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# DISCOURSE PATTERNS EMPLOYING CHORAL RESPONSE IN MATHEMATICS CLASSROOMS IN SEVEN COUNTRIES

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*Classroom discourse patterns provide insight into the pedagogical conventions and educational values of different cultures. Other research has classified the use of choral response as an instructional strategy in mathematics classrooms (Clarke, Xu & Wan, 2013). This analysis focused on discourse patterns that included choral response as a key element. Classroom discourse employing choral response is best thought of as monologic rather than dialogic and has limited capacity to cater for student differences or to foster student creativity. However, structural similarities to the IRF pattern are misleading. Discourse patterns involving choral response can constitute sophisticated practice for both students and the teacher. Research must inform the optimisation of the use of choral response in mathematics classrooms.*

## INTRODUCTION

Choral Response refers to a classroom event in which all students in a group respond orally in unison to a question or statement presented by the teacher (Heward & Wood, 2009, p.158). Choral response has been widely reported as a teaching technique in foreign language classes and as a method of maximising student participation in programs employing direct instructional approaches to teach language, reading, mathematics, and spelling (Carnine, Silbert, Kame'enui, Tarver, & Jongjohann, 2006; Przychodzin, Marchand-Martella, Martella, & Azim, 2004).

In their study of Korean primary schools, Grow-Maienz, Hahn and Joo (2001) documented sequences of highly organized and systematic patterns of instruction dominated by leading questions by the teacher and followed by short student answers, often in choral response. Their analysis demonstrated coherence in lesson development and a high degree of student involvement in instruction. They identified a pattern that can be described as teacher question/student answer/choral evaluation of the student answer. Other research suggested that secondary Korean students had limited opportunities for spoken participation in classroom discourse (Clarke, Xu and Wan, 2010). Discourse patterns, such as the one identified by Grow-Maienz, Hahn and Joo (2001), represent a culturally-specific solution to the question of how and in what form students might be initiated into technical discourse in classroom settings.

In another study, Wang (2010) examined two sixth-grade mathematics classrooms in China. He distinguished two functions of choral response: a regulative function and an instructional function, drawing on the work of Bernstein (1986). Four variations of choral response were identified: co-reading, co-narrating, simple answering, and tag

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answering (answering “tag questions” to which the response is ritualized rather than informative, serving purposes such as re-focusing student attention). Wang concluded that a high level of teacher authority is crucial to the use of highly formal choral response.

In a companion paper (Clarke, Xu & Wan, 2013), we classified the use of choral response as an instructional strategy in mathematics classrooms. That paper reported the diversity of forms of choral response and the occurrence of seven types of choral response in the mathematics classrooms analysed: Yes/No (Select Choice); Numerical; Mathematical Symbolic Expressions; Mathematical Terms; Mathematical Procedures; Mathematical Propositions; and Non-mathematical Responses. Insight into classroom practice and learning is likely to come from the investigation of how choral response is employed within discourse patterns in mathematics classrooms. This paper reports discourse patterns with choral response as an integral component.

## **METHODOLOGY**

This paper reports the fine-grained analysis of a subset of 22 lessons selected from 110 lessons from 22 classrooms in Australia (Melbourne), China (Hong Kong and Shanghai), Germany (Berlin), Japan (Tokyo), Korea (Seoul), Singapore, and the USA (San Diego). The lessons were taken from the data corpus collected for the Learner’s Perspective Study (LPS). Details of the project methodology are available elsewhere (eg Clarke, 2006). It is important to note that three video cameras were used (teacher camera, student camera and whole class camera) and each provided an audio record from which classroom speech could be analysed. We distinguished three types of public utterances: teacher utterance, choral utterance, and (individual) student utterance. Public utterances were defined as those that occurred in whole-class discussion or during teacher-student interaction. From the 110 lessons examined, we selected one lesson that had the highest number of choral responses from each classroom. Since our goal was the identification of discourse patterns, the analysis attended to the occurrence of types of choral response, their function in the classroom discourse, and their connection with the utterances following and preceding them. By focusing our attention on the lesson from each classroom that contained the highest number of choral responses we maximized the possibility of finding a range of classroom discourse patterns that included choral responses. It must be noted that choral response is a form of public spoken interaction, and this analysis did not include the student-student interactions so common in some classrooms. In fact, choral response was least frequent in classrooms where such student-student interactions were most common (Clarke, Xu & Wan, 2013). Our interest in this paper is in the location of choral response within identifiable patterns of discursive practice in the various classrooms.

