A critical analysis of the role of wait time in classroom interactions and the effects on student and teacher interactional behaviours

Jenni Ingram, University of Oxford, UK*

Victoria Elliott, University of Oxford, UK

Jenni.Ingram@education.ox.ac.uk

Oxford University Department of Education,

15 Norham Gardens,

Oxford.

OX2 6PY

Abstract

Extending the pauses between a teacher asking a question and a student responding, or the pauses following a student's response (wait time), has been recommended as a way of improving classroom learning. Drawing upon the Conversation Analysis literature on classroom interactions alongside extracts of classroom interactions, the relationship between these pauses and the interactional behaviour of teachers and students is examined. Extended wait time is structurally built in to classroom interactions because of tight control over who can speak when, encapsulated within the IRF framework. Extending wait time can lead to a variety of changes in the norms of classroom interaction. This paper uses the structures of interactions in formal classrooms to explain many of the previous findings relating to the extension of wait time. However, we also show that different uses of extended wait time lead to different interactional norms and maintaining extended wait times may not be desirable. Consequently, we argue for a more nuanced understanding of wait time, desired student behaviours and the interaction of the two.

Keywords: Wait time, classroom interaction, conversation analysis, interactional strategies

Introduction

Wait time has received considerable attention in the professional and policy literature on effective questioning and assessment both in the US and the UK (for example, Blosser, 2000; Johannessen, 2003; Black, Harrison, Lee, Marshall & Wiliam, 2003; DfES, 2004; Sprenger, 2005; Loughran, 2010). It is argued that wait time gives students more time to think and reflect more deeply upon the questions which teachers pose, leading to greater learning gains (Mercer & Dawes, 2008). Most teachers naturally leave an average of less than 1 second of wait time after asking a question before repeating or rephrasing, or giving their own answer (Rowe, 1972; for an exception, see Heinze & Erhard, 2006). However, extending this wait time to at least 3 seconds has been associated with a number of positive outcomes (described

below). Consequently, many professional education texts advocate the deliberate and conscious extension of wait time to at least 3 seconds.

The arguments we put forward here have developed from the Conversation Analysis (CA) literature and are supported by illustrative extracts from mathematics lessons. CA is an ethnomethodological approach to the analysis of talk-in-interaction; in this approach talk-in-interaction is considered to be jointly constructed by all participants in the interaction. Consequently in this paper there is a focus on the joint construction of pauses by both the teacher and the students, in contrast to much of the existing literature which focuses on the behaviour of the teacher (e.g. Lee, 2007; Cazden, 2001). CA focuses on the often implicit rules that structure interactions, specifically how participants interpret these structures and orient to them; through examining these structures, CA can reveal pedagogical strategies without recourse to wider contextual features such as the nature of teachers' questions.

Drew (2005, p.79) identifies four key concepts that underpin CA examinations of talk-in-interaction: turns and turn-taking; turn design; social action; and sequence organisation. The analysis offered in this paper largely focuses on turn-taking, though turn design, social action and sequence organisation permeate the analysis and help to distinguish the analysis here from the existing literature on classroom interaction from other discursive approaches.

We argue that the turn-taking structure of formal classrooms maximises the potential for extended pauses between turns of talk, in contrast to the turn-taking structures of other forms of talk, such as ordinary conversation or story-telling, where the potential for pauses is minimised (Sacks et al., 1974). This enables students and teachers to manipulate lengths of pauses to achieve pedagogical and other social goals, such as many of the reported outcomes of extending wait time. We will use the structures of interaction to explain why many of the

highly cited outcomes of extending wait time occur, which will reveal issues with the current recommendations for teachers in regard to wait time (e.g. Lesh & Zawojewski, 2007).

As a consequence we will argue for a more nuanced understanding of wait time on the part of teachers, teacher educators and policy writers. The desired nature and quality of interaction needs to be considered when making decisions about the need for and length of wait time, both following a teacher's turn and a student's turn. For example, the role of wait time would be different in dialogic student-teacher talk and exploratory student-student talk within whole-class interactions (Myhill, 2006). The importance of this type of 'metacognitive awareness' has been promoted by Edwards-Groves and Hoare (2012, p.98) as being key to establishing good dialogue in the classroom.

To illustrate the arguments, we use extracts from a collection of mathematics lessons with students aged between 12 and 14 years old with four experienced teachers from four contrasting schools. The lessons were video-recorded and then only the whole class discussions were transcribed (using Jefferson, 2004). The data is naturally occurring, to the extent that the interaction would have occurred with or without the researcher being present.

