Turn taking and 'wait time' in classroom interactions

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Abstract

In this paper we examine classroom interactions using a conversation analytic approach to explore the relationship between turn taking and silences in classroom interaction. Seventeen mathematics lessons with pupils aged between 12 and 14 years were analysed in terms of the structure of turn taking and the length and nature of pauses that occurred during whole class interactions. We show that the turn taking structure of classroom interactions remains consistent with that described in the Conversation Analytic literature. In classroom interactions where different turn taking structures apply, silences have a different influence on student and teacher behaviour. We then demonstrate that the pedagogical construct of wait time is structurally built into classrooms with a formal turn taking structure and that this structure explains many of the previous research findings relating to the length of wait time. These findings have implications for pedagogic policies and recommendations relating to classroom interactions.

Keywords: Conversation analysis, turn taking, silence, classroom interactions, wait time

1 Introduction

Different turn taking structures give silences different roles which results in different interactional behaviours. This study focuses on the relationship between the structure of turn taking and silences during whole class interactions in 12 to 14 year olds. This analysis is used to examine the pedagogical concept of wait time.

Different approaches have been taken to analysing classroom interactions. Conversation analysis (CA) is one such approach and aims to describe and explain the structural organisation and patterns of turn taking through a fine-grained analysis of how the participants themselves orient to these structures through their interactional behaviour. Other notable approaches include the work of Sinclair and Coulthard (1975) and Mehan (1979) who both used a discourse analysis approach to reveal the Initiation Response Feedback (IRF or IRE) pattern that dominates classroom interaction. A teacher initiates an interaction, usually by asking a question, then a student responds, and then the teacher gives feedback (IRF) or evaluates (IRE) that response. This pattern continues to dominate classroom interaction (Kyriacou & Issitt, 2008) and many authors have explored variations on this pattern (Waring, 2009) or ways of using this pattern to improve the quality of teaching and learning (Mercer, 1992). Taking a conversation analytic stance, the IRF is not a single sequence type but instead consists of a question-answer adjacency pair and a third turn that can function in a variety of ways, such as closing down the interaction sequence (Schegloff, 2007) or beginning a range of teaching activities (Lee, 2007; Nassaji and Wells, 2000).

1.1 Conversation analysis and turn taking

> “a turn ... refers to an opportunity to hold the floor, not what is said while holding it” (Goffman, 1981).

Using a conversation analytic approach, McHoul (1978) detailed the structure of turn taking in formal classrooms. More recently, this work has been extended by Seedhouse (2004) in his exploration of language classrooms and Maroni et al. (2008) in their examination of Italian primary classrooms. A conversation analytic approach looks at the structure or implicit rules that govern who speaks when, how long for and what can be said. In formal interactions, such as those that occur in classrooms, there are often additional constraints on who can speak when compared to ordinary conversation. These tacit rules can be revealed by the actions of participants, demonstrating their orientation to such rules and the sanction of participants when these rules are violated. Sacks et al. (1974) discuss the adaptation of turn-taking systems to the type of activities that are being undertaken and this is evident in the research into the different structures of turn-taking systems in institutional settings such as classrooms (McHoul, 1978), courtrooms (Drew, 1992) and news interviews (Greatbatch, 1988).

Sacks et al. (1974) outline a model for the organisation of turn-taking in ordinary conversation, emphasising the local management of turn-taking. The authors note that generally only one person speaks at a time, overlaps between speakers are short and there are no gaps when the speaker changes. Their analysis of naturally occurring data leads to a set of 'rules' governing the transfer of a turn from one speaker to the next. First, if the current speaker nominates another participant to speak next, then that participant is obliged to take the next turn and no other has the right to this next turn. If the next speaker has not been nominated by the current speaker, then another participant can self-select as next speaker with the participant speaking first having the right to the turn. If neither of these first two scenarios occurs, then the current speaker can continue and keep the turn. These rules then apply recursively at each point in a turn where transition to a different speaker is relevant (referred to as a transition-relevance place (TRP) by Sacks et al.).

However, turn taking does not necessarily follow the rules of ordinary conversation in formal classrooms (McHoul, 1978; van Lier, 1984). McHoul's analysis of discourse in geography classrooms leads him to develop an adaptation of Sack's et al.'s 'rules',

which function in formal classroom contexts. These ‘rules’ highlight the different roles of the teacher and their students as they provide a normative structure which supports and enables different kinds of turns from teachers and students (Wooffitt, 2005).

