by giving hints (clues) or feedback. In fact, DW reminded students to make the conclusion that is being done. The contingent dominant approach of the provision of scaffolding that impressed DW done quickly, not long, less to enable children to think deeply, and spontaneously. DW tends to encourage students toward procedural understanding. DW rarely ask the question "why", asked for justification, and comment on the students' answers. DW emphasizes dialogue to encourage students for finding the answers rather than thinking. Therefore, considering the characteristics scaffolding done by DW, the researchers mention that DW as a teacher who has intuitive contingent dominant characteristis.

*B. AD's Description of Teaching Interaction*

Here is a fragment of scaffolding when AD taught trigonometry in determining sin (90 - θ), known sin θ = a, a ≠ 0.

Fragment 2

*Line 1: S: How about the second number, Sir?*
*Line 2: T: Second number ...have you completed it? [D]*
*Line 3: S: Not yet*
*Row 4: T: [The teacher read the student's work while pointing out] If this.. is simplified, so what will happen?[D, C, Questioning]*
*Line 5: S: What?*
*Line 6: T: It's, you know ... [Teacher sees the student writing sin (90-q)] [I, Hints]*
*Row 7: S: Ninety ... [Student thinks hard]*
*Row 8: T: Sine of ninety degrees min theta... if is simplified... [the teacher pointed to the 90-θ] [C, Feedback]*
*Line 9: S: Sine theta...*
*Line 10: T: Well ... It's ... $90^0$, right? [Pointing to article $90^0$-θ] [D]*
*Line 11: S: Yes*
*Line 12: T: What's kind of axis...this? [D]*
*Line 13: S: The Y-axis*
*Line 14: T: If there is a reference axis of Y ... Y ... [C, Questioning]*
*Line 15: S: Reversed to cosine Y*
*Line 16: T: Yes ... the result is ... [C, Questioning]*
*Line 17: S: Cos θ*
*Line 18: T: Yes already [Feedback]*
*Line 19: S: [keep silent]*
*Line 20: T: What is known? [D]*
*Line 21: S: Sine θ*
*Line 22: T: What will you find? [D]*
*Line 23: S: Cosine θ*
*Line 24: T: How can it be? [C, Questioning]*
*Line 25: S: Reversed, right?*
*Line 26: T: Lho...why is it reversed?... sinus is known ... keep looking cosine θ.. θ, How do you find it? [C, Feedback]*
*Line 27: S: [pause, confused]*
*Line 28: T: [Teacher directly asked the question] if sine θ is known... what is the comparison of sine? [C, Feedback, Questioning]*
*Line 29: S: opposite ...hypotenuse ... oh ..looking ...adjacent...*
*Line 30: T: Lho .... it means that what should be drawn?. [I, Questioning]*
*Line 31: S: Drawing a triangle*
*Line 32: T: What triangle? [D]*
*Line 33: S: Right triangle*
*Line 34: T: Yes ... draw it, try! [I, Instruction]*
*Line 35: S: Sinus ..opposite ...hypotenuse ...*
*Line 36: T: Set the first angle ... [The teacher immediately cut the student's statement] [I, Hints]*
*Line 37: S: [students draw a triangle while thinking aloud]*
*Line 38: T: No ... only its angle ... [I]*
*Line 38a: S: [Doing]*
*Line 39: T: Yes ...*
*Line 40: S: ..opposite ..hypotenuse...a, sir?*
*Line 41: T: a ... the "a" is meant...? [C, Questioning]*
*Line 41: S: [students is thinking] em?*
*Line 42: T: a.. means ... the same as ? [C, Questioning]*
*Line 43: S: 1*
*Line 44: T: Yes ... the same as opposite over ... [C]*
*Line 45: S: Hypotenuse...*
*Line 46: T: Yes..how is that?. [I, Questioning]*
*Line 47: S: 1*
*Line 48: T: Why is 1? [C, Questioning]*
*Line 49: S: a is divided by one ... a*
*Line 50: T: yes .... It means… is it the line? [The teacher showed a right angle of triangle] [C]*