CA and the analysis of classroom interactions

CA is a field which grew out the lectures of Harvey Sacks in the 1960s (1992) and subsequent work by Sacks and his colleagues Schegloff and Jefferson. Analysis is undertaken within the context of certain framing principles. It assumes that talk is ordered (Schegloff, 2000) and that this order is the product of the meanings and social actions of the participants involved in the interaction (Psathas, 1995). When examining these interactions, CA only draws upon the local context, what participants in interaction do, and how they design their turns in response to the turns of other participants in the interaction which have gone before,

rather than by the imposition of external interpretation on participants' actions (Schegloff, 1997). Therefore the characteristic which defines 'classroom interaction' in a CA sense is *not* that the interaction is happening in a classroom, but that participants within the interaction are orienting themselves to the roles of teacher and students and the goal of learning (Goodwin & Heritage, 1990). The aim of CA is to discover and explicate the 'common set of methods or procedures' (Heritage, 1984, p. 241) which participants use to construct and construe interaction. Analysis is systematic and based on the fine details of transcriptions of naturally occurring talk (ten Have, 1990).

Of the four main concepts (Drew, 2005) which underpin this analysis, turn-taking is the main focus of this paper and will be examined at length below. Of the other three, social action refers to the idea that in interaction people are not merely talking but actually *doing* things in their turns. For example, in asking a question, a teacher might be doing a combination of the following actions: eliciting information; checking understanding; making certain vocabulary available for future use; directing attention to particular features of the interaction which have gone before; initiating a repair on a previous turn (see below); or any number of other 'social actions'. Turn design refers to the notion that the speaker constructs their turn in terms of what it will accomplish as well as what has gone before and the consequences it might have for the turns that follow. It is designed for the specific local context and the specific participants in the interaction in which the turn occurs, a notion referred to as 'recipient design' (Sacks et al., 1974). To continue the example just given, in answering the teacher's question, a student designs their turn in such a way that they demonstrate recognition that the teacher's turn was a question, that an answer is required, and that it is them who is required to answer, but they will also construct their response within the constraints of what the teacher might treat as a preferred answer (see below). Turn design includes features of the turn such as pauses, delays and prosody as well as the content of the

turn. Sequence organisation refers to the notion that interactions are built up of sequences of turns, rather than individual turns. The most basic sequence is the adjacency pair (Schegloff, 2007), such as question-answer or invitation-accept/decline. Once the first part of the pair is uttered, the second part is expected. The IRF sequence (Initiation-Response-Feedback/Follow-up) commonly identified in research on classroom interaction is an adjacency pair expanded by a sequence-closing third turn (Schegloff, 2007), to which teachers and students orient as an intrinsic part of learning interaction (Margutti & Drew, 2014).

Turn design and sequence organisation lead to the concept of preference organisation and repair. Preference organisation refers to the idea that within an adjacency pair some second parts are preferred over others. Preferred responses are usually given quickly and without any marking (as in extract 1 below). Whereas, a dispreferred response would usually be marked by the presence of delays, hesitations and/or explanations and excuses. A preferred response is one which is *noticeably absent* when it does not occur (Wooffitt, 2005).

'Repair' refers to things which participants do to ensure 'that intersubjectivity is maintained or restored, and that the turn and sequence and activity can progress to possible conclusion' (Schegloff, 2007, p. xiv). CA makes a distinction between the initiation of a repair and the performance of a repair. The existence of trouble in a person's turn can be identified either by that person (self-initiated) or by another (other-initiated) and the repair can then be performed either by the person in whose turn the trouble occurred (self-repair) or by the other (other-repair). There is also an organisation of preferences in relation to repair: self-initiated self-repair is the most preferred response to 'trouble' in the interaction, followed by other-initiated self-repair, and finally repair by another. Here, trouble is taken to mean any difficulty occurring in the interaction, which could include a mistake or discourse issues such as word searching (Seedhouse, 1996). Some authors make the distinction between repairs

and corrections (e.g. McHoul, 1990; Macbeth, 2004), where corrections refer to errors that are directly replaced with something that is correct.

What do we know about turn-taking in classrooms?

