The potential of using stimulated recall approaches to explore teacher thinking

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Our purpose in this chapter is to consider the origins of stimulated recall approaches in qualitative research. After presenting some of the strengths and limitations, we share something of the way we have used video stimulated recall in our own research.

Introduction

Although there may be earlier examples of stimulated recall use, most of what has been written about stimulated recall recognises Benjamin Bloom as one of the first users of the approach in his study of students' thinking in different instructional contexts (Bloom 1953):

'The basic idea underlying the method of stimulated recall is that a subject may be enabled to relive an original situation with vividness and accuracy if he [sic] is presented with a large number of cues or stimuli which occurred during the original situation.'

(Bloom 1953: 161)

Bloom's study involved audio recordings of class sessions which were replayed to the students within 48 hours of the event. It is not clear what was going on when the students then were asked to recall their thinking in an interview. Bloom recognised that in this situation recall was only partial and students would select what they determined were significant events to talk about. He also acknowledged that the relationship with the interviewer was a significant factor in the selection process. Despite these reservations, acceptance of Bloom's basic assertion about the value of the technique has led to many other studies in a variety of contexts including that of teacher thinking and decision-making. Most of the studies since the 1970s have used video-recordings as the basis for the stimulated recall interview (see for example, Housner and Griffey, 1985; Butefish, 1990; O'Brien, 1993; Gass and Mackay, 2000; Lyle 2003; Egi, 2008). Due to the increasing ease of the use of camcorders to provide an instant record of classroom events the use of audio-recording has dwindled. In the rest of this chapter we will use the term stimulated recall to refer to the use of a visual stimulus, usually a video-recording¹.

A resurgence of interest in stimulated recall followed a review of the technique (Calderhead 1981) and its application to research on teacher thinking. Calderhead suggests that three sets of factors may influence the status (and therefore validity) of data collected through stimulated recall:

1 The extent to which teachers consciously and selectively recall and report their thinking

Viewing oneself on video can be a stressful and anxious experience and can challenge confidence. The relationship between teacher and researcher can be crucial in encouraging a focus on reconstructing thought patterns rather than explaining or defending actions. Explaining or defending actions (such as poor classroom behaviour or even teacher mannerisms), might sometimes be perceived by the teacher to be viewed negatively by the researcher. The importance of building rapport with the teacher in advance of the lesson and familiarising him or her with the conduct and process of the stimulated recall activity can help here to 'reduce these influences and result in fuller recall commentaries' (Calderhead 1981: 213).

¹ There are some open questions which do not seem to have been addressed in the literature about the difference between recall based solely on audio stimuli compared to a video-recording which has both video and audio stimuli. There seems to be an implicit assumption that video-recordings will provide a richer source of stimulation for recall but it may be that the visual cues dominate perception and the soundtrack plays a secondary part. No comparative studies seem to have been carried out.

2 The extent to which it is possible for teachers to articulate their thinking

This is an issue to which we have already alluded. If much knowledge about practice is tacit and automatised, then can teachers talk about it? As Calderhead says, '... the teacher may have long since forgotten the rationale for behaving in such as manner and the behaviour may be engaged in unthinkingly' (Calderhead 1981: 213). He goes on to suggest that, in their attempts to present their actions as rational, they may construct an explanation after the event because of the difficulty of being able to actually recall their thinking – retrospection rather than introspection? This is more difficult to deal with in practice. Perhaps, as with the previous issue, the rapport between teacher and researcher would encourage the more honest 'I'm not sure why I did/said that ...' rather than a post-hoc rationalisation.

