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Constructivist Classroom: Elements of Class Discourse as Measure of Constructivist Practice

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Abstract

This paper aimed at determining the shift towards constructivist practice over a period of two years by identifying the changes in the following classroom discourse elements; Teacher Talk and Students Talk. Data collection included all lessons about "Solution" for years 2001 and 2003 from 78 science students of grade five in a public school. Lesson's video recordings were converted into protocol and analyzed. The analysis was conducted in two stages; 1) categorizing the class discourse in teacher, student and monitoring talk. Monitoring talk was further analyzed to examine the level and type of questions used by teacher to monitor students' learning progress. Results showed an improvement towards constructivist practice in terms of increase in the share of student talk by 10% compared to 2001. Teacher talk in both cases is still more than 50% but it reduced from 67% in 2001 to 57% in 2003. Consequently, student talk increased from 33% in 2001 to 43% in 2003. This change may not seem satisfactory but is encouraging and results were more interesting if looked by each category. The research helped in developing a constructivist interaction analysis model which can further be developed by expanding the scope of the result to diverse classrooms and increased number of teachers.

Key words: constructivism, class discourse, interaction analysis

Introduction

Classroom discourse (verbal interaction) is being analyzed for long by many researchers to reflect upon the quality of teaching and training. Most popularly referred interaction analysis systems were developed by Flanders (Flender, 1970, Freiberg, 1981; p. 1) and Brown (Brown, 1975; p.68) in 1960's for coding teacher and student behavior in the classroom by using the classroom protocol.

Brown's Interaction Analysis System (BIAS) is known for its simplicity of use (Kono, 1993; p.118) but its categories are debatable for their depth to encompass all dimensions of classroom interaction. Flanders Interaction Analysis System was widely adopted by most of the researchers with occasional manipulations (Simon & Boyer, 1974;pp. 87-106, Schwanke, 1981; pp. 8-10) at times to suit the individual researcher's objectives but mainly the framework remained the same.

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The classroom interaction has gone through many fundamental shifts since the development of these interaction analysis systems more than forty years ago. Present day classrooms are more students oriented, activity based and demanding in practice. Thus requiring teachers to be more responsive, spontaneous and critical to create and sustain a classroom environment serving the learner's needs. The changing needs were realized and discussed by Newton (2002) to describe the demands of the today's classroom by laying down a theatrical framework for effective classroom talk in science classroom for guiding student thinking. Wragg and Brown conducted a more practical work in a series of classroom interaction related studies in their Leverhulme Primary Project Classroom Skill Series (Wragg & Brown, 2001). These efforts have taken the issue of interaction analysis in part but still no clear system of interaction analysis has evolved from these studies.

The framework of interaction analysis used in this research is thus developed from review of all these efforts by arranging and connecting them in the manner that suits the objectives of the present study.

Objectives

The paper aimed at determining the shift towards constructivist practice over a period of two years by identifying the changes in the following classroom discourse elements; Teacher Talk and Students Talk.

It was assumed that a continuous exposure of students (one year) and teachers (two years) to constructivist practice would result in more constructivist compatible classroom discourse ensuring greater students participation, critical and thought provoking teacher questions, and increased connective talk.

Methodology

The study involved classroom protocol for the unit of solution in grade five science course. All lessons for the unit were recorded in year 2001 (in the first year of data collection of this research) and 2003-04 (in the final year of data collection of this research) taught by same teacher. The video recordings were converted into protocol for the purpose of analysis.

a) Participants

The study involved 78 (39 students in session 2001 and 2003 each) grade five science students of one of the attached elementary school of Tokyo Gakugei University.

b) Data collection

Data was collected for all lessons in the unit on both occasions. The unit was completed in nine and seven class sessions (one class session is two

school hours) in 2001 and 2003 respectively. The timing and duration of the data collection was as follows;

- *Unit of content*: Solution
- *Duration of first data collection*: October 18, 2001 – December 6, 2001
- *Duration of second data collection*: January 28, 2003 – March 6, 2003.
- *Lesson hours:* 18 school hours in 2001 and 14 school hours in 2003. (1 class hour is 45 min.)

c) Data analysis

The analysis was conducted in two stages; 1) categorizing the class discourse in teacher & student talk and 2) monitoring talk (a sub-category of teacher talk) was further analyzed to examine the level and type of questions used by teacher to monitor students' learning progress.

i) Categorizing the class discourse

Following framework for data analysis was developed for the present study (Nasir & Kono, 2003; pp. 281-282) by adapting the three categories of class talk (tuning talk, connecting talk, and monitoring talk) suggested by Newton (2002: pp. 33-50). An addition of one category titled, "Direction" was made to accommodate the class discourse related to "teacher directions" concerning the use of apparatus, class administration and related procedural issues.