Classroom interaction is most clearly distinctive from ordinary conversation in the structure of turn-taking, which has been considered by a number of authors. Cazden (2001) considered the power imbalance and the differing rights and obligations of teachers and students in classroom discourse, drawn from their relative social positions. Although teachers do not necessarily use the rights which they have, achieving more equitable speaking rights can be difficult (Cazden, 2001), and this is one of the concerns of the dialogic teaching approach (Edwards-Groves, Anstey and Bull, 2014). In CA the rights and obligations of teachers and students are constructed in the interaction, rather than drawing from the wider social context. Turn-taking (the fourth of Drew's (2005) concepts) is the key principle on which we base the analysis presented below. The seminal work by Sacks et al. (1974) outlines the systematics of turn-taking in ordinary conversation and this forms the basis of McHoul's (1978) analysis of turn-taking in formal classrooms which describes interactions between teachers and students. Many authors (Cazden, 2001; Mehan, 1979; Seedhouse, 2004; Hauser, 2009) describe the organisation of turn-taking in terms of rules, norms or structures. The rules are the patterns to which participants in conversations orientate, such as the order of speaker, when they can and cannot speak, and what type of turn they can take (Sacks et al., 1974). These rules are usually tacit, but through the interactional behaviour of participants they become apparent (Maynard, 2013). The rules enable successful turn-taking in a variety of interactional contexts, and differ depending on that interactional context, that is, they are different in doctor-patient consultations, courts of justice, dinner-table conversations, etc. The interactional context can

also vary within the classroom, for example between monologic, exploratory, dialogic or cumulative co-constructed talk (Molinari & Mamelli, 2013).

McHoul (1978) used CA to detail the structure of turn-taking in the context of formal classrooms. The rules he explicated reflect the asymmetric roles of teacher and student in that the possibilities following a teacher's turn differ from those following a student's turn. These are illustrated in Figure 1. If the teacher is the current speaker then he or she can nominate the next speaker (1a in Figure 1) at a point where a change of speaker could be appropriate (called a transition relevant place (TRP) in CA); the nominated student then has the right and the obligation to take the next turn, and no other student may speak. So far, there is no deviation from the rules for ordinary conversation (as distinguished by Sacks, et al., 1974). However, if the teacher does not nominate a student to be the next speaker, then the teacher has the right to continue the turn (1b in Figure 1). There is no opportunity for students to self-select and take the next turn, as there would be in ordinary conversation. If a student is the current speaker then at the TRP, either the teacher has been nominated to take the next turn (though they are rarely nominated by name) (2a in Figure 1) or the teacher has the right to self-select first (2b in Figure 1). If the teacher has had the opportunity to speak but has not taken it up, the student who is currently speaking can continue their turn (2c in Figure 1). There are a number of strategies which a teacher can use to nominate a student to take the next turn, categorised by Mehan (1979) as individual nomination, invitations to bid and invitations to reply.

Figure 1 here.

Some authors attribute values to the descriptions of the structure of interactions, in particular in relation to the asymmetric roles of students and teacher, particularly the apparent dominance of the teacher (e.g. Cazden, 2001; Edwards-Groves, Anstey & Bull, 2014), but these are not considered within a conversation analytic approach. How students and teachers use their turns can vary within the structure of interactions as is clear from the wealth of literature discussing the variations within the IRF exchange (See Heap, 1985; Lee, 2007; Margutti & Drew, 2014; and Hellerman, 2003 for discussions of this from a CA perspective; and Cazden, 2001 and Wells, 1993 from other perspectives). The diagram above illustrates pathways for turn-taking, not social or psychological relationships. More recent research has continued to confirm the applicability of McHoul's rules to classrooms today (e.g. Kyriacou & Issitt, 2008). McHoul's structures of interaction explain the prevalence of the IRF sequence in classroom interaction.

In this paper, we explore the extension of wait time in relation to this structure of turn-taking as described by McHoul. In particular, we consider the opportunities offered and the constraints imposed by this structure in relation to pauses between speakers in classroom interaction, and how an understanding of this can be used by teachers as a dialogic tool to complement a range of other strategies.

What is wait time?

In ordinary conversation, pauses between speakers are minimised. Jefferson (1988) found that, almost exclusively, these pauses were less than a second in length. Where pauses were longer than one second they were usually interpreted by participants as an indication of trouble in the interaction. Participants in interactions often react to this trouble by speaking even though the turn is not theirs, usually by rephrasing the previous turn or adding additional information (Macbeth, 2004; McHoul, 1990).