## DISCOURSE PATTERNS OF CHORAL RESPONSE

We identified two discourse patterns associated with the use of choral response. The first one featured a teacher question, a choral answer, followed by teacher feedback/evaluation/follow-up (TQ/CA/TF). In the second discourse pattern, an individual student was asked to respond to a teacher question, and a choral evaluation by the class of that student's response was requested by the teacher (TQ/SA/CE). Both discourse patterns echo the IRF structure (teacher initiation, student response, teacher feedback/follow-up) identified by Mehan (1997), but these two discourse patterns are based on different authority structures in the classroom and have different affordances for student participation in mathematics classroom discourse.

### Teacher Question/Choral Answer/Teacher Evaluation (TQ/CA/TF)

This particular discourse pattern was the most frequent in the classrooms studied. The choral responses could take any of the forms identified by Clarke, Xu and Wan (2013). Three variations of this pattern were identified in the lessons analysed. These were labelled according to the pedagogical nature of the activity and consisted of choral reading, providing feedback after students' choral response and co-narrating.

#### *Choral Reading*

Choral reading was found in lessons from HK1 and SH1. In this form, the whole class is expected to respond by reading the material in unison. It is usually initiated by an explicit request from the teacher. Since nothing would normally go wrong with the reading of available information, choral reading is usually accompanied by a brief teacher acknowledgement. Below is one example from the Hong Kong classroom.

Example 1: HK1-L03 (00:21:10:30)

Choral reading of a procedure from a handout and applying it to a problem

T:	[T holding a sheet] Please read the first sentence.	TQ
Ss:	Every term has a common factor.	CA
T:	Okay. Is there any common factor? Is there any common factor? What is it? What is it?	TF TQ
S:	x minus y.	SA
T:	The second sentence. What? Louder. One, two, three.	TQ
Ss:	Take out the highest common factor.	CA
T:	Good. Take it out. [T writing on the blackboard]	TF
T:	The third sentence.	TQ
Ss:	Divide the polynomial by the HCF.	CA

T:	Is it like division? Divide them as if you're doing division. What's left if these are taken out? What's it? //What's left if these two are taken out? It's like dividing a polynomial.	TF
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While choral reading can serve the organisational purpose of keeping the students on task, it also helps to highlight important information. Successful choral reading depends heavily on the authority of the teacher, since the students are expected to deliver exactly what the teacher expects. It is not surprising that this form of choral response was only found in classrooms where the teacher's authority was highly respected.

*The teacher gives explicit feedback on the students' choral response*

The second variation of this discourse pattern featured explicit teacher feedback in response to the choral response. This feedback was typically a succinct restatement/affirmation or commendation, as in this Japanese example.

Example 2: JP1-L03 (00:24:21:12)

Identifying the values of  $a$  and  $b$  for linear equations in the form,  $y = ax + b$ . The linear equations,  $y = 2x + 2$ ,  $y = x$ , and  $y = 4x$  are considered in this example.

T	Zero. Uh-huh. Plus zero. So what is A here?	TQ
Ss	Two.	CA
T	Two. What about B?	TF TQ
Ss	Two.	CA
T	What about this? A?	TQ
Ss	One.	CA
T	One. What about B?	TF TQ
Ss	Zero.	CA
T	Okay, what about this?	TF TQ
Ss	Four.	CA
T	Four. What about B?	TF TQ
Ss	Zero.	CA
T	And, these are called linear function.	TF

The questions for choral response are typically simple and straightforward compared with those questions intended for individual students. It is therefore less likely that the class would give an unintended answer. The teacher's feedback consists mostly of repeating what was said by the class or by a brief affirmation such as "okay" and "very

good.” As such, the classroom discourse associated with choral response is highly scripted and students are expected to say exactly what the teacher had in mind. Diverting from the teacher’s agenda could violate the principles of participation in the classroom and therefore would be considered to be undesirable.

*Co-narrating*

The third variation of the TQ/CA/TF pattern was labelled as “co-narrating” by Wang (2010). By voicing the answer together with the students, the teacher provides simultaneous feedback to the whole class. Similar to the primary classrooms observed by Wang, when using this variation, the teacher usually increased the pitch of his voice on the last word to prompt the class to respond in unison. Below is an example from a Shanghai classroom.

Example 3: SH2-L02 (00:04:00:14)

The teacher was discussing with the class the common characteristics of linear equations in two unknowns.

T	Among the solutions, that is about solutions, so I don’t have to ask you what does a solution mean. For now I am asking about the meaning of solution of linear equation in two unknowns, right? Sit down, okay, this one.	
Carry	That can make the two sides of the linear equation in two unknowns equal to each other.	
T	A pair...	
Carry	A pair of values	
T	A pair of what [rising inflection], //values of unknowns	TQ
Ss	//Values of unknowns.	CA
T	Good! Very good, what did she say as suits or satisfies the linear equation in two unknowns? A pair of values of the unknowns, that is called a solution of the linear equation.	TF

In Example 3, the individual student is guided to frame a satisfactory response that the teacher completes in unison with the class. The teacher invited choral response as a way to state the mathematically correct response, focus attention on a key concept, and ensure that every student voices the mathematically correct answer.