The part of class discourse concerning the non-academic interaction e.g. what is the lesson no? What is date today? May I go to drink water? Or occasional jokes were excluded from this analysis and were not counted in the class discourse data.

Table 1 describes the scope of these categories for their content and scope. Classroom discourse is mainly divided into two categories i.e. teacher talk and student talk. The sub-categories of teacher talk were adapted from Newton (2002) but adjustments were made to represent thoroughly the depth of classroom discourse. The adaptations are represented in Table 1 by *italic* characters. Student talk is sub-categorized in students responding to teacher or fellow students, student self-initiated talk to contribute ideas, observations, or experiences to add creative dimension to classroom learning. The last sub-category of student talk is student questions, which includes students questioning the teacher to have guidance or further explanation regarding any on-going topic or seeking direction for some procedural matter.

The sub-categories of student talk were derived from Flanders Interaction Analysis (Flanders, 1970:p. 34) and students queries was added to accommodate one dimension observed in recent classroom where students are increasingly participatory and arguing than before. In addition, a conceptual difference between Flanders description and present research is

the inclusion of inter-student response and in-group discussion as student talk.

Furthermore, in present sub-categories soliciting any particular students in not must for the teacher to regard the students answer as student response but even in case of a general questioning aiming at whole class and picked by any of the students was regarded as students response category, thus offering more freedom and flexibility.

ii) Analysis of teacher questions by level and type

The type of questions asked by the teacher can measure the efficiency of constructivist classroom. If the questions asked are unto the task, creative, thought provoking, critical and contextually correct, they assist the process of knowledge construction. It is desirable to have more number of higher order questions trying to probe the deep understanding.

Table 1
Framework for constructivist class discourse analysis

		Sub-categories	Explanation
Classroom Discourse	Teacher Talk	Tuning	Usually at the beginning of the lesson *but can be anytime during the lesson if the lesson comprises of more than one activities* of different focus. This includes encouraging students to recollect their mental resources (like experiences, previous learning, etc.), checking sufficiency and quality of those resources, scaffolding where necessary, drawing the aim of lesson and getting students ready to enter activity by accepting and valuing their ideas and experiences.
		Connecting	It may appear in any part of the lesson. Mostly about helping to establish the link between current learning, already learned and future learning by exploring patterns, relationships, reasons and causes. It involves accepting students' ideas and leading them to extend those ideas by putting immediately verifiable challenges. *It is also meant to keep the students focused on the lesson objectives and see the learning activity in that context.*
		Monitoring	Mostly occur at the beginning and end of the lesson. *At the beginning for judging the previous knowledge* and in the final part for the understanding of immediate task. It comprises of the teacher questions about content, process and value judgment of the learned.

		Directions	It can be found in any part of lesson. It is not directly related to the concept addressed in the lesson but a pre-requisite for carrying out the learning activity successfully e.g. correct use of devices needed to carry out an experiment, keeping order, setting time limits for various phases of lesson, suggesting efficient mean to record class results in notebooks, providing necessary knowledge etc.
	Student Talk	Response	It is mostly initiated by teacher *but sometimes can be initiated by the students asking other students.* Some of the situation can be when teacher asks question to check understanding of on-going learning activity (monitoring), experimental detail, or procedural verification. It may also result from sharing results on demand or supporting/criticizing comments from fellow student or teacher, clarifying own statement, accepting teacher's explanation, or justifying own position etc. It is not essential for the initiator to point out to some specific respondent. It can be a general question/statement open for anyone in the class to respond.
		Self-initiated	It can also occur at any phase of the lesson. Student volunteers an idea, observation, experience, opinion or lead to address the issue in discussion. It may be in the form of a question setting direction for thought or adding new dimension to the point in discussion. The provocation may come from the teacher's talk or class fellows but the respondent is not obliged or expected to contribute the shared information. It can also be in the form of an addition to other student comments or clarification of own position.
		Queries	It can too occur at any phase of the lesson. Student asks the teacher or fellow students for further clarification of their previous explanation. It may also include the questions addressing students' intent to have teacher's directions mostly about procedural issues.