In the classroom pauses between speakers are often described as ‘wait time’ (Rowe, 1974), ‘think time’ (Stahl, 1990) or ‘thinking time’ (Alexander, 2004), although think(ing) time covers a wider range of pedagogical actions which offer students opportunities to think, such as discussing in pairs (for others, see Alexander, 2005; or the professional literature, such as Hodgen & Wiliam, 2006 or Edwards-Grove, Anstey and Bull, 2014). Wait time has been defined in a number of different ways, each focusing on a different type of pause that occurs in classroom interaction. Most scholars follow Rowe (1972) or Tobin (1986). Rowe’s initial research identified two types of wait time; the first is the pause that occurs between the teacher finishing speaking and the teacher starting to speak which she labels wait time I, and the second occurs between the student(s) finishing speaking and the teacher starting to speak, labelled as wait time II. Tobin also distinguishes between these two types of pause. Hence both focus on those pauses that the teacher ends. Many subsequent studies of wait time have interpreted Rowe and Tobin in different ways, particularly in considering wait time I to be between the teacher finishing speaking and student beginning to speak. The origins of this ambiguity can be traced to the fact that although Rowe measures wait time I as between two teacher utterances, the phenomena which she explores relate to the effects on student responses. Maroni (2011) and Ingram and Elliott (2014) make a distinction between gaps, lapses and pauses in classroom interactions, depending on whether the period of silence occurs during a speaker's turn (a pause) or at the point where a change in speaker is relevant (a gap which can become a lapse if talk becomes discontinuous and the silence indicates trouble). These distinctions include the silences that are ended by a student.

In this paper, four categories of pause are considered, based on Rowe’s (1972) initial classification. The pause which occurs between a teacher finishing speaking and a student starting to speak are related to Rowe’s wait time I; the teacher must have waited at least as long as this in order for the students to have had the opportunity to speak. By excluding

pauses between a teacher finishing speaking and a student starting, the initial studies by Rowe and Tobin only considered instances where the pause failed to enable students to take the next turn. However, many of the positive outcomes they report (discussed below) are related to students successfully taking the next turn. In the discussion below, the terms wait time and extended wait time incorporate all four categories of pauses between turns. Consequently, we define four categories of wait time:

- Wait time I(i): pauses following a teacher finishing speaking and a student starting to speak
- Wait time I(ii): pauses following a teacher finishing speaking and then taking the next turn
- Wait time II(i): pauses following a student finishing speaking and the teacher taking the next turn
- Wait time II(ii): pauses following a student finishing speaking and then continuing their turn.

The influence of the structure of turn-taking on wait time

The structure for turn-taking in classrooms (McHoul, 1978) means that extended wait time is structurally built in as the opportunity for pauses is maximised. Following a teacher's turn, only the nominated student has the right (and obligation) to take the next turn (1a in Figure 1). There are no opportunities for another student to self-select to take the next turn, and if they do they are likely to be sanctioned (Ingram, 2012 and extract 4 below). The teacher can then extend the wait time following their turn simply by delaying the nomination of the next speaker (see for example extract 3 below). This would extend both wait time I(i) and I(ii). The student can also pause before taking the turn because their nomination as next speaker means that only they have the right to the next turn. This would extend wait time I(i)

but if the student failed to speak and the teacher took the next turn this would be categorised as wait time I(ii). The frequency of students' turns beginning with markers that indicate that they are going to take the turn whilst delaying the turn itself shows us that students are orienting to this structure of the interaction (Macbeth, 2004). Hence, wait time of type I can be considerably longer than in ordinary conversation. Both the teacher and the nominated student can influence the length of this pause.

Similarly, following a student's turn the next turn is usually taken by the teacher (2a or 2b in Figure 1), but if the teacher does not take the turn, then the turn returns to the student (2c in Figure 1). If the teacher pauses at this point, the student is likely to continue their turn and the pause would be categorised as wait time II(ii); the pause is extended as the student waits to allow the teacher to speak if they wish. Hence, wait time of type II can also be considerably longer than the pauses found in ordinary conversation, with the teacher primarily influencing the length of this pause, as they must pause before the student can decide to continue talking (see extract 3).