McHoul’s description of the structure of turn taking in formal classrooms is as follows. If the teacher is the current speaker then, as before, the teacher can nominate the next speaker. The student that has been nominated is obliged to take the next turn and no other student has the right to speak. However, if the teacher has not nominated a student to take the next turn, then the teacher is then obliged to continue the turn. Here is the first deviation from the rules of turn taking in ordinary conversation. There is no opportunity for any of the participants to self-select to take the next turn except for the teacher. If it is a student who has the current turn, then that student can select the next speaker. There are no occasions in McHoul’s data where a student selects anyone other than the teacher as next speaker, and perhaps consequently, McHoul states that it is the teacher that has the right to the next turn. Otherwise, another participant can self-select as next speaker, with the teacher being first speaker. Again in McHoul’s data, there are no examples where a student

self-selects to be the next speaker. Finally, if neither of these two scenarios occurs then the student who is currently speaking can continue. However, they do not have the right to the turn as the first speaker as they would in ordinary conversation; the teacher retains the right, even if they do not speak first.

These adapted ‘rules’ illustrate the constraints on the roles in the local management of turn-taking in the classroom. For example, these rules do not allow students to self-select as next speaker if the teacher is the current speaker. Instead, they allow the teacher to pause during their current turn without risking ‘interruption’ by a student. They also allow for gaps between the speakers changing from student to teacher, when the student has not nominated the next speaker, as it is the teacher who has the right to first start. This scenario also restricts the possibility of students self-selecting following another student’s turn: whilst the option for them to do so is there, it is the teacher who has the right as first speaker. Furthermore, the situation where a student who has the current turn selects another student as the next speaker is not considered. McHoul reported no instances where a student selected another student to take the next turn and there were no instances in the data from this study either. These restrictions on students’ self-selecting minimise the

possibility of overlap in classroom interactions, whilst increasing the opportunities for gaps between turns compared to ordinary conversation (McHoul 1978), which changes the possibilities for different types of wait time as outlined below in section 1.2.

In McHoul's rules there is also no opportunity for multiple participants to self-select which again means that the potential for overlaps is minimised. Whilst McHoul's rules do not allow for multiple students to self-select as next speaker, he does provide an example where this occurs, and describes it as a violation of the rules. In his example, the teacher has solicited a response by asking a question, but has not nominated a student to answer the question. Many students self-select to answer the teacher's question and, to use McHoul's description, "chaos" ensues (p.199). However, as soon as the teacher nominates a student to speak next the other students stop talking and the normal structure of turn-taking resumes. McHoul describes this as using "renormalizing acts as a reparative technique" (1978, p.199). Other studies that have examined the structure of turn taking in classrooms have also considered these scenarios where the teacher has asked a question but has not selected a particular student to answer the question. Mehan (1979), for example,

considered questions where the whole class gave a choral response, such as in chanting. The structure of turn taking was similar to that described by McHoul, with the second participant being the whole class rather than a particular student (Ingram, 2012).

The differences in turn-taking structure are not only between formal classrooms and other contextual settings. Maroni et al. (2008) found differences in the turn-taking strategies in students of different ages with older students taking more turns than those in younger years. Cazden (2001) also offers a variety of examples from a variety of contextual situations indicating that differences in turn-taking strategies may also relate to cultural differences, the number of participants in the interaction and the form of the interaction itself.

1.2 Preference organisation

Conversation is made up of adjacency pairs, such as greeting-greeting, question-answer or request-grant. Preference organisation refers to the notion that some second pair-parts of an adjacency pair (i.e. that following the hyphen) are structurally preferred over others. For example, following an assessment, agreement is generally preferred to disagreement, with the exception of when an individual makes a

negative assessment of themselves, such as ‘I’m so useless’, when disagreement is preferred (Pomerantz, 1984). The preferred response is the one which is ‘noticeably absent’ (Bilmes, 1988) when it does not occur, rather than preferred in the psychological sense. There are common structural features of preferred responses and of dispreferred responses that are used by many researchers to analyse the structure of interactions. The features of dispreferred responses, for example, include markedness (Schegloff, 2007) such as the inclusion of filled pauses, greater complexity of responses, the inclusion of a partial agreement before disagreement or the inclusion of an explanation of or account for the disagreement before the disagreement itself. Preferred responses are often unmarked and given quickly, and they are given more frequently. Silence is generally dispreferred; it may be a response in itself or it may be part of the marking of a dispreferred response. These features are associated with preferred or dispreferred responses, in that they frequently co-occur, but they do not define them as this is not always the case (Bilmes, 1988).

1.3 Pauses in classroom interactions

The term ‘pause’ has different meanings in different branches of linguistic analysis. Conversation analysis distinguishes between three different types of silence: the gap, the lapse and the pause (Sacks et al., 1974). The pause occurs during a speaker’s turn, while a gap occurs where a change in speaker is relevant. However, if no change in speaker occurs, and the turn is resumed by the original speaker, this would become a pause. A lapse develops when a gap is extended and the possibilities for speakers to take the turn have gone through several iterations (Sacks et al., 1974). Talk thus becomes discontinuous. Gaps, pauses and lapses are defined by the local interactional context in which the silence occurs and therefore the designation emerges over time (Goodwin, 1981; Maroni, 2011). Lapses are extremely rare in classroom interaction and there are no instances in the data from this study. In a classroom the right and obligation to take the next turn always lies with the teacher if there is a silence.