The analysis of teacher questions (sub-categorized as monitoring talk in class discourse) was made by using the categories suggested by Moore (2001; pp.200-209) both by type and level.

Table 2
Level of classroom questions

Category	Bloom's Taxonomy	Type of thinking	Examples
Factual	Knowledge or comprehension	Student simply recall information	Define…? Who was …? What did the text say …?
Empirical	Application or analysis	Student integrate and analyzes given or recalled information	Compare …? Explain in your words …? Calculate the …?
Productive	Synthesis	Students thinks creatively and imaginatively and produces something unique	What will life be like …? What's good name for …? How could we …?
Evaluative	Evaluation	Students make judgment or express value	Which method is most suitable…? Why do you favor …? Who is the best …?

Source: adapted from Classroom teaching skill (Moore, 2001; p. 203 & 205)

He suggested three levels of questions (monitoring talk)i.e. focusing, prompting and probing questions and by level he derived four levels based on Bloom's taxonomy namely; factual, empirical, productive and evaluative. Focusing questions were meant to get the students' attention focused on the lesson at hand by arousing interest, exploring previous knowledge or linking to daily life. Prompting questions are used when students' fail to respond correctly to the teacher's question in the first place and probing questions are used to urge students to furnish more details, think thoroughly, and clarify their previous answer. The description of question types by level is described in Table 2 as suggested by Moore.

Results

The results will be described in the form of comparison of results in 2001 and 2003 in the following order:

1) Time management
2) Percentage of classroom discourse (teacher & student talk) along with their sub-categories
3) Analysis of monitoring talk by level and type.

a) Comparison of time management

The fundamental improvement was observed in the time management between 2001 and 2003. Figure 10.1 shows the comparative analysis of time

management in comparison to the time schedule suggested in the teacher's guide. Teacher's guide suggested 12-14 hours (6-7 class sessions) for completing the unit (Morikazu, 1999; pp. 2-3).

The difference in approach to address the sub-concepts to be learned in the unit is quite clear in the Figure 1. The teacher was more organized, sequenced and focused in year 2003 than two years earlier. The lesson titles in 2003 more directly address the objectives of unit.

b) Comparative analysis of classroom discourse

The data was analyzed by considering one utterance as basic unit of count. An utterance was defined as a complete meaningful segment of conversation dealing with single continuous idea. It can be comprised of one word or one small paragraph depending on the context and demand of the situation. The rationale for using an utterance as the unit of analysis was constructivist focus on the content of talk rather than the quantity of talk. It was observed during review of the data that sometimes a long sentence does not convey the meaning, which a single word can. Thus mere counting of words can mislead the reader about the actual value of classroom discourse.

Using the utterance as the fundamental unit of discourse, the overall results showed an improvement towards constructivist practice in terms of increase in the share of student talk by 10 percent compared to 2001. Teacher talk in both cases is still more than 50 percent but it was 67 percent (476/711 utterances) in 2001, which reduced to 57 percent (615/1071 utterances) in 2003. Consequently, student talk increased from 33 percent (235/711 utterances) in 2001 to 43 percent (456/1071 utterances) in 2003. From constructivist standpoint this is encouraging, but it is interesting to look at change in each sub-category of teacher talk and student talk understand better that exact categories contributing to this overall change.

Figure 2 shows a decrease in the percentage of tuning talk and directions in 2003 while connecting and monitoring talk has increased. Decline in tuning talk is not a desired change as the success of constructivist instruction rests on the exploration of previous knowledge, experiences and observations that students bring to the class.

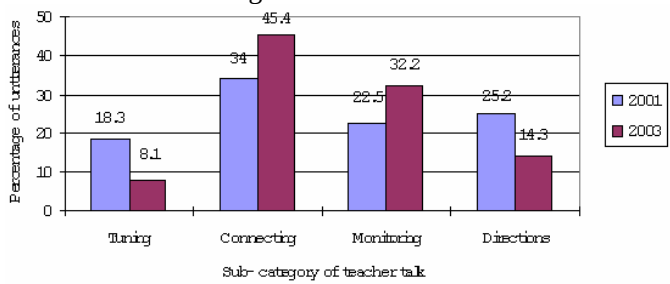

Figure 2: Comparison of percentage of sub-categories of teacher talk 2001 and 2003

The other decline was in the percentage of directions, which shows better management of lesson plan, class time and increased trust on the students' abilities to mange the procedural work by themselves as compared to classes in 2001. This decline in percentage of utterances addressing the classroom discipline also implies more student involvement in the lesson.