The outcomes associated with extended wait times in classrooms

Extended wait time has been shown to have a range of effects on both student and teacher behaviour. In terms of student behaviour, extension of wait time I (types (i) and (ii)) to longer than three seconds is associated with fewer failures to respond, including 'I don't know' (Rowe, 1972). Extending wait time II is associated with longer student responses; responses are more likely to contain an explanation or logical reasoning; there is an increase in speculative responses; students ask more questions; there are fewer inflected responses from students and the number of student-to-student interactions increase (Rowe, 1972, 1986). There have also been several studies, reviewed by Tobin (1987), which showed links between increasing wait time beyond three seconds and higher cognitive level achievement in

mathematics and science. Indeed, Lesh and Zawojewski suggested that without opportunities to think such as those provided by wait time many students would 'believe that every problem should be solvable with little or no thinking' (2007, p. 784). By contrast, Duell (1994) reports that increasing wait time from three to more than six seconds resulted in lower high level attainment in a university context; however, the study did not use naturally occurring data and focussed only on wait time I (i and ii). Research into pupils' perceptions of increasing wait time, whilst generally positive, suggests that for some students who were able to respond quickly the additional time created boredom (Kirton et al., 2007). These studies show that while extending wait time has many positive effects, this is not true for all contexts and participants.

Teachers demonstrated greater flexibility in their interactions with students when wait time was increased: there were fewer discourse errors, such as the teacher continuing irrespective of the students' responses, and greater continuity in the development of ideas (Rowe, 1986). Rowe also reported that the number and nature of teacher questions changed with extended wait time (they are fewer, but they are more likely to invite elaboration, explanation or alternative viewpoints, each of which indicate the relevance of manipulating wait time for dialogic teaching, as in Alexander (2008)) and that teachers' expectations of students also altered (see also Michaels, O'Connor & Resnick, 2008). Similarly, teachers themselves reported changes in their perceptions of students, describing some students as not being less able, as previously thought, but as needing more time to respond to questions (Kirton *et al*., 2007). Teachers also interrupted students less often (Tobin, 1986).

Some of the changes in interactional behaviour attributed to extended wait time above have been found to be associated with desirable changes in the *content* of classroom interactions, such as dialogic teaching (Mercer & Littleton, 2007; Alexander, 2008). For example, Nystrand *et al*. (2003) found that a change in the nature of teacher questions (noted

by Rowe, 1986) and particularly higher numbers of student questions (noted by Rowe, 1972, 1986) act as 'dialogic bids' prompting dialogic episodes in the classroom.

The structure of turn-taking and its relation to extended wait time outcomes

The structure of classroom turn-taking combined with the standard maximum tolerance of 1 second silence explains the findings of both Rowe (1972) and Tobin (1986). Firstly, when wait time of type I((ii) and therefore (i)) was extended, students were more likely to respond, i.e. the number of non-responses reduced. If the silence following the teacher's turn is interpreted by the participants as trouble in the interaction, then both the teacher and the nominated student experience an obligation to speak. In many studies of classroom interaction, it is the teacher who speaks and initiates a repair usually by repeating or rephrasing the question or nominating a different speaker (Liebscher & Dailey-O'Cain, 2003; Seedhouse, 2004). If the teacher resists this and extends the wait time, the student will feel obliged to speak, and thus the likelihood of a non-response is reduced. In extract 1, there is a pause of 1.7 seconds before the student offers a response, which is considerably longer that the pauses left by most teachers or in ordinary conversation (see also extract 2). The longer pause also offers students more time to think and construct a response, so the likelihood of an "I don't know" response is reduced.

Extract 1

95	T:	so how much is that
96		(1.7)
97	S:	four thous[and pounds]
98	T:	[four thou]sand pounds

Tim lesson 1

The perceived obligation to speak following an extension of either wait time I or II can be used to explain the increase in speculative responses and the reduction in the failure to

respond which Rowe reported (1972). These two findings are related to each other, in that in a classroom context a speculative response is treated as preferred, whereas no response at all is treated as dispreferred (Ingram, 2012). When wait time is being extended, no response is treated as trouble in the interaction, whereas a speculative response may not be, depending on how it is treated in the turns that follow..

The same features can also explain why, with the extension of wait time II, students' responses were longer and more complex. When a student has finished their turn, the next turn is taken by the teacher. If the teacher does not take the turn, it returns to the student. The silence following the student's turn indicates to the student that the teacher may not take the next turn, and so the obligation to speak is transferred to the student, who usually adds to their previous turn. This silence can also be interpreted as meaning that there is trouble in the interaction, in particular with the student's previous turn. (Interpretation in CA terms is evidenced by participants' actions in subsequent turns, rather than being a speculation on what someone is thinking.) This trouble could be with the appropriateness of the response, including correctness, or that the response is incomplete or that the teacher has not understood the response. Each of these interpretations would lead the student to attempt to initiate and perform a repair, by self-correction, adding additional information or extending their explanation. In extract 2, following lengthy pauses of 1.7 seconds and then 2.5 seconds, the student first indicates that there might be trouble with his first answer of ninety nine before correcting his answer.