In ordinary conversation gaps are minimised (Sacks et al., 1974) and there is a standard maximum tolerance of silence of one second (Jefferson, 1989). This is not the case in classroom interactions; several different authors have explored silences in the classroom, for example Rowe (1974), Tobin (1986), Heinze and

Erhard (2006) and Maroni (2011). Maroni argues that in the classroom context silences are more challenging to classify because of the different interpretations that different participants can have of the same silence. However, in the examples which she gives there are other features of the discourse that could explain the different interpretations by the participants, , such as a story-telling context, for example. Furthermore, the context of her work was with younger children than those considered by McHoul or in this study, where the rules of classroom interaction as described by McHoul (1978) may not necessarily apply or be established as rules of interaction for the classroom context.

Rowe (1974, 1978) used the term ‘wait time’ to describe specific silences in the classroom. She defines wait time I as the pause between a teacher‘s question and the teacher speaking again, which in CA terms is a gap which transforms into a pause. Although it is not made clear in Rowe’s research, the teacher has presumably nominated a student to answer the question, as the study focuses on the instances where students have failed to respond to the question and so there must be an expectation that they will answer it.

When a teacher pauses between asking a question and nominating a student, in ordinary conversation the end of the question would be a TRP, but in classroom interaction transition does not occur so the silence remains a pause until the teacher nominates the next speaker, at which point another TRP occurs. The exception to this is choral responses such as those detailed by Mehan (1979). In Rowe's research it is not clear when the measurement of the silences begins so it is not clear whether these pauses between asking a question and nominating a student are included or not. This would influence the accuracy of the pedagogic recommendations regarding the length of wait time that teachers should leave.

Wait time II is defined by Rowe as the gap between a student giving a response and the teacher speaking again. There are other silences which have subsequently been treated as wait time, namely, the gap that occurs between a teacher finishing speaking and a student starting a turn, and the gap between a student finishing a turn and another student starting one. We will be considering these in addition to the two types originally defined by Rowe.

In this study we consider gaps, pauses, and gaps that turn into pauses, which we classify below. If the teacher is the person who has spoken immediately before

the silence, we classify this as wait time I. If the student is the person who has spoken before the silence, then we classify this as wait time II. If the silence that follows is a gap (i.e. there is a change of speaker) then we classify this as sub category (i); if the silence is a gap that transforms into a pause (i.e. the original speaker takes the next turn), we classify this as sub category (ii). Hence, we have wait time I(i), which is the silence between a teacher finishing speaking and a student taking the next turn; wait time I(ii), which is the silence between the teacher finishing speaking and taking the next turn (a gap that has transformed into a pause, rather than a pause in its own right); wait time II(i) which is the silence between a student finishing speaking and the teacher taking the next turn; and wait time II(ii) which is the silence between a student finishing speaking and the same student taking the next turn (again these are gaps that have transformed into pauses, rather than pauses in their own right).

	Previous speaker	Next speaker	Type of silence
Wait time I(i)	Teacher	Student	Gap
Wait time I(ii)	Teacher	Teacher	Gap transformed into a pause
Wait time II(i)	Student	Teacher	Gap
Wait time II(ii)	Student	Student	Gap transformed into a pause.

1.4 Outcomes associated with extending wait time

Silences during classroom interaction have been advocated as offering both students and teachers the opportunity to think, to formulate answers before speaking, to listen to the contributions of others, and to reflect on those contributions (Tobin, 1987). Extending some of these silences have been shown to have effects on both teacher and student behaviour. For example, Rowe (1986) found that extending wait time meant that teachers made fewer discourse errors, such as taking the next turn with no reference to what the student had said. She also reported greater continuity in the development of ideas, possibly as a consequence of teachers building upon students' ideas. Teachers also interrupted students less often (Tobin, 1986). Rowe also reported that the content of the teachers' turns altered to include more questions which were designed to support students in elaborating upon ideas, explaining their reasoning or offering contrasting viewpoints.

Rowe (1986) and Kirton *et al*. (2007) both reported that teachers' expectations and perceptions of their students changed, for example students were characterised not as being less able, but as needing more time to answer questions. However, some

pupils in Kirton *et al.*'s (2007) study reported boredom when required to wait when they could have answered the question, leading to suggestions that extending wait time is only appropriate following certain types of question, those that require time to think (Riley, 1986). However, identifying these questions can be challenging. From a conversation analysis perspective the classification of questions as closed or open or lower or higher order is not only dependent on the question asked but also on how students respond to it, and how their response suggests the question has been treated (in contrast to a discourse analysis perspective which would classify a question without considering the student's response). Tobin's (1987) review of research on wait time linked teachers' increase of wait time beyond 3 seconds to higher achievement in science and mathematics.

