

# **MATH TEACHERS' STRATEGIES IN DEVELOPING CLASSROOM ACTIVITIES: A CASE STUDY OF BILINGUAL PROGRAM AT JUNIOR HIGH SCHOOL IN YOGYAKARTA**

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## **Abstract**

The practice of bilingual program in educational system in Indonesia is to improve the quality of education in secondary school. The achievement of such objective could be observed from teacher-student classroom interaction. The present paper addresses the math teachers' strategies and interaction types in structuring classroom activities and type of interaction using English in teaching Math at bilingual class on a private and public junior high school in Yogyakarta. Research findings show that due to mediocre level of English they employed several strategies such as maximizing the use of textbooks or students' worksheet, maximizing individual work, using demonstration in presenting the topics, and performing translation. The interaction types are mostly in the form of telling and instructing.

Pelaksanaan program bilingual dalam system pendidikan di Indonesia adalah untuk meningkatkan kualitas pendidikan di tingkat sekolah menengah. Pencapaian tujuan tersebut dapat diamati dari interaksi guru dan siswa di kelas. Paper ini mengungkap strategi yang digunakan guru matematika dalam mengembangkan aktivitas pembelajaran dengan bahasa Inggris sebagai pengantar pada program bilingual di salah satu sekolah menengah pertama swasta dan negeri di Yogyakarta. Hasil penelitian menunjukkan bahwa para guru matematika menggunakan beberapa strategi dalam berinteraksi dengan siswa, seperti memaksimalkan penggunaan buku teks atau lembar kerja siswa, memaksimalkan tugas individu, mendemonstrasikan materi yang diajarkan, dan menterjemahkan. Sebagai kompensasi atas keterbatasan penguasaan bahasa Inggris mereka, jenis interaksi yang digunakan adalah memberi instruksi dan informasi.

**Keywords :** bilingual program, math teachers' strategies, teacher-student interaction.

## **INTRODUCTION**

The demand for effective communication in English is increasing rapidly in this globalization era. This is due to the fact that English is a global language. The availability of varied information in English such as in the field of business, technology, science, scientific journal, the internet, popular entertainment and even sport are the evidences. Besides, more and more people use English to fulfill some communicative purposes among people with different mother tongue in various settings. Therefore, as what Nunan stated, the trend of using English in communication is unstoppable (Graddol in Nunan, 2003). English language competency, then is closely connected to all aspects of human life in this modern world.

However, opportunities to learn English are very limited if it is only taught as a subject and only then as a foreign language. In this context, what they acquire is general English which is not sufficient to meet the need for academic purposes. Consequently, integrating language and content is now becoming the feature and choice of educational system. It is believed that integrating content and language instruction will provide students with greater chances to develop their language competence needed for a better future. Many also assume that proficiency in English is a prerequisite for academic learning. In Indonesian context, this practice is commonly known as a bilingual program. One of the most significant features in the implementation of bilingual program is the use of English as the medium of instruction.

The advantages of bilingual education have been proposed by many researchers. Stoller (2004) said that such instruction is believed to foster academic growth while also developing language proficiency, while Lessow-Hurley (2003) claimed that students who are highly proficient in two languages appear to have academic advantages over monolingual students. This one was supported also by Cummins (2003) who said that bilingual students who have access to more than one language code appear to have the academic advantage of highly developed metalinguistic and problem solving skills not only in language but also in mathematics. As a conclusion Garcia (2009) proposed that bilingual education becomes prestigious and is viewed as an educational advantage.

The bilingual program, at junior high schools, mandates the use of English for the delivery of mathematics and science in addition to English itself. Mathematics then is considered important to be seriously discussed. This is based on the fact that mathematics is believed to touch or relate to all aspects in human life. The content of mathematics is always relevant to ones' lives and nothing is free of mathematics concepts. In addition, mathematics becomes one of the measurements of the students' competence to pursue further academic attainment or education and also employment.