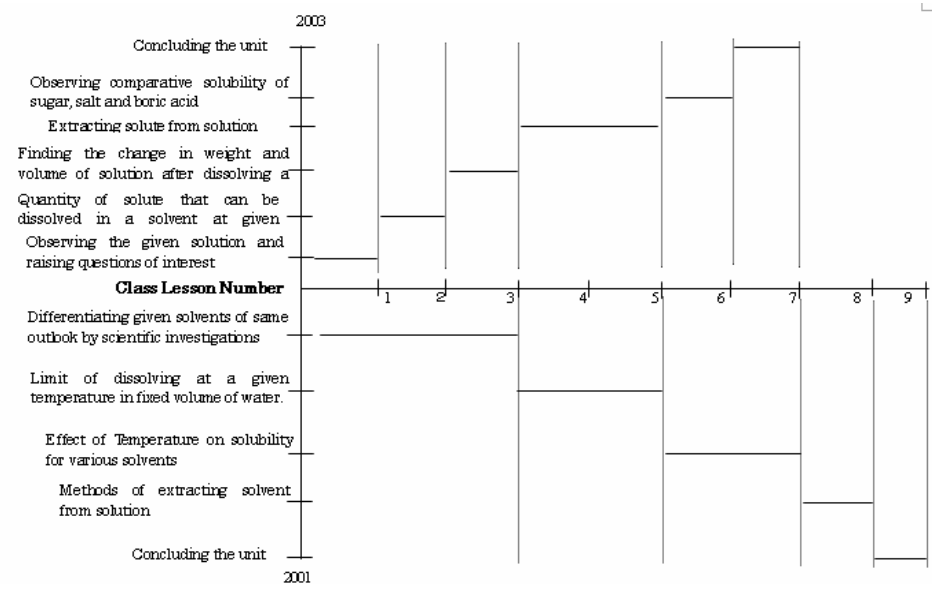

Figure 1: Comparison of lesson management during 2001 and 2003

An increase in the connecting talk reflects the better adaptation of teacher to his role as facilitator or manager in constructivist perspective. He puts more value in the students' ideas and urges them to learn through understanding the reasons, causes and relationships in the phenomenon under study. More connecting talk in turn implicates more student involvement in the lesson and increased thinking and brain storming activity in the lesson.

Monitoring talk has also increased comparatively, which shows continuous effort on the part of the teacher to ensure that what is being done is understood in the same manner as intended. This is also an indication of enhanced constructivist compatibility of classroom practices if compared to 2001

These results apparently look contradictory to the results of student talk analysis, shown in Figure 3, which shows a decline in the percentage of student responses in 2003. But if looked upon in terms of number of utterances, it increased from 193 utterances to 334 utterances in 2003. Another factor is the corresponding increase in the student self-initiated talk

in 2003. Student self-initiated talk has become more than twice, which show more willing student involvement in the lesson. The rise in self-initiated talk reflects the customization of students with constructivist learning environment and better understanding of demands of constructivist learning environment.

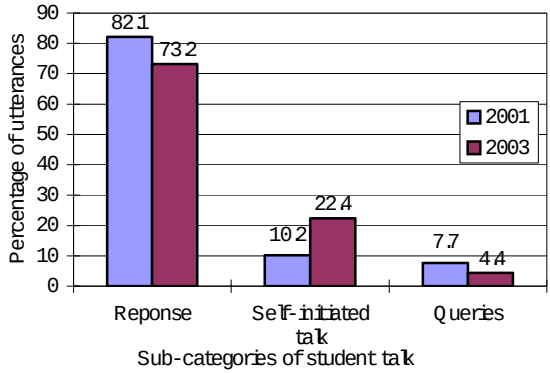

Figure 3: Comparison of percentage of sub-categories of student talk 2001and2003

Students' queries are still a non-factor because of their very low percentage and the nature of the queries itself. The low percentage may be interpreted as clear and comprehensive teacher explanation in the first place leaving a little need for the follow up.

c) Comparative analysis of monitoring talk

Preliminary analysis in the Figure 3 has showed an increase in the questions (referred as monitoring talk) asked by the teacher in 2003. Although it shows shift towards more constructivist activity but mere increase in number is not sufficient to predict constructivist compatibility. Therefore, in this section questions were categorized by level and type.