In terms of student behaviours, Rowe found that students were more likely to answer and that their responses were generally longer and often contained an explanation or logical reasoning; students were more likely to engage in hypothesis and conjecture, but also indicated more confidence in their responses by reducing inflection. Students also asked more questions and the number of student to student interactions increased (1974, 1986).

There are some studies which offer contradictory evidence, e.g. Duell (1994) and Tincani and Crozier (2008), but these studies consider very tightly constrained contexts which are not generalisable to secondary classrooms.

2. Methodology

This study uses a conversation analytic approach (Sacks, 1992) to analyse the structure of turn taking during different teacher-led whole class interactions in mathematics lessons. The data is naturally occurring in that no instructions were given to the teacher about which topics to teach, tasks to use or how the lesson should be planned. The teacher-led whole class interactions included the introduction of new topics, discussions following group work, question-answer sessions assessing students, etc. There were contrasting teacher styles; however, all teachers' classrooms demonstrated the structure of classroom interactions as described by McHoul (1978), and each showed at least some of the deviations which are described in this paper.

A mathematics class from each of four secondary schools in England was video recorded. Each class was recorded between three and six times over a period of five weeks resulting in a total of 17 recordings of lessons lasting between 45 minutes and 1 hour each. The students were aged between 12 and 14 years and there were between 27 and 30 students in each class. The data was collected in the final term of the school year in 2008, so the teachers had been working with their classes for at least nine months. This was so that any norms or patterns of interaction would be largely established in each classroom. The videos were transcribed using Jefferson (2004) notation and the length of pauses or gaps was measured using Nvivo (version 8). The smallest pause measured is 0.3 seconds and pauses less than this appear as (.) in the transcripts.

In the transcripts in this study the roles of teachers and students are not explicitly identified but it is clear from the interactions which speaker is the teacher as they take more turns, have longer turns and ask more questions. Teachers are given male names. Students are given unisex names but referred to in the analysis as 'her', but in the classrooms there were a mixture of male and female teachers and

students. Participants do not make gender relevant to the interactions, so this distinction has not been made.

Only the transcription details that are explicitly used in the analysis in this paper are included in the transcripts presented below to make them easier for the reader to follow. Transcription details are outlined in Appendix A.

3. Findings

The findings of this paper are that the majority of classroom interaction follows the rules of turn taking outlined by McHoul (1978) (Section 3.1). However, there are interactional contexts in which the structure of turn taking alters to that of ordinary conversation (3.1.1, 3.1.2 and 3.1.3). Wait time is structurally built into the turn taking structure of interaction in formal classrooms (Section 3.2) and this explains many of the findings associated with extending wait time (Section 3.2.1.)

3.1 Turn taking in classrooms

The first finding of this study is that turn taking continues to follow the same structures as outlined by McHoul (1978) with some notable exceptions (detailed in

sections 3.1.1, 3.1.2, and 3.1.3 below). In extract 1, the roles of teacher and student are clearly identifiable. Simon takes alternate turns and nominates the next speaker in each of his turns. His turns are also longer than the other participants. The other participants do not nominate the next speaker in their turns and their turns are followed by Simon.

Extract 1 Simon lesson 1

```
117 Simon:    sixty four, thank you. can someone add up all those numbers
118           there, have you done it, have you got it. (2.5) I ca- I
119           ↑really can't believe how many people are sitting there
120           without a calculator. um I just find it amazing. Danny
121 Danny:    one seven six oh
122 Simon:    one (.) seven (.) six (.) oh. ((teacher is writing the digits
123           as he says them)) (0.6) ok. (3.7) I'm just gon- I'm just
124           waiting ten twenty seconds for people to catch up with that.
125           (6.7) George
126 George:   um (.) now do you (.) divi:de um (.) one one thousand seven
127           hundred and sixty by five hundred?
128           (1.4)
129 Simon:    let's ask um (0.3) Gerry in the corner. what does that number
130           there represent, this five hundred.
131 Gerry:    er::m how many (.) times, (0.9) um how people there was
132 Simon:    good how many people were surveyed. Kieran. what does that
133           one thousand seven hundred and sixty represent.
134 Kieran:   um the total (um number of days off)
```

On each occasion that Simon has nominated the next speaker in his turn, at the next TRP that student takes the turn. There are pauses during the teacher's turns where no other participant self-selects to speak, for example 2.5 seconds in line 118, 3.7 seconds in line 123 and 6.7 seconds in line 125. There is a gap between the student speaking and the teacher speaking of 1.4 seconds in line 128, where the student

does not attempt to continue their turn and no other student attempts to take the turn.