Extract 2

288	T:	add them together and half it
289		(1.8)
290 291		ninety nine, (1.7) what ↑add them together? (2.5) a hundred and (.) fifty
292		(2.4)
293	T:	Okay

Simon lesson 2

Extract 3 offers an example where a student expands their answer to include an explanation after the extension of wait time II.

Extract 3

33 34	T:	so:: >er we're trying to work out< how ↑far you travel weren't we (0.4) ↑go ↑on ↑Jim,
35 36	S:	↑u:::m (.) for i (.) I did nought point one was how long the blink would be
37		(0.6)
38	T:	right,
39		(0.5)
40 41	S:	ti:mes, (0.6) a hundred (0.8) because that's how fast it was going

Richard 1 line 34

If the student does not continue their turn, then there is the opportunity for another student to initiate a repair on the perceived trouble source, i.e. there is an opportunity for student-to-student interactions, as reported by Rowe (1972). Similarly, Rowe reported an increase in the number of unsolicited but appropriate responses when wait time was increased. The structure of classroom interactions as described by McHoul (1978) (summarised above) do not consider student selection as it does not occur in his data. However, there are examples of students self-selecting without sanction in teaching and learning conversations, in other research which takes a CA approach (Mehan, 1979; Ingram, 2012; Molinari & Mamelli, 2013).

An unsolicited response can occur in three scenarios. Firstly, where the teacher has asked a question and nominated a student to answer, but a different student answers. In this case, where the extended wait time is beyond the tolerance for silence in ordinary conversations, the silence could be interpreted by the self-selecting student as a source of

trouble, in that the nominated student is not going to respond, in which case the self-selecting student is initiating a repair on the interaction by offering a response to the teacher's question.

Secondly, where the teacher has asked a question but does not nominate a particular student to answer. Here any response from a student would be an unsolicited response. In this scenario, the 'rules' of turn-taking in classroom interaction would indicate that the turn returns to the teacher. However, in ordinary conversation any participant has the option to self-select with the first speaker gaining the right to the turn. If the teacher appears not to be continuing with their turn, because of an extended pause, then the normal interactional rules of ordinary conversation come into play and students can self-select to answer the question. An example of this occurring, and incurring the sanction of the teacher is given in extract 4 below.

Extract 4

30 31	T:	… what happens then (.) ↑hotter or colder and by how much
32		(2.4)
33	S:	twenty eight
34	T:	don't shout out please but Nathan said tell me

Edward lesson 1

Finally, once a student has given their response and it is clear that neither the teacher nor that student is going speak, because of a long pause (extended wait time II), then another student can self-select to take the next turn, either to build on or offer an alternative to the response. In all these cases of appropriate but unsolicited responses, it is the point at which there is an interpretation of trouble within the structure of the classroom interaction, relating to the silence, which means that the rules of ordinary conversation are used to structure the turn-taking that immediately follows.

Extending wait time has been advocated as a tool to support students in giving longer responses which contain their reasoning, in asking questions, and in responding to the

contributions of other students, all of which are often perceived as desirable in the context of classroom discussion (Mercer, Dawes, Wegerif, & Sams, 2004). However, it has also been noted in the literature that teachers find it difficult to extend wait time (Black *et al*., 2003). Extended wait time, in the form of silence, can be interpreted as trouble by both students and teachers. As shown above, when students interpret silence as trouble, they initiate a repair, which often has the positive consequences identified by Rowe (1972) and Tobin (1986). However, when the teacher treats the silence as trouble by taking the turn before the students have the opportunity to, then wait time (of either type I or type II) is likely to be shorter than if a student spoke next, as a consequence of the structure of the interaction. This is why both Rowe (1986) and Black *et al*. (2003) reported that teachers felt uncomfortable with the extended silences when lengthening wait time: they are interpreted as indicating trouble, which makes it difficult for teachers to change their interactional behaviour.

Changing norms of interaction

The positive aspects of changing norms

Deliberate efforts to extend wait time are, in effect, establishing a different set of norms and structures for classroom interaction. If the desired classroom outcomes are students giving longer and more comprehensive responses which include explanations and reasoning and an increase in speculative responses, then extending wait time can support these outcomes. As the proportion of student responses that include an explanation or reasoning increases (as a consequence of students interpreting wait time type II as an indicator of trouble in their turn), this type of response becomes a norm (Yackel & Cobb, 1996), and hence the preferred response to a teacher's question.