Problems in the implementation of bilingual program in math class lie mostly in the ways teachers structure classroom activities to develop students' understanding of content subjects compounded with the use of English as the medium of instruction. Van Lier (2006) considers this task a very hard and double stake undertaking especially for non-native speakers of English because at one end there is a high demand on developing students' language competence while at

the other end mastery of content subject is very important. In this paradigm math teachers' attention to both language and content is not a choice of either or and also non-negotiable. Instead they should find out the appropriate amount of attention to both components.

One of the parameters in revealing the success of the program is through a vivid observation on math teachers' instructional practices from which the features of teacher talk, i.e. math teachers' effort in discussing the academic content discursively with the students while simultaneously developing students language proficiency. A balance talk between teacher and student will promote language learning (Cazden, 2001; Echevarria, 2010). Those practices are usually realized in math teachers activities in presenting, asking questions, providing challenging assignment also enrichment, and engaging students in the discussion or analysis; it could be observed how effective the instructional tasks are (Richards, 2002). He also added that effective classroom instruction depends on factors such as time-on- task, question patterns, feedback, grouping and task decisions, in which they can impede or promote learning.

As one of the objectives of teaching mathematics in bilingual program facilitating students to communicate mathematically, mathematics teachers should possess an excellent acquisition of significant language of mathematics and classroom language. The absence of those two will contribute to the failure of developing academic content and language knowledge.

Based on the brief description of the state of the art, this present paper aims at revealing how the math teachers develop classroom interaction in bilingual classes and what strategies they use to compensate their limited English competence in developing classroom activities.

## **RESEARCH METHODS**

This study involved one male and one female mathematic teachers in bilingual program and their 2<sup>nd</sup> grade students of SMPN 8 Yogyakarta and SMP Muhammadiyah 2 Yogyakarta. The focus on two teachers was due to limited availability of math teachers. In addition, this study serves as a preliminary study of 12 math teachers in Yogyakarta Junior High Schools.

The primary data for the study is the teacher-students interaction in math classes. Discourse analysis was chosen as the techniques of analysis to reveal the extent to which the interaction that the teacher built in classroom could provide more access for students to learn math.

Data was collected by means of observation and interview. Observation was conducted to second grade of math classes; interview was conducted to the math teachers and five students selected or invited, rather, by the teacher. Data analysis was based on the transcripts of teacher-student interaction during the classroom. Information gathered through interviews and document analysis are complementarily used to help understand the interaction better.

## **RESULTS AND DISCUSSION**

One of the significant features of the implementation of bilingual program is the use of English as a medium of classroom interaction. This could be analyzed from,

at least, two angles: the proportion of English used in classroom interaction and the functions of classroom interaction served with the use of English.

### Use of English

In general, the teachers develop their classroom activities based on some methodological bases to maximize their efforts to help students learn. The model used is the three-phase techniques consisting of pre-, while- and post teaching activities. Such model is equivalent to the widely practiced model of presentation – practice – production or PPP for short (Hammer, 2001; Richards and Rodgers, 2002). As the model does not amount much in structuring classroom interaction and is also called *vacuous* (Harmer, 2001:161) at the classroom level, this model has been widely translated into a different ‘three-stage model’ by the teacher to cover the stages of opening, presentation, and closing.

To comply with the demand of the implementation of bilingual program, the teachers are observed to have used English as the medium of instruction in their math classes in different proportion to cover several interactional functions. From the transcription, it can be described that the teachers use up to about 50% of his interaction with the students. Such a figure is a rounded calculation from the proportion of the use of Indonesian and English in his classroom. This proportion can be more explicitly presented in the following table.

Table 1. Proportion of use of English in Classroom

No	Stages of classroom activities	Proportion of English use	Notes
1	Opening	*	The teachers only use brief greeting for the opening.
2	Presentation	50	
3	Closing	*	The teachers only use brief part taking for closing.