3.1.1 Debate is an exception

There are some exceptions to this structure of turn taking. The turn taking structure when students are engaged in argument or debate with other students who held opposing views resembled that described by Sacks et al. (1974) as the structure of turn taking for ordinary conversations and this is initiated by the teacher asking a question and not nominating a particular student to answer. An example is offered in extract 2 below.

Extract 2 Tim lesson 1

```
268 Tim:      …which is the first prime number.
269 Jordan:   one
270 Alex:     tw[o
271 Jamie:     [zero
272 Alex:     two
273 Jordan:   one
274 Tim:      one [two
275 Alex:       [two
276 Riley:    is seven one sir?
277 Tim:      okay we might discuss it tomorrow
278 Jordan:   one
279 Tim:      which one's the first prime number?
280 Jamie:    um
281 Tim:      why one?
282           (2.1)
283 Tim:      why is it not a prime [number ]
284 Jordan:                         [because] you can only divide it by,
285           one
286 Alex:     yeah but you can divide it by itself, because it divides by
287           itself
288 Jordan:   yeah but you can't, you can only divide it by one though
289 Alex:     yeah and that's dividing by itself
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290 Jamie:    yeah but one's ((inaudible) number)
291 Tim:      wind them up and let them go ((directed at camera)) . so what
292           is it, one or two, one or two.
```

In extract 2, students are self-selecting to take turns and there is not oscillation between the teacher and the students. In line 268, the teacher has asked “which is the first prime number” after which students self select to give three different answers in the subsequent turns: zero, one and two. This becomes mainly an oscillation between Jordan and Alex, although the nature of their contributions changes when Tim interjects questions in lines 279, 281 and 283. There are no gaps between the students’ turns, no pauses within turns, and there are a number of overlaps, including with the teacher. From line 286 onwards students are responding to other students’ turns and their turns also include explanations and justifications for why their particular answer is correct. At no point does the teacher intervene to assert their authority by confirming that one is not a prime number.

A point of contention (Gellert, 2011) has arisen between different students, and the interactions cease to be between teacher and students, and are now between disagreeing students. As Egbert (1997) describes it, there has been a schisming of the whole-class interaction into multiple interactions. The students are

no longer orienting themselves to the formal classroom context and instead the rules that govern ordinary conversation apply. This schisming has occurred following a question asked by the teacher but without nomination of a particular student to take the next turn (line 268 and lines 279–283). The question indicates a change in speaker, but only a self-selecting student can take the next turn (because there has been no nomination). This is therefore a departure from the rules of classroom interaction in that students are required to self select in order to answer the question and to defend their position to one another.

3.1.2 Students asking questions

Another deviation from the rules of turn taking in formal classrooms occurs when a student self-selects to ask a question. Students rarely ask questions in lessons (Van der Meij, 1988) and when they do it is usually after they have raised their hand and the teacher has nominated them to speak (Ingram, 2012). In extract 3, an example of a student asking a question by self-selecting is given.

Extract 3 Tim lesson 4

```
234 Tim:       one in eight. ok. if I cancel them down, that and that
235            cancels. that and that cancels I'm left with (0.7) a tenth.
```

```
236             so-
237 Chris:       how do you know that cancels with that
238 Tim:         how do you know what this cancels down
239 Chris:       yeh
240             (1.1)
241 Tim:         if I multiplied it out you'd see tha-, that (0.3) I have a
242             factor of eight on the top and a factor of eight on the
243             bottom.
244 Chris:       oh
245 Tim:         and I know that because there's just an eight on the top and
246             we're timesing them.
247 Chris:       oh
248 Tim:         so I can just cancel the down straight away. so, despite
249             what you thi:nk (0.4) it doesn't matter when you go. you
250             still have the same (.) probability if y- if you chose
251             before now which position to go in, you would have the same
252             probability of winning (0.6) no matter where you go=
```

In line 237 Chris asks a question about the mathematics Tim is doing on the whiteboard. The next turn is taken by Tim, which repeats Chris's question, which Chris interprets as a hearing check and affirms the question in line 239. There then follows a pause of 1.1 seconds indicating that the rules for turn taking have returned to those of a formal classroom as the following turn is taken by Tim and no other student attempts to self select to take the turn. Tim is also able to pause during his turn without interruption (eg. 0.3 seconds in line 241). So the only deviation from McHoul's rules is that the student self-selected in order to ask the question.

The rarity of students' self-selected content-related questions can be accounted for by the rules of turn-taking in formal classrooms; however, the data show that deviations from the rules in this case are not sanctionable and are in fact

explicitly rewarded in some instances. Chris asks a question in line 237 which Tim repeats in line 238 before offering an answer in lines 241–248. Tim does not sanction Chris for asking the question. This type of deviation from the rules of turn taking in formal classrooms is only not sanctioned when the question relates to the relevant topic rather than those related to classroom or task management.