*Line 51: S: 1... a*
*Line 52: T: Lho, why? .. [Teacher asked for the reasons of getting 1 surprisingly] [C]*
*Line 53: S: Oh ... 1 minus a ...*
*Line 54: T: Lho... why 1 minus a? [Teacher asked for the reasons of saying 1 minus a surprisingly][C]*
*Line 55: S: 1 min ... a square ...*
*Line 56: T: go on ... [teachers justify] [I]*
*Line 57: S: It is rooted ...*
*Line 58: T: Okay, rooted ...then… [Feedback]*
*Line 59: S: How is this? [Student try to root …while thinking aloud] one minus ....*
*Line 60: T: It cannot, ... can you? [D]*
*Line 61: S; 1 min a squared ...Sir?*
*Line 62: T: Lho ... it's worth ... it is still ... [C]*
*Line 63: S: But ... that's not the point ... like this, you know ... [students write the sgns of under root of 1- a squared]*
*Line 64: T: Yes ... keep being asked about? [D]*
*Line 65: S: Cosine*
*Line 67: T: Write, please! [I, Instructining]]*
*Line 68: S: Cos b*
*Line 69: T: Lho ... cosine theta [justifying the way the students read Cos b of which it should be theta] [I]*
*Line 70: S: opposite...hypotenuse [students write] 1 per root ....*
*Line 71: T: Lho, cosine theta you know ... [I]*
*Line 72: S: Oh ya ..ya ..it was reversed ...reverssed ... [students failed to determine the ratio of 1 to the root of $(1 - a^2)$]... yes ...this is the answer! [while he saw no option not to answer the question] Oh, ... oh yes yes... [ student reveals satisfaction in her work]*
*Line 73: T: [Teacher left the student]*

Based on the Fragment 2, AD starts providing the scaffolding using diagnostic strategy (D) by questioning using wh-question or yes/no question (line 2, 4), reading the students work, and continuing to use checking strategy directly (line 4). In general, AD implementing three strategies scaffolding almost evenly, although slightly more dominant implementing checking strategy (lines 4, 8, 14, 16, 23, 25, 27, 29, 40, 42, 44, 48, 50, 52, 54, and 62). It was demonstrated that AD provides scaffolding to students strictly, which began with an intervention in the form of a question that asks every step of the student after performing diagnostics. Almost every step of workmanship students are faced with the question "why or *lho*", as a way to reinforce the problem or checking (*Lho* is a special word that expressed surprise or shocked in the Javanesse). AD is more dominant inquire initial concepts and skills (procedures) of that students did and students will do. AD does not let students write just the answer without questioning as student to teacher accountability. In other words, AD strictly controlling every step in the order execution strategies help students apply D (Lines 2, 16, 19, 21, 31, 36, 60, 64), I, C or D, C, and I strategies.

AD is very often generate the interactions such as Fragment 2. As a whole interaction, AD almost equal implements the three strategies (D, C and I) in providing scaffolding (can be seen in Table 1). Although the strategy of checking of doagnosis (C) is more dominant than the other two strategies, but AD's intervention strategies do not directive in the sense of giving out the answers but rather intervence students to think about issues being worked student. AD tends to do well in solving the problem. AD tried to breakdown the problem into small parts of pieces of students work. A small section was more probing students' prior knowledge about the fact that demands memorizing. This is in accordance with the said [18] that the analytic resolve the problem based on facts and logic rather than emotion. Based on this description, the researchers mention that AD as a teacher who has analytic contingent dominant characteristic.

## V. DISCUSSION

Learning is a process of building relationships between teachers and students in mathematics in order to construct meaning both individually and collectively [19]. This research has shown the empirical facts about the characteristics of teachers' contingent dominant scaffolding in teaching and learning mathematics in order to construct mathematical meaning, specially in trigonometry. Although this study did not generalize the findings, but the empirical evidence has shown that the contingency provision of scaffolding can be reached by teachers through two approaches, i.e. intuitive and analytic. Empirical evidence also showed that the interaction of contingent dominant learning mathematics teacher are possible on the background of different types of schools, i.e. a public high school and religious schools. However, the ability of teachers about the material presented is a factors to consider and have not been studied in this research.

As shown in Fragment 2, AD used a strategy that breakdown the student understanding when scaffolding. When students asked about the concept or procedure that is not understood, AD does not

only help students to resolve the question asked but AD also expands these problems by exploring related concepts of the problem. In other words, AD tends to implement the checking and intervention strategy through questioning with the aim of "assisting". Each student responses when scaffolding followed by excavation deeply about what is known, and what is understood, by students. Furthermore, AD uses information from the student's response to resolve the problem presented students. In the dialogue, AD does not believe the student's response before the students were able to answer every question asked by AD in connection with concepts or facts. It could be argued that the scaffolding by AD is conceptual. It was conscious and was impressed slow. Considering such a process, the authors state that AD uses an analytic approach in his scaffolding.