However, if the desirable outcomes include student self-selection and student-to-student interaction, this will result in the evolution of the turn-taking structure to more closely

resemble that of ordinary conversation. In this case students' self-selection to take a turn would no longer be interpreted as a source of trouble, and hence sanctionable, and instead would become part of the structure of turn-taking as it is in ordinary conversation. In these circumstances it is the first speaker who has the right to the turn and thus there is an element of competition (Sacks *et al*., 1974) and the pauses between turns decrease in length. Extract 5 gives an example of student-to-student interaction which is not considered sanctionable, in which the rules of turn-taking revert to those of normal conversation.

Extract 5

283	T:	why isn't it not a prime number
284	S1:	because you can only divide it by (1.2) [one]
285	S5:	[one]
286 287	S2:	yeah but you can divide it by itself because it divides by itself
288 289	S3:	yeah but you ↑can't you can only divide it by ↑one though
290	S2:	yeah and that's dividing by itself
291	S5:	yeah but one's the same number

Tim lesson 1

Consequently, if the intent is to create structures of interaction in which students are able to self-select and respond to the contributions of other students, then shorter pauses will naturally occur as in extract 5. There is no need to continue to artificially extend wait time. In fact, if teachers continue to deliberately extend wait time, the norms of interaction would revert. That is, in order to ensure the extension of wait time, teachers would have to sanction students for self-selecting. Additionally, in order to give the thinking time benefits of wait time, other strategies will need to be employed, such as giving pupils time to discuss possible answers with a partner (Hodgen & Wiliam, 2006).

Not all classroom interaction has the structure described by McHoul (1978). For example, when the interaction involves a debate with participants offering different opinions and arguments including both teacher and students, then the structure of interaction more

closely resembles that of debates in ordinary conversation, with speakers self-selecting to make and defend their positions (Ingram, 2012; see also extract 5). Wait time is only structurally built in to interactions where there is tight control over who can speak when. This occurs in formal classrooms with asymmetric relationships between the teacher and students, where the teacher has all the control over who can speak (though not necessarily control over the content of the turns). This may be an explanation why it is hard to maintain extended wait time for a prolonged period in classrooms which do not follow the structures of turn-taking as outlined by McHoul (1978). Namely, extended wait time leads to a change in interactional behaviour, which in turn leads to new structures of turn-taking where silence is not structurally built in. If self-selection becomes part of the structure of turn-taking in the classroom, then it can prevent the other positive outcomes that extending wait time enables, in that even short pauses are interpreted as an opportunity to self-select, but student talk, especially explanations, frequently comes in bursts with pauses that exceed 3 seconds (Rowe, 1972). Some examples of these scenarios in empirical data are reported in Ingram and Elliott (2014).

Implications: teachers' decision-making

Researchers and politicians have argued for a change in the interactional norms in the classroom and advocated extending wait time as a mechanism for doing this (for example, Blosser, 2000; Johannessen, 2003; Black, et al, 2003; DfES, 2004; Sprenger, 2005). However, the explicit focus has often been on extending wait time rather than the interactional outcomes such as student responses including explanations and justifications. Some authors have discussed the appropriateness of extended wait time for different types of questions, for example factual questions requiring a shorter pause than 'higher order' questions (e.g. Brophy & Good, 1986). This perspective focuses on what the teacher does

with their preceding turn, rather than how the students interpret the turn, and how much time they might need.

In considering wait time of type I the only information available to the teacher is the question which they asked and their intention in asking that question, which could include expectations of what students' responses might be. In terms of the IRF sequence, they only have access to the Initiating move. They do not have information about how the students interpret that question, or how they might be constructing their responses. If the teacher interprets the question to be a simple, closed or factual question, and therefore requiring a short wait time, but the students require more thinking time than has been offered, this is likely to result in failures to respond or short answers. Whilst leaving extended wait times would cover a wide range of possibilities, it has been suggested in the literature that unnecessarily extended wait times are associated with a range of negative outcomes (Duell, 1994; Kirton *et al*., 2007). It might also be useful for the teacher to consider if extending wait time I is necessary because the question is of a sort to which the students need longer to respond, or because there is trouble in the interaction, or a combination of the two. In addition, teachers should be careful not to interpret silence as indicating a lack of knowledge as it can also be a result of social or cultural differences (Haider et al., 1968; Bernstein, 2000).