3 The extent to which teachers' commentaries are framed by their understanding of the purpose of the research

If teachers are aware of the purpose of the research, this may influence the nature of their responses. We have already suggested that the teacher's response is going to be both consciously and subconsciously partial. Some degree of understanding will be inevitable through the process of contacting teachers and negotiating entry to classrooms, so will this influence what they focus on in talking about their thinking? Calderhead suggests that 'the ways in which teachers are prepared for their commentary and how they are instructed to comment' (Calderhead 1981: 214) can potentially bias responses. This is another difficult area as ethically it would not be possible to carry out research of this sort without informed consent and that involves giving some insight into what the researcher wishes to find out. Similarly, it would be wasteful of time and frustrating for the teacher not to be given some guidance about what to focus on in the recall interview. Calderhead leans towards the view that it is preferable that any attempts to categorise types of thinking or decision-making should emerge inductively from the recall data rather than being too evident in advance. This has clear implications for the sort of protocols used in preparation for the recall interview and the sort of prompts and interventions which the researcher might consider appropriate during the interview.

Calderhead's conclusion is that the technique can give insights into teacher thinking but users should be aware of its limitations, particularly that it cannot provide a complete account of thinking and needs to be complemented by other sources of data. A more detailed critique is presented by Yinger (1986) whose focus is on the examination of thought in action and the use of 'stimulated recall as the primary source of data for interactive thought'. Yinger suggests that, based on studies on memory and recall, '... there is good reason to doubt the validity of stimulated recall as means for accurately reporting interactive thinking'. Reviewing previous studies, he asserts:

'Researchers not only make the relatively conservative claim that stimulated recall promotes recall of what was said and done but also a much stronger claim that the technique allows the participant to remember what he or she was thinking at the time.'

(Yinger 1986: 268)

Yinger is perhaps the only researcher who has attempted to examine what is going on in stimulated recall at a neurological level. He addresses the question of what cognitive processing is taking place when a participant views a video recording and how the experience of viewing the event relates to the actual event itself. Using an information processing conception of memory, Yinger develops a model to show the complexity of response in the stimulated recall interview and the process of interaction between short term memory (STM) and long term memory (LTM) from the original event through to the reconstruction of it in the stimulated recall interview. Put briefly, he suggests that, because information is either lost or transferred very quickly to long term memory, direct 'recall' from STM is impossible. Any 'recall' even a few hours after the event will involve retrieval of information from the partial data set in LTM into STM for verbalisation and then, Yinger suggests, it may not only be information from that event that is retrieved but it may be contaminated by information from other

similar events in providing an account. The use of video or audio data to stimulate recall adds a further layer of complexity. The new information coming into STM and thence into LTM from the actual stimulus will influence the selection of information from LTM in a sort of feedback loop. His view is that 'stimulated recall primarily produces a record of a subject's reasoning about the videotape stimulus and only secondarily about thinking related to the original event'. The hypothesis developed is that the observer's position in viewing the video-recording is different from the actor's position in the actual event. Even though observer and actor are the same person, the focus in the former case may be on explaining past action while in the latter case it was on determining the action. In order to at least acknowledge this multi-layered problem, Yinger draws attention to the nature of prompts used in the interviews and the effect these might have on information retrieval.

His conclusions are that:

"... data generated during stimulated recall interviews may be at best only tangentially related to actual thinking during the recorded event and at worst entirely fabricated. ... the teacher, though a participant in the original event, relates to the video stimulus as a different event rather than as a means to remember the original. The task for the teacher then becomes one of making sense of the action viewed on the videotape instead of the original experience." (Yinger 1986: 273)

This may seem a damning indictment of the technique but Yinger sees value in it 'not as a means of eliciting interactive thought or reflection-in-action, but rather as a means of eliciting reflection-*on*-action' [his italics]. Thus, provided one is not making a claim that the commentary is an accurate reconstruction of the event, it may have value in providing 'access to the ways in which teachers make sense of teaching episodes' and to elicit implicit theories of teaching and beliefs which are seen as being important in guiding action.

In a more recent review of the use of stimulated recall, Lyle (2003) comments on how stimulated recall is viewed in most studies that have used it as being an unproblematic methodology despite both Calderhead's and Yinger's discussions of its limitations in the 1980s. In terms of research into its teaching, Lyle (2003) cites 17 studies between 1985 and 2002 which used stimulated recall either alone or in combination with other data collection methods to consider aspects of teacher thinking and decision making. He also cites studies in other fields where stimulated recall has been used from counselling and psychiatry to nurse education and sports coaching.