3.1.3 Initiating a repair

There is one final exception where the data deviates from the rules of turn taking in classroom interactions. In extract 4 (lines 76–7) two students self-select to initiate a repair where the teacher writes something different on the board to what has been said, and are not sanctioned for it. This is one of only two examples of a student initiating a repair on something a teacher has said or written in the entire dataset. There are occasions where a repair has been initiated by a self selecting student on a previous student's turn and therefore the turn taking structure deviates from the rules of turn taking in classroom interactions. However, these all occur in the interactional contexts outlined in section 3.1.1, and hence the structure of turn taking resembles that of ordinary conversation rather than classrooms. For example, in

extract 2, line 286, Alex initiates a repair on the previous student's turn, but that is within the context of a debate.

There are other occasions in the literature where students self select in order to initiate a repair on another student's turn. These turns, however, are directed towards to the teacher rather than the student in whose turn the trouble occurred; this is described as 'turn-shark' behaviour by Erickson, indicating that it is a 'theft' or 'attack' (1996, p. 37).

3.2 Turn taking structurally enables extended wait time

The second main finding is that extended wait time is structurally built in to the turn taking structure in classrooms, as described below. It is this turn taking structure that explains many of the outcomes described by earlier research but also reveals some issues associated with asking teachers to deliberately leave an extended wait time of at least three seconds (see section 3.2.1 below).

Wait times I(i) and I(ii), those which follow a teacher's turn, as shown in Figure 1, can be longer than those in ordinary conversation because of the structure of turn taking in formal classrooms. Once the teacher has finished speaking they can pause

before nominating a student to speak. If they do not nominate a student to speak, they can also pause for longer than in ordinary conversation because the students do not have the opportunity to self-select and the turn continues to be the teacher's. Once the teacher has nominated a student to speak, only that student has the right and obligation to take the turn. As the turn is secured as theirs, the student can leave a longer gap than in ordinary conversation before starting to speak (see extract 4).

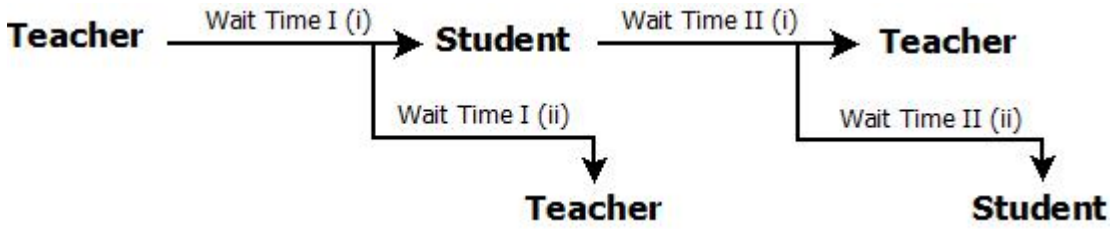

Figure 1 Turn taking and wait time

Wait times II(i) and II(ii), those which follow a student's turn, can also be longer than those in ordinary conversation. Once the student has finished their turn, the next turn is either taken by the teacher, or, if the teacher does not start to speak, wait time II(i) transforms into wait time II(ii) (that is from a gap to a pause), and the turn returns to the student who has just finished speaking. The teacher has the opportunity to leave a longer pause than in ordinary conversation as the next turn is theirs unless they choose not to take it and the student must wait to be sure that the teacher is not taking the turn before they will continue their turn.

In extract 4, there are numerous silences that demonstrate the teacher's and students' orientation to the structures of turn taking in the formal classroom and the opportunities for extending wait time. This demonstrates that in classroom interaction the normal maximum tolerance of silence of 1 second (Jefferson, 1989) does not apply (e.g. the silence of 3.7 seconds on line 88).

Extract 4 Richard lesson 1

```
66  Richard:  ... the raindrop. (1.7) that falls at thirty kilometres an
67            hour. (1.3) this time you know the distance (0.7) and the
68            speed and you're trying to find how long it takes. what did
69            you get Taylor.
70  Taylor:   erm (2.1) er erm (divided it) (1.4) one thousand two hundred
71            divided by thirty
72            (1.4)
73  Richard:  why one thousand two hundred, oh yes. one thousand two
74            hundred,((writes 1200 on the whiteboard as he's saying it))
75            (2.0)
76  Drew and  that's twelve thousand
77  Casey:
78  Richard:  thank you. (3.2) ((erases the 0 on the end)) . getting used
79            to this new (0.1) board bu- i- hard. one thousand two hundred
80            and you divided it by (1.2) thirty ((writes on the
81            whiteboard)) . what did you get.
82  Taylor:   erm (0.8) then I like (.) cancelled it down like t-(1.6) a
83            hundred and twenty divided by three.
84  Richard:  very good. (0.5) which makes forty?
85  Taylor:   yeap.(0.9) and then I took the um ((inaudible)) forty
86            (1.2)
87  Richard:  so this was forty what?
88  Taylor:   per- (3.7) yeh how long it took (0.4) like (four) ,
89            (2.7)
90  Richard:  how long it took, (2.1) so what have we done, we've taken one
91            thousand two hundred metres we've divided it by thirty what.
```