Table 3 shows the comparative distribution of the questions by type and level. There were no prompting questions in both 2001 and 2003 lessons.

The reason for this is the emphasis of constructivist instruction to avoid stressing for any correct answer. Constructivist teacher tries to build upon the information provided by the student instead of declaring it right or wrong like traditional pedagogies. Therefore, teacher avoids giving declarative statements but leads students to self-realization of discrepancies in their concepts by using probing questions. An increase of 9 percent in the probing questions over a two years period shows reasonable shift towards constructivist practices

Table 3
Categories of teacher questions by level and type

Question Level/ Type	Factual		Empirical		Productive		Evaluative		Total	
	2001	2003	2001	2003	2001	2003	2001	2003	2001	2003
Focusing	17 36%	39 56%	27 58%	9 13%	3 6%	11 16%	-	11 16%	47 44%	70 35%
Prompting	-	-	-	-	-	-	-	-	-	-
Probing	12 20%	33 26%	7 12%	32 25%	35 58%	41 32%	6 10%	22 17%	60 56%	128 65%
Total	**29** 27%	**72** 36%	**35** 33%	**41** 21%	**38** 36%	**52** 26%	**6** 6%	**33** 17%	**107**	**198**

There is decrease in the focusing questions in terms of percentage share in total questions asked which reflects the teacher's lack of interest in exploring the students' previous knowledge. This is discouraging trend as it ignores a crucial element of constructivist learning i.e. building on the students' previous knowledge. This result is in conformity with the previous observation of decline in the tuning talk noted during teacher talk analysis shown in Figure 2.

The comparison of vertical percentages in the Table 5 shows an increase in the factual and evaluative questions while a decrease in the percentage of empirical and productive questions. This is a mixed result if looked through the constructivist outlook. Increase in the evaluative questions is desired shift but at the same time increase in factual questions indicates more focus on the knowledge level, which is not constructivist. Similarly a decrease in the empirical and productive questions is also indicating decrease of higher order questions, which is not positive development. The level of questions asked determines the quality of the activity of learning going on and thus it is reflects that the teacher has moved closer to constructivist practice in some regards (like improvement in the type of questions asked) but still needs to make up on the level of questions. It is needed to make questions more innovative and demanding in order to provoke thinking and support understanding among the students.

Discussion

It is apparent in the results that the lessons conducted in 2003 were comparatively more constructive as far as the lesson management, focus to the concepts, prior planning, involvement of students, and effective monitoring is concerned but still need improvement in exploring students previous knowledge, sufficiency of that knowledge, level of questions asked and improvement in pre-activity readiness of the students at the start of the lesson or at the beginning of any new activity during the lesson.

Some of the lesson might have all components of interaction analysis in right proportion but overall analysis suggests at least lack of consistency. The improvement can be attributed to sustained practice of constructivist practices in the class for a period of two years. The observed improvements were encouraging considering that isolated nature of science lessons in context of overall school environment. The students only took science class twice a week at maximum and while rest of the school lessons remained typical. Once they are out of science class they have to revert back to the same usual system having where teachers use conventional method of teaching. Even if some features were aligned with constructivist principles but they were not carried out with constructivist frame of mind. The students have to appear for traditional evaluative practices, which are rarely in conformity with constructivist principles, and achievement is measured through the count of correct answers.

Similar problems were facing the teacher, who has to keep a balance between the innovation and demands of the school authorities and parents. Although it was tried very hard to avoid create any experimental condition for the research but still the gap between the demands of the constructivist practices and enforced school system made it hard for the teacher to meet the demands of the both at times.

An observed increase in the factual questions highlighted matching limitation from different angle. It shows the tendency to make sure that students remember what is done in the class to ensure better results in the term evaluation. Thus restricting the number of higher order questions.

In such circumstances, the constructivist compatible changes in a period of two years can be assumed satisfactory and make case for the shift of the whole system if initiated with internally motivated desire in all spheres of school activities. Teacher's encouragement is also evident in the increased percentage of self-initiated student talk in the classroom. Although it is still less than desired but at least it reflects the gradual familiarization of students with the constructivist classroom environment and shows their internal motivation or willingness to play their role in the learning process.
Although it is quite difficult to rank order the pro-constructivist improvement in the lessons under investigation in the absence of any standardized criteria but the indication are clear for some significant changes against the interaction analysis model described in this paper.

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