Contrary to AD, as shown in Fragment 1, DW dominantly use intervention strategy with focus on results being achieved, not focus on the process. When students asked about the concept or procedure that they have not understood yet, DW focuses on helping student to the question without extending the problem in the question or without digging the concepts involved deeply. In other words, scaffolding of DW tends to be procedural. This happens spontaneously and quickly. Considering such the process when scaffolding, the authors states that DW uses an intuitive approach.

Actually, the two teachers in this study have shown a good approach in the provision of scaffolding because both have shown the contingent interaction. However, the opportunity to engage students in learning mathematics need attention by the teacher. Moreover, learning is not about receiving information but more than that, learning is about building relationships to construct a strict mathematical meaning [19]. Therefore, what is done by the AD above is actually very consistent with the concept of learning desired in the classroom. As stated by [19] that the class should be a place where teachers and students engage in learning activities that are rigorous mathematics. Opportunity should exist in a class that allows the teacher relates to students. Added by [19] that as many teachers ask questions to the students and the question was not just recall, it gives students the opportunity to express their ideas and verbal activity can develop students' understanding.

When associated with a dual theory of S1 and S2 according to [20], both teachers demonstrated in different ways. AD using S2, as though the help seems slowly, but he was full of awareness in helping children to understand, not only results. According to the view [4], AD approach known as "scaffolding as tool and result". This differs from the DW help children tends to get results only. According to the view [4], DW approach known as "scaffolding as a tool for result". The differences of interaction of both teachers can be influenced by several factors, e.g. the teachers' experiences, type of school, and learning approach that transactions are carried out [14]. Both the teachers in the study are different educational backgrounds. AD is a master educational background, while DW is a scholar. Of course, the experience of this background needs to be considered in establishing contingency, especially the two teachers belong to a relatively young age and have a high motivation. However, the interesting in this study is that even teachers with less than five years experiences, both AD and DW are able to show learning the contingent dominant interaction patterns naturally.

All the three strategies built by the teachers in scaffolding need guiding, including language problems or questioning skills. As in [21] that if learning occurs in social interaction, language or speech is an important tool for communicating and guiding learning. Through language, a student can express his understanding, giving reasons, posing a problem, and learning. Through language, teachers and students are able to build shared knowledge in interaction, i.e. they are thinking. Therefore, teachers need to have the skills of questioning. According to [22], based on the level questioning can occur: 1) at a low level, asking the skills, and 2) a high level, that asks or encourages thinking like asking to explain the process of what is found.

Of course, this study has some limitations. First, this study only just looked at two new teachers' contingent dominant interactions when scaffolding. Second, the issues raised in this study only in trigonometry that is in similar problems. Therefore, future research can be conduct by lifting the same exact problem and more than two teachers (if possible). But it will not be easy to do because to find the contingent dominant teacher in mathematical scaffolding is a tiring job.

## VI. CONCLUSION

This research found the characteristics of teachers' scaffolding in teaching and learning mathematics carried out by two teachers showing contingent dominant interaction, namely: intuitive and analytic. The teacher whose intuitive contingent dominant interaction tends to use the approach that explore the informal knowledge or the intuitive knowledge of students to develop procedural knowledge. This aproach can be reached by starting the process of scaffolding through an easy problem for students. From here, teachers can develop students' understanding. Via this approach, the teacher has a quickly and less

digging the student understanding. Some characteristics of this approach of teachers are: faster, less strict, less careful, spontaneous, very considering limit of time, and using scaffolding as "tool-for-result".

Teachers whose analytic contingent dominant interaction is likely provide the scaffolding approach by exploring formal and procedural knowledge of students to develop conceptual knowledge. Teacher can reached this approach with the help of probing students understanding. From here, the teacher can develop students' understanding and a mindset of students to thrive in solving the next problem. Some of the inherent nature of this kind of teacher are: tight, rigor, meticulous, long, carefully, seriously, no matter of limit of the time of teaching, unpretentious, and using scaffolding as a "tool-and-result". So, teachers using analytic contingent dominant interaction is likely to provide scaffolding more strictly and deeply in providing learning assistance to students compared to that of the teacher using intuitive contingent dominant interaction.

## ACKNOWLEDGMENT

Anwar, Ipung Yuwono, Edy Bambang Irawan, and Abdur Rahman As'ari thanks to the 3th ICRIEMS 2016 , Yogyakarta State University.

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