In most of these studies there is little discussion of the method itself or how limitations have been addressed beyond a common view that the stimulated recall interview should take place as soon after the actual event as possible. To illustrate this, we will consider two examples.

Butefish (1990) attempted to analyse teacher' perceptions of interactive decisions² basing his conclusions on data gathered mainly though stimulated recall interviews of video-taped lessons. His only methodological reference is to Clark and Peterson (1986) who provided an endorsement for the use of stimulated recall in the investigation of teachers' thought processes. In the post-lesson stimulated recall interview, Butefish reminded the teachers that the purpose of the session 'was to identify those points in interaction wherein the teacher had to deviate from planned behaviour or routine'. Responses from the interviews were used to categorise decisions made with no further consideration of the validity of the recall data or the influence of the guidance given to the teachers in the interview; the latter point having been recognised as important by both Calderhead and Yinger in influencing the cognitive process during recall.

Housner and Griffey (1985) studied differences in pre-active and interactive decision-making with experienced and inexperienced teachers. Stimulated recall was complemented with a 'think-aloud'

 $^{^{2}}$ The related concepts of pre-, post- and interactive decision making are drawn from Clark and Petersen's (1986) who use them as the basis for exploring teacher's thought processes.

technique as the teachers planned to teach small groups of children sport skills. As with the previous study, the teachers were instructed to focus on identifying points at which they deviated from their planned activity. Although there is some critical evaluation of the conclusions drawn in this study, there is little to question the validity of the data in terms of the extent to which the teachers were actually reconstructing the teaching activity as it took place at the time rather than responding to the fresh stimulus of the video-recording.

Lyle (2003) in his study involving stimulated recall with volleyball coaches to examine interactive decision-making,, concludes that stimulated recall should be ...

"... acknowledged as an indirect method of obtaining evidence of cognitive activity, and like all such methods, findings should be evaluated with an acknowledgement of this constraint." (Lyle 2003: 872)

Although his research was not into classroom teaching, he considers this to be sufficiently similar to the coaching context and suggests that a stimulated recall procedure ...

'... has significant advantages for research into teaching, particularly in capturing the complexity and subject specificity of classroom interaction.'

(Lyle 2003: 874)

For a very detailed consideration of the use of stimulated recall, the monograph by Gass and Mackey (2000) explores its use in the context of second language research. They locate stimulated recall in the context of introspective research methods and the field of 'verbal reporting'. Their review of studies extends beyond the use of video or audio-recordings to provide the stimulus for recall. For example, they consider how the use of diaries and other documents, questionnaires or personal questioning by an interviewer can be used to stimulate recall. Their book provides detailed guidance about the conduct of stimulated recall research including the recall interview itself and how to deal with the secondary data generated by it. Although the focus is on use with learners as well as teachers in second language learning, much of this guidance could be more generically applied to other teaching contexts. For example, the importance of consistency in preparing for video-recording and subsequent recall interviews, and the use of protocols. They even go so far as providing scripts to use in briefing participants and prompts to use in interviews. There is also an extensive discussion on data analysis and coding.

The key issue remains the claims that might be made for an account or commentary generated through a stimulated recall interview – is it a reconstruction of the event drawing on stored memory relating only to that event or a re-interpretation of the event drawing on a variety of stored memories? Although today through neuroscience research the operation and structure of memory is better understood, the original information processing ideas of STM and LTM continue to be the dominant model for memory and no challenge has been made to the neurological basis of Yinger's critique of claims for stimulated recall. It is clear that despite some similarities between the brain and a computer, the brain does not store memories of events in a complete and uncompressed form which can be recalled like a video file from the hard disk and exactly reproduce what was there in the first place. Further, what is important in stimulated recall research is not recall of the event but an attempt to recall the thinking, reasoning or decision-making at the time.