The turns in this extract oscillate between teacher and student. The interaction begins with the teacher. There are pauses of 1.7, 1.3 and 0.7 seconds in the teacher's first turn during which no one else attempts to take a turn. The teacher ends his turn by nominating a student, Taylor, to take the next turn. Taylor begins

her turn hesitantly but by saying ‘erm’ she indicates that she is aware that she has the right and the obligation to take the next turn. She then pauses for 2.1 seconds without the teacher or another student taking a turn before she gives her initial answer of ‘divided it’. The teacher has the right to speak at this point because it is a TRP, but he leaves a gap of 1.4 seconds which turns into a pause when Taylor resumes her turn (line 70) (an example of wait time II(ii)), and expands her answer to give the calculation in full. This is then followed by a gap of 1.4 seconds, which is wait time II(i) (line 72).

Taylor claims the turn on each of lines 82, 85 and 88 but then leaves significant pauses before answering the question. It is not possible to tell from previous studies about wait time, which have taken a discourse analysis approach, whether wait time I is measured between the teacher’s question (last meaningful utterance) and the student’s first meaningful response, rather than between vocalisations. In previous studies, therefore, these examples of Taylor’s turns (and earlier in line 70) might have been classed as wait time I (with the exception of Rowe (1986) and Tobin (1986) which only considered the time before a teacher spoke).

It is the structure of turn taking in the classroom, which does not allow self selection, in contrast to the structure of ordinary conversation, that enables longer gaps and pauses to occur within classroom interaction.

3.2.1 Explaining the outcomes of extending wait time

The structure of turn taking, together with preference organisation of repair (Schegloff, Jefferson and Sacks, 1977, McHoul 1990), explains many of the reported findings associated with student behaviour following the extension of wait time. Extending wait time I(i) offers students more opportunities to think and construct their responses, which is likely to result in fewer failures to respond. A speculative response is preferred to a non-response, including 'I don't know', and the time to think affords for the construction of conjectures or hypotheses. It also affords students an opportunity to reason through their answers so that they may have more confidence in them. It is the combination of the structure of turn taking which enables longer pauses, together with the maximum tolerance of silence of no more than one second (Jefferson, 1989), that means that the students feel compelled to answer rather than wait for the teacher to respond. The nomination of the student means that they are obliged to take the next turn but the longer silences strengthen this compulsion hence increasing the likelihood of the student responding. The maximum tolerance of silence will also be felt by the teacher, but by allowing the pause, they provide the opportunity for the student to continue the turn.

A pause following a student's response (wait time II(ii)) can also be interpreted by that student, because of the structure of preference organisation, as the initiation of a repair by the teacher on their response. The student perceives this as indicating that there is trouble (Seedhouse, 1994) in their response, which could be that the teacher does not understand what the student has said, or that the teacher thinks that what the student has said is inappropriate, incorrect or

incomplete. The preference for self-repair means that the student will attempt to perform the repair by expanding or explaining their initial response, or explaining the reasoning behind their response.

Extract 5 Edward Lesson 1

```
144 Edward:   Madrid. good. ok so say you're going on holiday (0.6) if
145           you're going on holiday and you're get in your aeroplane start
146           off in London, (0.6) and you're going to Madrid.(0.8) ok?
147           (0.9) does it get (0.7) hotter (0.3) or colder (0.4) and by
148           how much. (0.8) Sam?
149           (0.7)
150 Sam:      hotter (0.4) by seven (2.0) centigrade
151           (0.8)
```

In extract 5 the student, after a gap of 0.7 seconds, initially gives an answer of 'hotter' which they then expand to include a number, after a short pause of 0.4 seconds, as requested by the teacher in the original question and then, following a longer pause of 2 seconds, the units are included. Following each pause, the student has expanded their answer to make it more specific. Alternatively, students have the opportunity to self-repair where an extended pause has enabled them to recognise an error in their response, as shown in extract 6, where the student self-repairs after a pause of 1.2 seconds (line 163).

Extract 6 Edward Lesson 1

```
162 Edward:     hotter or colder
163 Brooke:     erm hotter, (1.2) colder
164 Edward:     colder. ok. (0.8) what about if you then go from Moscow
165             (0.7) to Montreal, what happens then. (1.4) Elam?
```

Extended silences can also be interpreted by the other students as indicating that there might be trouble in the previous turn. The structure of turn taking in classroom interaction means that they must wait for the teacher not to speak, and for the student whose turn includes the trouble-source not to self-repair before they can self-select. If the teacher does not initiate a repair then they may self-select in order to initiate a repair, that is, there will be an increase in student to student interactions. There are no occurrences of this in the data, but this study did not deliberately manipulate the silences being considered and all those included in the analysis were naturally occurring.

