Classroom Discourse Interaction in Science Classroom: Analysing the Use of Meta-Discourse for Pre-Service Science Teachers

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ABSTRACT

This study aims to analyse pre-service science teachers' use of meta-discourse to construct students' scientific knowledge. Data were collected from classroom observation, video recording, and review article. Results indicated ten major categories of meta-discourse (move/interactions pattern, types of utterance, the purpose of utterance, cognitive process, meta-discourse, classes, Socratic questioning, verbal jigsaw, semantic tapestry, and framing) on the learning of additive, addictive, and psychotropic. The use of meta-discourse in the main stage of teaching was mainly indicated from the stages of discussion and analysis of questioning which consist of four aspects of classroom discourse. According to the interaction between the teacher and students, the opening stage has Initiation – Response – Follow-up pattern. Regarding the teachers' questioning based on approaches and strategies, there are four domains, such as the Socratic questioning, verbal jigsaw, semantic tapestry, and framing. In terms of the purpose of utterance, the series of "accept and focus" have a correlation with C-S in the type of utterance. In summary, the analysis of the meta-discourse in science chemistry for the teaching and learning process comprises on the analysis of classroom discourse theory and questioning based on approach and strategies.

Keywords: Analysis of interaction-discursive, Meta-discourse, Pre-service science teachers, Science-chemistry, Teaching and learning.

1. INTRODUCTION

A The study of discourse is the important issues in past two decades. The acquiring of knowledge in the classroom for the students is the socially constructed and can be examined by discourse analysis approach [1]. Specifically, the discursive analysis in classroom can provide new insights of the practice, learning, complex and dynamic of the student-student and students-teachers interaction. The interaction between teacher and student in the classroom can produce the development of knowledge and thematic content of science education [2] [3] [4].

In term of science teaching, there are five standards or assumption, such as the vision of science education described by the Standards requires changes throughout the entire system, what students learn is greatly influenced by how they are taught, the actions of teachers are deeply influenced by their perceptions of science as an enterprise and as a subject to be taught and learned, student understanding is actively constructed through individual and social processes, and actions of teachers are deeply influenced by their understanding of and relationships with students [5]. Although science education teachers have learned much about the interaction students and teachers in the science classroom, but it has been largely stranded in discourse analysis and teachers cannot manage with systematically reviewed and analysed the use of metadiscourse [2]

The interaction of students and teachers in science teaching consist of three sequences with different characteristic [6]. Firstly. The introduction stage. This stage is encouraging students to connect on previous subject which have correlate with recently subject. In addition, the teachers on this stage is increasing the students' motivation to prepare acquire the lesson.

Secondly, the core stage. In this stage, teachers are delivering, discussing, and collaborating with several strategy of learning to achieve the learning of goals. Lastly, the closing stage. The stage is focusing on the summary of the lesson. Teachers and students collaborate to make conclusion of the lesson. Although science education researchers learned about the social interactional processes of classroom talk and the thematic content and knowledge development aspect of the talk, the science education researchers have neglected on the discourse analysis [7]. In addition, the classroom talk for science classroom is not real science as described as science talk [4],[8].

In term of the discourse sequences, [9] proposed at least two utterances or two turn exchange, such as initiation (I)-response (R)-evaluation (E) as indicate the quality of students' interaction in the science classroom. The issue of IRE/F research was conducted in past 40 years. The investigated of classroom-discourse in classroom become familiar between teachers and students [10]. The discourse in the classroom is encouraging teachers to initiate interaction with students by known-answer question. The aim of this study is to analysis of interaction-discursive in core stage of the science lesson with the basic competency additive, addictive, and psychotropic.

2. METHODS

The qualitative method with descriptive analysis was used to gain the data [11], such as transcript, coding, and the major of several meta-discourse analysis. The video recording from the science classroom observation with the interaction talk to talk between students and students, and/or students with the teachers become the focus of this research. Overall, based on the curriculum 2013, the time duration of pre-service science teachers practicing is around 40 to 50 minutes.

