

The affordances and constraints of turn-taking in the secondary mathematics classroom

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This paper discusses the affordances and constraints of the rules of turn-taking in classrooms. The study draws on conversation analytic studies of both classrooms and ordinary conversations as well as data from a collection of sixteen secondary mathematics lessons with 12-13 year old pupils. Examining McHoul's (1978) rules for turn-taking in the classroom alongside examples from the data in this study where interactions deviate from these offer alternative ways of interpreting the actions of both teachers and pupils in whole class interactions.

Keywords: turn-taking; affordances; conversation analysis; constraints.

Introduction

There has been extensive research into the structure of turn-taking in a wide variety of contexts, including classrooms (Drew and Heritage 1992a; Mehan 1979; Seedhouse 2004; Sinclair and Coulthard 1975). Many of the classroom-based studies have reported the patterns that turns take in classroom interactions. Most well known perhaps is the Initiation-Response-Feedback (IRF) pattern of turn-taking that is widely used in teacher-pupil interactions (Mehan 1979; Nassaji and Wells 2000; Sinclair and Coulthard 1975). The implications of this IRF pattern of interactions for teaching and learning has been widely discussed (Cazden 2001; Wells 1993) and many argue that it is in fact an ineffective interactional pattern that stifles pupils' contributions to discussions and restricts opportunities for higher level thinking (Cazden 2001; Lemke 1990). The majority of the studies into turn-taking in classrooms have been conducted using some form of discourse analysis approach. The current study takes a conversation analytic approach to the analysis of interactions, examining the creation and shaping of meaning and context through sequences of turns (Have 2007).

The Systematics of Turn-Taking

In all interactions there are rules and practices that structure turn-taking: who can speak when, how long they can speak for and what they can say. Sacks et al.'s (1974) detailed examination of sequences of interactions led to the development of a system of rules (a systematic) that govern all turn-taking. Sacks et al. noted that usually only one person speaks at a time, yet the speaker changes frequently with minimal overlap or gap between the change of speaker. Sacks et al.'s systematic includes an iterative hierarchy of rules that manage speaker change. Firstly, where it would be relevant for there to be a change in speaker, the current speaker can select the next speaker and they are morally obliged to take the turn. If the current speaker has not nominated the next speaker, then another speaker can self-select to take the next turn and the person who speaks first takes the turn. Finally, if the next speaker has not been nominated or has not self-selected, then the current speaker continues with the turn. These rules then apply again at the next place where it is relevant for the speaker to change. Participants in interactions have been shown to orient to these rules in interactions and in a variety of contexts. However, certain activities or institutional contexts can place further constraints on the sequential structure of turn-taking.

McHoul (1978) examined turn-taking in whole class interactions in formal (geography) classrooms and refined Sack's et al.'s (1974) rules to reflect the differing roles of the teacher and their pupils. When the teacher is the current speaker, then firstly the teacher can nominate a pupil to be the next speaker. If the teacher does not nominate the next speaker, then the teacher must continue the turn. If a pupil is the current speaker then they select the next speaker and the teacher takes the turn. If the pupil does not select the next speaker then anyone can self-select as next speaker, with the teacher taking the turn if they self-select. If the teacher or another pupil does not self-select then the pupil continues the turn.

There are several noticeable features of McHoul's systematic. Firstly, it is the teacher who controls and manages the turn-taking and the role of the pupils is limited. Secondly, there are no options for pupils to self-select following a teacher's turn. In McHoul's data, there are no instances where a pupil does self-select and is not sanctioned for doing so and there are no instances where a pupil nominates another pupil. The conversation analytic approach that Sacks et al. developed and McHoul utilised views context as being both created and renewed through the participant's interactions. Thus the teacher and pupils are orienting to their institutional roles through their participation in the constrained turn-taking rules.

In formal classroom interactions, the teacher usually has some preformed idea or plan of what should be said and done in the lesson. Teachers may also have some preformed ideas about which pupils will participate in whole class interactions. Both the teacher and the pupils will have goals tied to the classroom context, which they will orient to in their interactions. Additionally, whole class interactions include several participants, so there is an audience for any interaction. This aspect goes some way to explaining the frequent use of nomination in changing speaker in order to minimise the possibility of overlap of turns.