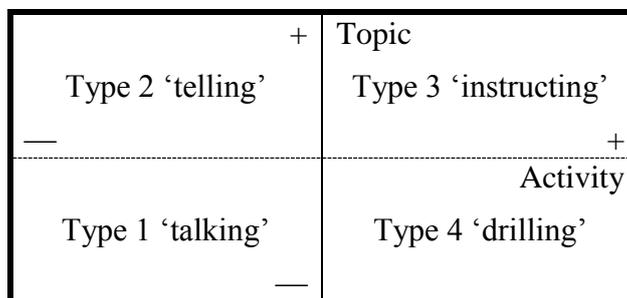
\* refers to insignificant use of English

The table shows that teachers only use English to perform the presentation stage. This is preceded by a very brief opening in the form of greeting and closed with a brief part taking at the closing. In other words, they only ‘teach’ but not sufficiently ‘preach’ the students.

### Interaction types

Van Lier classifies classroom interaction activities based on topic and activity orientation into four interaction types (1988: 155-157). They are type 1 ‘less topic-orientation, less activity orientation’, type 2 ‘more topic-orientation, less activity orientation’, type 3 ‘more topic-orientation, more activity orientation’, and type 4 ‘less topic-orientation, more activity orientation’. Further, he also states that each type of interaction usually plays certain roles and functions in

different stages of classroom interaction. The interrelation of the four interaction types are described in the following diagram.



(van Lier, 1988: 156)

Figure1. Interaction types

The use of interaction types has been described to be circularly systematic (van Lier, 1988: 147). In typical classroom situation it is observed that during the interaction, it is likely that most teachers use all the four types of interaction based on the communicative needs in a particular situation of lesson. Further van Lier also mentions that typical classroom activities need different interaction types. The group-work activity will certainly use different interaction types than the 'lockstep' or teacher fronted ones. Group or pair works tend to use both or combination of type one or talking and type 2 'telling' while teacher fronted tends to use types 3 'instructing' and or type 4 'drilling'.

Based on this paradigm, the use of English to structure classroom activities in the observed bilingual program math lesson conducted by the teachers could be briefly described as follows: Out of the orientation, the teachers develop more topic oriented activities and less activity oriented activities. Out of these two, the third interaction type, that is instructing is used more dominantly than the telling. The talking type is insignificantly used but in the opening, that is greeting, and the closing. Out of the four types, type 4 which is drilling is not used at all throughout the lesson. Further analysis revealed that drilling activities are typically and often heavily practiced in foreign-language classes in which the interaction is focused on establishing the accuracy of language forms, especially pronunciation and grammatical constructions.

This interaction type—drilling—is absent in math classes in this study. It seems that the teachers are well aware that as math teachers they do not put emphasis on the form of language. In fact, during the interview the teachers themselves make confession that their English is not better than the students', especially on pronunciation. Therefore, they never practice the drill to the students. It can be inferred that the absence of type 4 in this study is context-specific. Type 4 (drilling) is much used in the beginning level of foreign language classes and not used in math classes.

A brief illustration of the overall use of interaction types in structuring classroom activities is as follows: After brief greeting (type 1) the teacher asks the students to open their book (type 2). Then he appoints three students to share their homework to their classmates by writing their answers on the board (type 2). After that he checks their work and shows or tells the class whether the answer is

correct ( type 2) and how to correct the wrong one/s (type 3). After spending 25 minutes on that the teacher proceeds to introduce a new topic (type 3). He does it by giving some examples (topic 3) then checking students' understanding (type 2). Finally he spends the last 25 minutes telling the students to do the assignment (type 2) until the bell rings. Before the students leave the classroom, he gives a brief part-taking (type 1). The development of this classroom interaction can be displayed in the following figure.

Minutes	10	20	30	40	50	60	70	Class ends at
Interaction type	1	2	2 3	3	3 2	3	2 3	2
								75 minutes

Figure 2. The development of classroom interaction

The following is an extract of classroom interaction conducted by a female teacher at SMP Muhammadiyah 2 Yogyakarta at the first twenty minutes of her class to exemplify the above description.