In considering whether to extend wait time II, the information available to the teacher is much greater: they know both the question which they asked (I), and how the student who responded to it has interpreted it (R). They know how they initially want to respond to the student's turn and what kind of response they had intended the student to make, for example an explanation. The teacher can use all this information to make a decision about extending wait time II, and thus giving the student the opportunity to extend, repair or finish their turn, rather than immediately embarking on the F turn of an IRF exchange.

The extension of wait time, therefore, is multi-faceted; teachers need to be aware that it is a decision-making process, and that all these aspects need to contribute to this process. Making teachers aware of these aspects is a more difficult undertaking than simply recommending that they extend wait time to at least 3 seconds, but it may be more effective in transforming the norms of classroom interactions. Teachers must also consider what it is that they desire in terms of classroom interactions: their strategies will need to be different if they wish to promote explanations or speculative responses, or if student-to-student interaction is their aim.

Teachers need to develop a repertoire of interactional structures to suit different interactional goals and be flexible in their use of wait time to establish these structures alongside the content aspects of their interactions such as those discussed in the literature concerning the use of the IRF exchange (Wells, 1993; Lee, 2007; Molinari, Mameli & Gnisci, 2013)). Earlier we suggested different groups of desirable behaviours which could be enabled by manipulating wait time in different ways. All of these behaviours are advocated in the literature discussing the development of high quality learning and teaching (e.g. Alexander, 2004; Mercer, 2012; Molinari & Mamelli, 2013). It is not simply a case of one size fits all. Teachers need to be aware of which strategies could result in which outcomes.

Conclusion

We can see, therefore, that opportunities for extending wait time are structurally built into formal whole class interactions, that is the structure of turn-taking allows for longer pauses both during and between turns, without the possibility of another participant self-selecting to speak. This is only the case in formal classrooms, where the speaker is always the teacher or a nominated student. This is because there is such tight control over who can speak when. This control does not necessarily affect what students and teachers are doing *with* their turns.

We have also argued that the extension of wait time can result in differences in how students and teachers use their turns, both in terms of the structuring of the interaction but also in terms of what they do in their turns. For example, longer answers from students often include reasoning or explanation, or a speculative response. Consistent and appropriate use of wait time will lead to changes in the norms of interaction, i.e. extended answers become the normal, preferred response and shorter answers will become rarer and dispreferred. If the purpose of extending wait time is to generate these types of answer then once the new norms have been established, there is no longer a need for extended wait time, and indeed continuing to leave noticeable pauses could lead to students interpreting their turns as being a source of trouble. This may not be undesirable, as it would support students in self-assessing the appropriateness of their responses. However, it could also cause a further change in norms, or the students losing confidence in their answers. Further research exploring the manipulation of wait time and the transformation of interaction norms is needed here.

One other outcome associated with extending wait time is an increase in unsolicited responses. Extended pauses can be interpreted as a signal of trouble which can lead to participants self-selecting in order to initiate a repair. Where this occurs in the classroom, the structure of interaction is similar to that in ordinary conversation where wait time is not structurally built in. If this is the desirable outcome, it is not compatible with those described above, because of the change in the structure of turn-taking. However, other strategies such as asking students to discuss questions in pairs before taking an answer are available to the teacher. Additionally, in order for the teacher to enforce extended wait time, they would need to sanction self-selection and therefore it would remain dispreferred, rather than an accepted norm of interaction. Further research is needed to examine how teachers to use a combination of turn-taking structures within their lessons to address different pedagogical aims. There is evidence that this is possible (Ingram et al., 2011) but further research is

needed into how teachers indicate the transition from one structure to another so that their students also transition successfully.

Therefore, teachers need to be aware of the options available to them, and the consequences of each of these options when making a decision about how long to wait before they speak. This metacognitive awareness will enable them to decide what norms of interaction they want to achieve and which strategies may be effective in doing so. Therefore, asking teachers to mechanistically leave pauses of at least 3 seconds is not a productive strategy, as it focuses their attention on the length of the pause, rather than the desired student interactional behaviours. A more nuanced understanding of the purposes and consequences of extending wait time is required on the part of teachers, teacher educators and policy makers. Extending wait time or not, as appropriate, is one part of a toolkit for improving the quality of classroom dialogue, alongside asking different types of questions, structuring tasks and using the 'F' move in the IRF exchange strategically.

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