In formal classrooms, it is the teacher who asks questions and the pupils who answer (Drew and Heritage 1992b). This pre-allocation means that the teacher, as questioner, can take long turns, constructed with a variety of turn types until the teacher produces a question that is recognised as such by the pupils. The pupils, as answerers, are constrained to give an answer to the teacher's question and their turn ends as soon as an answer is given. The dominance of teachers asking questions and pupils answering questions is often discussed in terms of the power and dominance of the teacher (Richards 2006).

The Affordances of Turn-taking

The term affordance was originally defined as a relation between an animal and an object (Gibson 1986), and the opportunities and constraints made available to the animal by the object. These opportunities and constraints are dependent upon how the animal perceives the object (Hammond 2010). Whilst the rules of turn-taking are not tangible physical objects, they do provide opportunities and constraints for interactional actions. There has already been much debate about the constraints that turn-taking imposes on whole class discussions and the implications these may have on teaching and learning, but less of an emphasis on the opportunities afforded by them.

The rules outlined by McHoul enable successful interaction to happen in the context of classrooms. There are many potential participants and the rules minimise the possibility of overlap. The rules also enable the teacher to maintain control over the topic and over which pupils contribute to whole-class interactions. The rules also provide an "intrinsic motivation for listening" (Sacks *et al.* 1974, p. 43) as participants need to monitor any interaction for points where a change in speaker is relevant, and in particular for their own nomination as next speaker. Finally, the control the teacher has over who can speak results in longer pauses occurring in interactions that would normally occur in ordinary conversation. Once the

teacher has nominated the next speaker, the turn is theirs and they can take their time in starting. In addition, as the turn returns to the teacher following a pupil's turn or the pupil continues the turn, a pause at the end of a pupil's turn will not be filled by another pupil self-selecting as next speaker. It is not the first self-selecting speaker who has the right to the next turn in formal classrooms, but the teacher. Pupils need to wait to see if the teacher will self-select before they self-select themselves, allowing for longer pauses at the end of a pupil's turn than would be possible in ordinary conversation. These opportunities for wait-time (Rowe 2003; Tobin 1987) do not occur in ordinary conversation and are a consequence of the rules of turn-taking in formal classrooms.

In order to examine further the affordances and constraints of the turn-taking system further, extracts that deviate from the rules are explored. The data in this paper is taken from a collection of sixteen video-recorded mathematics lessons from four mathematics teachers and their classes of 12-13 year old pupils. These data include examples that deviate from the rules outlined by McHoul and are not sanctioned. There are three situations where the teacher is the current speaker and a pupil self-selects as next speaker. The first is when a pupil asks their own question and the second is where a pupil is initiating or performing a repair (McHoul 1990). Both these situations are very rare in the data and there are also examples where the same actions of asking a question or initiating a repair in a self-selected turn are sanctioned by the teacher. On the occasions where a pupil has self-selected to ask a question, the question has occurred at a point where a change of speaker is relevant and the question does not initiate a change in topic. Therefore, whilst the role of questioner and answerer has changed, the teacher is still in control of the topic. Similarly, when a pupil self-selects to initiate a repair the topic remains unchanged.

The final situation where a pupil self-selects as the next speaker is in response to a question asked by the teacher, where a change of speaker is relevant but the teacher has not nominated the next speaker. Here, by asking a question requiring a response but not nominating the next speaker, the teacher is explicitly opening the next turn to a self-selecting speaker. At this point McHoul's rules for classroom interaction cannot apply; there is no opportunity for pupils to self-select in his system. However, Sacks et al.'s rules for naturally occurring conversation do apply. Here the first participant to speak has the right to the next turn and any other pupil that begins to speak will usually cut-off the turn to allow the first speaker to complete the turn. In the data, there are two situations where multiple speakers self-select after the teacher's undirected question. Firstly, where multiple pupils give the same answer:

- 131 Teacher: what's the probability?
132 Pupil1: a hal[f]
133 Pupil2: [[a ha]lf]
134 Pupil3: [fifty fifty]

Secondly, where the multiple pupils give differing answers:

- 176 Teacher: what total will go (5.4)
((draws diagonal boxes on the whiteboard))
177 Pupil1: seve[n]
178 Pupil2: [six]