**Teacher Question/Student Answer/Choral Evaluation (TQ/SA/CE)**

While in many classrooms the teacher is the only person who evaluates student responses, in the second discourse pattern, the students are given the responsibility to evaluate other students’ responses. This choral evaluation was sometimes accompanied by a follow-up from the teacher. This discourse pattern was found in

several of the classrooms analysed [HK1, KR2/3, SG1/2, SH1/2/3, and US1]. Compared with an evaluation provided by the teacher, the choral evaluation of a student's incorrect answer by the student's peers might possibly demoralise the student. This form of choral response was only found where public evaluation of student responses was already established as a common practice. Four variations of this discourse pattern were observed in the classrooms analysed.

*Choral evaluation of a student's spoken answer*

In this variation, after a student responds to the teacher's question, the rest of the class are invited to evaluate the student's response. In the cases where the student's answer was obviously correct, the teacher usually gave an acknowledgement and no further explanation would be offered. If the answer given was incorrect or it required multiple steps to obtain the answer, the teacher provided further explanation or asked a series of guiding questions to lead the class to obtain the correct answer. Such discourse patterns typically involved a combination of individual responses and choral responses, and a combination of teacher evaluation and choral evaluation. This way of building upon multiple student contributions was a key characteristic of the Shanghai SH3 classroom. Here, the choral evaluation served two purposes simultaneously. On the one hand, it held students' attention and made sure that everyone was on task. On the other hand, by inviting the class to evaluate their classmates' answers, the teacher involved everyone in the instructional process rather than relying solely on interaction between the teacher and the nominated student.

*Choral evaluation of student solutions on the board*

The teacher gets a few students to present their solutions to a given problem on the board, and then asks the class to give their evaluations of the solutions presented. One example from a Singapore classroom is presented below.

Example 4: SG1-L02 (00:17:18:00)

T	Alright, he was counting the number of zeros. Is this answer correct by the way?	TQ
Ss	Yes.	CE
T	Now, this method of course you get the right answer. But you realize something when you are writing down the zeros you have to be very careful. You have to take note of how many zeros you write down, correct?	TF
T	Now what about this answer, is it right or wrong?	TQ
Ss	Wrong.	CE

In the above episode, the teacher gave time for the class to complete the problem individually prior to asking two students to present their solutions on the board. After

both students had written their solutions on the board, the rest of the students were asked to evaluate the final answers. Following this episode, the teacher discussed the incorrect solution with the class. She began by asking them to identify where the mistake was in the solution, and then revisited the fundamental concepts prior to solving the problem, before leading the class through the procedure of solving the problem.

### *Rhetorical Questions*

The teacher asks a rhetorical question suggesting that the class give a choral evaluation of the student's answer, but either gives the evaluation himself or goes on to the next task without waiting for the evaluation to be given. In this variation, the choral response is implicit in the structure of the discourse pattern, but is actually provided by the teacher. This variation occurred most frequently when the answer was obviously correct.

### *Indirect choral evaluation of a student answer*

In this variation, no direct choral evaluation was requested. This variation occurred when the teacher noticed that the student's answer was incorrect/incomplete, and then asked the class leading questions to guide them through the procedures to generate the correct answer. Again, the discourse pattern implies a choral evaluation that does not occur and the teacher proceeds with a guided exploration of a student error that is not explicitly acknowledged.

## **DISCUSSION AND CONCLUSION**

In general, both discourse patterns follow a three-part sequence of initiation, response and follow-up (IRF). However, the two discourse patterns differ in terms of the sophistication of mathematical content, the rules of participation and the level of participation. In the first discourse pattern, TQ/CR/TF, the mathematical content involved is relatively simple and straightforward, mostly requiring recall of fundamental concepts or procedures or simple calculations. The teacher's expectation is that all the students are able to respond to the question posed. This discourse pattern establishes the taken-as-shared status of certain knowledge in the classroom.

In comparison, the mathematical content for the second discourse pattern usually involves an understanding of the fundamental concepts and procedures prior to applying them to mathematical problems. The choral evaluation of student work creates an opportunity for the students to reinforce their understanding of the concepts and also allows them to participate in the teaching process by assessing others' and their own learning.

While choral response is an efficient means to standardise participation, the classroom discourse associated with choral response is actually best thought of as monologic rather than dialogic. In other words, the students are expected to follow the teacher's

agenda (or script) exclusively. As such, it has limited capacity to cater for student differences or to foster student creativity. In spite of its limitations, choral response is a useful strategy for getting all the students participating in the classroom discourse, in particular for classrooms with a large class size. It should therefore be considered as a legitimate form of verbal participation that has the potential to initiate students into mathematical discourse. Its optimal use requires further study.

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