The data for this study were taken from pre-service science teachers who perform in microteaching course. This course is compulsory course within pre-service science teachers must accomplish the teaching and learning with several science topic and model of teaching. This research use topic additives, addictive, and psychotropic with the sub-topic food test contains additive, addictive, and psychotropic substances [6] with focus on student cantered activities. Furthermore, the teaching and learning of pre-service science teachers in microteaching course is the practicing of pre-service science teachers teach before them teaching in the real school.

In terms of practicing, the instructional approach in microteaching course is every lecture has group and the group have various strategy to teach. For example, one pre-service science teacher represented a group to teach, and the rest of other students are doing preparation before

teaching, such as the construction of the lesson plan, worksheet, evaluation sheet, and the laboratory equipment which use in teaching. There are 9 students who participate in one group of class. The seating of the classroom is consisting of nine students within three columns and three students in pairs.

3. RESULTS AND DISCUSSION

The result of the coding scheme of the additive lesson with food test contains natural additives and synthetic additives. The analysis of coding scheme was based on ten items of classroom discourses theory, such as move/interaction, types of utterance, and the purpose of utterance, cognitive process, meta-discourse, classes, Socratic questioning, verbal jigsaw, semantic tapestry, and framing.

This additive lesson with food test contains the natural additive and the synthetic additive is a part of the compulsory course that students in the group arrange the lesson plan and implement in teaching and learning or microteaching in the classroom. The practicing in the classroom focusses on main stage. The result of first main section of teaching and learning showed in table 1.

In the main stage, the coding scheme of the additive lesson with food test contains the natural additive and synthetic additive. The analysis of coding scheme was based on ten items of classroom discourses theory, such as move/interaction, types of utterance, the purpose of utterance, cognitive process, meta-discourse, classes, Socratic questioning, verbal jigsaw, semantic tapestry, and framing (see table 1).

The move or interaction pattern between teacher and students are following the I-R-R-R pattern and I-R-F pattern. The I-R-R-R is the interaction between teacher and three students who have a discussion where students following teacher question about how to identify the synthetic artificial coloring agents [12]. In one hand, the I-R-R-R pattern of interaction is based on teacher initiate by raising the question about "is there any different answer with your friend?" and the response from students is 'same' as the teacher's feedback or follow-up. Furthermore, the type of utterance is question-answer (Q&A) and comment-statement (C-S) from the teacher. The Q&A is the interaction between teachers could involve group as an individual or a group. This activity could improve the science inquiry in classroom [13]. In addition, another type of utterance is C-S which came from the teacher after students gave the answer. The purpose of this interaction is the teacher's reflection based on students' answer. For example, this is indicated as follows, "Yes, good. So, children, Adi group's answers" that "the colour of turmeric without soap water is orange, with soap water it changes into the red"; "pandan leaf are green in the beginning and it becomes light green with soap water"; " In tartrazine, the green one

and the yellow one doesn't change in its colour" and "yes good Ida. and for addition. Usually, food with synthetic artificial colouring agents, its taste is bitter, and the colour left in our hand, tongue, and others".

According to the purpose of utterance, in the coding scheme explain that student's interaction as a reply from teacher question. There is good interaction between teacher and students because students replied toward teacher elicitation. Besides elicit and reply, the purpose of utterance is to accept, focus, and extend about the other ideas from another group. For instance, "Yes, good. So, children, Adi group's answers that "the colour of turmeric without soap water is orange, with soap water it changes into the red"; "pandan leaf are green in the beginning and it becomes light green with soap water"; " In tartrazine, the green one and the yellow one doesn't change in its colour".

It means that teacher accepted the group idea about "the change of colour" and focus on how the colour is changed toward the food which was given an indicator to know the food contains the natural substance or synthetic substance. Moreover, there are three of the cognitive process such as evaluate, confirm, and explain. Through the cognitive process, teachers gain the evidence-based tools and guidelines for implementation in the classroom directly [14]. To gain the knowledge, students are evaluated by their thinking about food test by several indicators to understand which one the food is safe and not safe or dangerous. In addition, students are confirming the teacher's question about the alternative ideas about food test.

The teacher is trying to construct students' knowledge by using meta-discourse [2]. The challenge category of meta-discourse was used by the teacher to construct students' knowledge to encourage students the way to think, make an idea from another group in the science classroom. Furthermore, the communicative approach in the science classroom with additive substance is interactive-dialogic because the teacher has communication with the small and large group, with one by one students or teacher with student 1, student 2, and student 3 [15].