This leads to a potential tension when teachers are attempting to alter students' interactional behaviour by deliberately extending wait time. The structure of turn taking for formal classrooms enables longer silences to be left both between turns and during turns. It has been argued in this paper that these silences lead to desired student behaviours such as extended answers that include explanations or reasoning as well as increasing the likelihood of a response at all. However, it has also been shown that increasing wait time following a students' turn leads to more student to student interactions. When student to student interactions occur, the rules of turn taking alter to those that govern ordinary conversation (see for example section 3.1.1). Consequently, the gaps between turns become minimized. In certain

circumstances this might be desirable, but it may also reduce the tendency to supply extended answers or explanations. It may also create a bias in the participation in discussion towards certain students who are happy to self-select. For example, the literature shows that boys speak more than girls (Aukrust, 2008) and that teachers may have perceptions about students' ability based on their speaking or otherwise (Kirton *et al*, 2007). However, explanation and extended answers may still be possible within the context of student-to-student interaction if established as a norm of classroom interaction first. Further research is required. It may be necessary for the teacher to set up different rules of turn-taking for different pedagogic contexts, using re-normalising acts (McHoul, 1978) to mark changes between the different structures.

4 Conclusions

In summary, this analysis has shown that the structure of classroom interaction continues to follow the same structures as outlined by McHoul (1978), with some notable exceptions: debate; students asking questions; and students initiating a repair. Turn taking in the classroom is structurally different from turn taking in

ordinary conversation and this difference results in gaps and pauses taking on different roles.

This analysis has shown that the pedagogical recommendation of extended wait time is enabled by the structure of classroom interaction; the structure of turn taking is more tightly constrained than in ordinary conversation, so that self-selection and the consequent competition to speak first is limited, and this provides opportunities for longer pauses. In addition the structure of turn taking and preference organisation together (in particular the maximum tolerance of silence) explain the outcomes of extended wait time, as detailed in the previous literature. The norms which apply to classroom interaction are dependent on the interactional contexts as opposed to the physical context: not all interaction that takes place within a classroom has the structure of classroom interaction; argument and debate follow the rules of ordinary conversation (Jackson and Jacobs, 1980) until teachers undertake a renormalizing act to signal a return to the norms of classroom interaction (McHoul 1978).

This present study contributes a more rigorous approach to the analysis of wait time. The analysis has tried to show how the extension of gaps and pauses

affects student and teacher behaviour. From a pedagogical perspective there are implications for the development of particular classroom norms that teachers or researchers may see as desirable. In particular there may be scope for future studies which deliberately aim to collect data from classrooms where teachers have consciously attempted to manipulate silences in their classroom interactions, to explore how different manipulations affect the norms of classroom interaction. Theoretically, enforced extended wait time I(i) (teacher to student) would continue to lead to longer answers containing more detail, explanation or reasoning, as described by Rowe (1974, 1978), in situations where self selection is not desired or established as a norm of classroom interaction. In contrast, we conjecture that after longer answers that include reasoning or explanation have been established as a norm of classroom interaction, then continuing to extend wait time II(i) (student to teacher) or wait time II(ii) (student to same student) will be counterproductive, as students will no longer see these answers as preferred, and may revert to previous norms. Similarly if student self selection is desired, for example to set up a debate between students, it would not be possible to extend wait time I(i) since self selection introduces the element of competition as the first speaker has the right to the turn.

Deliberately extending wait time I(ii) (teacher to same teacher) should result in fewer gaps turning into pauses because students should speak more often (as also suggested by Rowe (1974, 1978) and Tobin (1987)).

At present there is no consideration of the pause between a student speaking and another student taking the next turn, without that change being mediated through the teacher (for example by a non-verbal turn such as gaze or gesture (Kääntä, 2010)). This is not considered in the literature and does not occur in our data but might be a phenomenon which is worth further exploration, particularly in terms of considering the possible differences between classrooms where student self selection is permissible following a teacher turn, and those where it is not.

Silences are a powerful tool which can hugely influence the structure and nature of interaction. As a consequence they are worthy of further study. This article contributes to our understanding of the role silences play in classroom interaction whilst also revealing aspects of the role of silence in classroom interactions that are not considered by existing research.

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Appendix

Key to transcription

[ ] overlapping talk

(0.5) length of silence in tenths of a second

(.) micro-pause

. falling intonation

? rising intonation

, continuing intonation, slightly rising

= contiguous utterances, no pause or gap

- cut-off

_ (underline) emphasis

(()) transcriber's description

() speech which is unclear or in doubt in the transcript

: prolongation of immediately prior sound

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