At the end of each extract, McHoul's rules would then apply again as another relevant place for the speaker to change occurs. As such, either the teacher would take the next turn or the pupil who spoke first could continue their turn, with the option for the teacher to take the

turn applying first. In both the extracts above, the teacher in fact does take the next turn. However, there are examples where the pupils who have self-selected to give different answers then begin to alternate turns to offer explanations or justifications for why their answer is correct. Here, two further situations arise. Firstly where the subsequent turns are directed towards the teacher, which in effect nominates the teacher to take the next turn and consequently enabling the control of the turn-taking to return to the teacher in the next turn. Alternatively, the subsequent turns are directed towards other pupils in the class, in effect creating an argument situation between two (or more) different answers. Here the pupils are in effect nominating other pupils as the next speaker, another situation not considered by McHoul. These argument style interactions only occur in one teacher's lessons from the collection, but all begin with multiple different answers to an undirected question from the teacher. These questions include 'what is the smallest prime number' or 'which (lottery) ticket would you prefer'. The arguments that follow often involve several groups of pupils holding interactions with each other across the room. However, this results in multiple speakers at a time, and consequently makes it impossible to transcribe what is being said by whom. The teacher no longer has control over the turn taking or over the information being given as explanation or justification by the pupils; however, these pupils are still adhering to Sacks et al.'s rules for turn-taking in naturally occurring conversation.

As discussed earlier, the teacher having control over turn-taking in their lessons affords several pedagogic possibilities. The teacher can distribute turns across different social groups, control the participation of particular individuals and control the topic of discussion. The teacher can offer wait-time to pupils, both before their turn and at the end of their turn without fear of interruption. The missing option of pupils self-selecting following a teacher's turn also allows the teacher to talk for as long as they want to, which may include significant pauses, without fear of interruption. The rules for turn-taking in formal classrooms also allow interactions involving many participants to run successfully. However, where this control of the teacher has come under some criticism is in the activities that teachers use these opportunities for. The last situation where pupils engage in a debate offers an indication of a constraint that the turn-taking rules may place on the teaching and learning of mathematics. This genuine debate between pupils involves not only the explanation and justification of answers, but also attempts to convince others of their answer. Whilst pupils can be given the opportunity to explain and justify their answers to the teacher, and indirectly to other pupils, the need to convince others occurs when another pupil offers an alternative answer.

McHoul's analysis is based on the interactions within the institutional context of the formal classroom. However many authors argue that analysis should focus on the actions utterances are doing as the institutional context. "Turn-taking systems are characterizable as adapting to properties of the sorts of activities in which they operate" and not the contexts within which they take place (Sacks *et al.* 1974, p. 696). Whole class discussions frequently involve teachers asking pupils questions that they know the answer to, this act of asking the question could be functioning on several levels. The teacher could be assessing what their pupils already know, involving pupils in the presentation of presumed shared knowledge, assessing whether pupils are understanding new information, or managing the actions of the pupils. Many of the teacher's questions could be viewed as indirect requests for the information of whether the pupil knows the answer. The rules of turn-taking in formal classrooms also allow pupils the time to think and develop their answers because of the possibility of longer pauses and hesitation at the start of their turns than would normally occur in ordinary conversation. Whilst there is plenty of research evidence that teachers are not using this wait-time (Black and Wiliam 1998) the opportunity for wait-time to occur is a consequence of the structure of turn-taking in formal classrooms.

Conclusion

Conversation analytic approaches to the analysis of classroom discourse have revealed a relationship between the structure of discourse and the actions of participants. However, only a detailed analysis of the implications of this relationship in language learning has been undertaken (Seedhouse 1996). This paper argues that the structure of turn-taking in classrooms offer opportunities for the teaching and learning of mathematics which are not available in the structure of turn-taking in ordinary conversations. Whilst, the structure also constrains the interactions in some ways, other research indicates that the affordances appear not to be utilised (or perhaps perceived) by teachers. The turn-taking rules support wait-time, thinking time and the distribution of turns amongst pupils.

Transcription Conventions

- . falling intonation contour
- ? rising intonation contour
- [] onset and end of overlapping talk
- (1.5) pause, timed in seconds and tenths of a second
- (()) additional information including non-verbal actions

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