The author also discussed teacher questioning approach that stimulates productive thinking. According to the coding table, there are five approaches such as stimulating multimodal thinking, Pumping, Question-based summary, Constructive challenge, and question-based outline.

T: If people don't study or their school doesn't have a laboratory, with what things to test it from synthetic artificial coloring agents?

Based on the dialogue above, the type of teacher questioning in the science classroom is stimulating multimodal thinking. The teacher encouraged students to think in a variety that if people or community doesn't have a laboratory to test the addictive substance in the food, so, how they can test it. Students must think deeply to find the alternative way to test the food which predicts contain synthetics colouring agents [16-17].

4. CONCLUSION

In terms of science teaching in the classroom, particularly for pre-service science teachers who conducted the microteaching course, should have pay attention on students and teachers' interaction. The interaction can be analyzed by classroom discourse, which deeper analysis on knowledge within social construction. Regarding the microteaching course, the analysis of interaction-discursive in the main stage of science lesson with the material additives, addictive, and psychotropic within sub: food test contains additive, addictive, and psychotropic substances, such as move/inter-actions pattern, type of utterance, purpose of utterance, cognitive process, meta-discourse, classes, Socratic questioning, verbal jigsaw, semantic tapestry, and framing.

Table 1. The Analysis of interaction-discursive in main stage of science lesson with the material: additives, addictive, and psychotropic
(Sub: food test contains additive, addictive and psychotropic substances)

Utterance	Move/inter-actions pattern	Type of utterance	Purpose of utterance	Cognitive process	Meta-discourse	classes	Socratic questioning	Verbal jigsaw	Semantic tapestry	Framing
T: If people don't study or their school doesn't have a laboratory, with what things to test it from synthetic artificial coloring agents?	I	Q	Elicit	-	Topicalizer/ apply knowledge	Interactive - Dialogic	-	-	Stimulating multimodal thinking	-
S1: it can mam, with turmeric	R	A	Reply	Evaluate	-		-	-	-	-
S2: with lime water mam	R	A	Reply	Evaluate	-		-	-	-	-
S3: with soap water mam	R	A	Reply	Evaluate	-		-	-	-	-
T: is there any answers different from Adi group's answers?	I	Q	Elicit	-			Pumping	-	-	-
S: Same	R	A	Reply	Confirm	-		-	-	-	-
T+S: yes, good. So, children, Adi group's answers that"the color of turmeric without soap water is orange, with soap water it changes into the red" "pandan leaves are green in the beginning and it becomes light green with soap water" " In tartazin, the green one and the yellow one don't change in its color"	F - E	C - S	Accept, focus, extend	Evaluate	-		-	-	-	Question-based summary
T: now whose group wants to present its observation from no 5 to 7?	I	Q	Elicit	-	Challenge		Constructive challenge	-	-	-
S: I want mam	R	A	Reply	-	-		-	-	-	-
T: Yes, Agus. Please come	F	C	Accept	-	-		-	-	-	-
S: Analyst from our group: " yellow tofu, in the beginning, is yellow, and with soap water it changes to red", then " Dadar gulung" in the beginning is green and with soapy water it is not changing in colour, still green, and " lapis" cake, in the beginning, is green and with soapy water it is not changing in colour, still green"	R	A	Reply	Explain	-		-	-	-	-

Utterance	Move/inter-actions pattern	Type of utterance	Purpose of utterance	Cognitive process	Meta-discourse	classes	Socratic questioning	Verbal jigsaw	Semantic tapestry	Framing
T: yes, good Ida. And for addition. Usually food with synthetic artificial coloring agents, its taste is bitter, and the color left in our hand, tongue, and others	F	C - S	Accept, focus	-	Importance/ topicalizer		-	-	-	Question-based outline
S: yes sir, I have experienced like it	R	A	Reply	Evaluate	-		-	-	-	-

AUTHORS' CONTRIBUTION

Beni: conceptualization, method, and drafting manuscript; Ricky: Transcript, coding, review, and editing of manuscript; Chiang: review of manuscript, and giving the permission to submit; and Binar: data curation, data visualization and editing.

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