Extract 1

T : Good morning class.....  
SS : Good morning, Mom .....  
T : Ok open your...book....(a very long pause and Ss get ready to start the class) (a long pause) please Tio do the exercise number one ..(pause) ...in front ....(pause) number two.. (SS noisy) ... number two Hafid..  
MS1 : nomor berapa..... (ss noisy)  
T : (long pause) number two...  
MS : siapa Buk.... noisy.. and....xxx  
T : Number two...  
MS : semua Buk... xxx  
T : number two A and B...  
S2 : Buk nomor dua Buk nomor 2 ... (long pause both students do the assignment on board)... tiga Buk.. both katanya semuanya Buk.. iya Buk... ..noisy..(ss laugh) ... long pause  
T : number two... what is the question of number two?  
Ss : The length..... xxx (ss read the question from the students' worksheet)

The extract shows that she opens the class with a short greeting (T's move 1). She then proceeds to involve the students with the homework he assigned the week before (T's move 2). She asks three students to come in front of the class writing down their answer to the first three questions on the board. During this, the teacher insists on using English as a medium of interaction in class with mediocre fluency and pronunciation. This could be observed from the relatively shorter sentence constructions used by the teacher and also the relatively frequent and long pauses that she made. On the other hand, the students mostly use Indonesian and very little English in responding the teacher's instruction. However, the students do not seem to show signs to come across problems in understanding teacher's English regardless of the low-fluency level of the teacher's English.

In this stage, the observed teacher is capable of using English in building classroom interaction. This type of interaction is relatively effortless for the teacher because this is part of the rituals she practices it very often. On the other hand, from the observation it can be seen that the intensity of the interaction is low in that in addition to frequent long pauses in her speech, she also chooses to engage the students in a more topic oriented discourse by asking them to do the assignment in front of the class. This is one of the very acceptable strategies for her not to talk or use English to keep class activities going. Such strategies are circularly and systematically applied thoroughly to develop the lesson by the teacher (see van Lier, 1988: 147).

The teachers' use of English in presenting mathematics in bilingual class is mandatory. Since the teacher's background is Mathematics rather than English, she still shows some degree of problems of using English in structuring classroom

*kawan... for domain.. berarti atau herarchi aturan yang memasangkan setiap anggota dengan anggota dengan anggota B... look at the example.... In page 40 –or 41.. state the relationship between Siti, Sita and Sandi... b straight weavy curly .. straight is straight..? curly..... ?*

Ss : keriting..

T : make an arrow diagram.... (48:03) to show relation .. so the rule relation is they have the design mempunyai tipe rambutnya... ternyata Vivi... has her style weavy Vita straight Sandy straight, Raka curly... in relation to express... relation there are three ways... number 1 is arrow diagram what is arrow diagram ?

The extract shows that in T's first move, she quotes the language from text book in presenting the topic. Since she has to elaborate the concept to help students understand the particular topic, she has to paraphrase it. Due to her limited verbal ability, she uses Indonesian and Javanese, instead. In such demand and short time, she chooses to code-switch into Indonesian and sometimes Javanese to compensate her linguistic handicap. From this extract, it can also be seen that the other strategy the teacher employs to keep the interaction going is by code-switching to Indonesian.

## CONCLUSION AND SUGGESTIONS

Based on the analysis and discussion it can be concluded that, to some extent, the teacher has successfully used English in presenting topics of Mathematics in bilingual class. She does not use English thoroughly and uses some Indonesian. So far this is understandable since most students use Indonesian in responding the teacher's utterances and very little English.

Based on the transcript of teacher students interaction it can also be inferred that the use of Indonesian constitutes one of the strategies of keeping the interaction going at the limited level of competency of using English. The other form of strategy is by engaging students in individual as well as classical activities. Of the most frequent activities are assigning the students solve the problems from the textbook and assigning several students to share their work by writing it down on the board. From this, the teacher could develop classroom interaction by discussing the result of students' work in class discussion.

Based on this interpretation, these strategies can be inferred to be forms of compensation of teachers' mediocre level of English proficiency. Although the strategies serve a positive role in keeping classroom interaction going, their use should be minimized because its intensive use equals to the limited English. To minimize the use of these strategies it could be conducted by enhancing the teachers' English competence. The higher teachers' level of English competence will automatically minimize the use of various strategies in developing classroom interaction. One of the efficient forms of enhancing their English is by providing a bridging English classes focusing on developing classroom interaction which demands teachers to perform and create authentic interactions based on problems commonly arise in classroom. Such course would be very effective because it answers problems that the teacher comes across.

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