However, recognising the inevitability of having to use 'after-the-event' techniques to study teacher thinking, it seems intuitive that recall will be enhanced by some sort of stimulus compared to attempting recall without one. The importance of any claim to the accuracy of the account is the key point. If the focus is on the particular event and a reconstruction of the teacher's thinking at the time, then the use of stimulated recall becomes problematic. If the focus is on using an event to be in itself the stimulus to reveal more general aspects of teacher thinking then perhaps use of the technique can be justified.

Background to our study involving the use of stimulated recall

We will now discuss our use of stimulated recall in a study with a group of experienced secondary school science teachers. Our aim in the research study (Bishop & Denley, 2007) was to generate some case studies of the practice of highly accomplished science teachers, as identified by their peers. We wanted to examine the way in which these accomplished teachers were able to bring together the different knowledge bases which underpin their teaching and how their thinking influenced decisions before, during and after their lessons. We were not only interested in the knowledge base which underpinned their teaching but also the nature of their thinking in deploying that knowledge. Our assertion was that a key indicator of accomplishment in teaching is not so much to do with the quantity or level of knowledge but the teacher's capability to transform knowledge into forms which are accessible to learners. That capability is evident in both the pre-active stage of lesson planning and designing engaging learning experiences, and in the inter-active stage of classroom teaching.

The use of a stimulated recall approach seemed to be a possible way to access this sort of thinking. Like Meade and McMeniman (1992) we felt that other methods such as conventional post-lesson interviews, direct classroom observation and interaction analysis would not give much insight into thought process and decision-making. As Reitano (2006) asserts, '... stimulated recall reduces superficial self presentation when teachers are confronted by their own actions'.

As in Meade and McMeniman's study (also with science teachers), the framework we used to categorise the knowledge base was that initially developed by Shulman (1987) and included the elusive notion of pedagogical content knowledge (PCK) which has been a focus for much science education research (Gess-Newsome & Lederman 1999; Loughran, et al. 2006). Shulman presented PCK as an 'amalgam' of subject and pedagogical knowledge and it is often viewed as being characteristic of accomplished or expert teachers. Our view of PCK is that rather than trying to pin it down in terms of propositional knowledge it might be evident and to some extent 'visible' in its application through teachers' pre-active and inter-active thinking. This became an indirect focus for our study – could stimulated recall provide a way of eliciting PCK in action through the commentaries accomplished teachers can generate in describing and explaining their thinking and decision making?

Our sample and our approach

Our group of fourteen teachers were identified by professionals such as subject advisers as showing high levels of accomplishment in their science teaching. In some cases this had been recognised in their promotion to leadership positions in their schools, in other cases their capabilities had been recognised differently, for example, through becoming what in England are termed Advanced Skills Teachers. Contact was made with the teachers. We then negotiated with headteachers and principals to gain access to their schools for the purposes of the research which centred around a single lesson for each teacher. Because the intention was to video-record in the classroom, parental permission also had to be sought. Initial discussions with the teachers explained the purpose of the research and how it was to be conducted. The teachers were sent a short briefing sheet indicating the areas to be explored in pre-lesson and post-lesson (stimulated recall) interviews. We recognised the balance here between providing an open and honest picture of the research and (perhaps subconsciously) suggesting we had a particular agenda and pre-determined foci for the lesson analysis – 'What are they [i.e. us, the researchers] looking for?'

Thus, our briefing sheet outlined possible areas for discussion across the two interviews rather than listing specific questions for each. As experienced and accomplished teachers, they were all used to being observed. We did not detect anything other than a genuine interest in the research and the opportunity to engage in a professional dialogue about their science teaching.

The pre-lesson interviews mostly took place one or two days before the video-recorded lesson to discuss lesson objectives, content and intentions. There was no intention that the lesson should be 'special' in any sense, just one that might typify the teacher's normal approach to a science lesson. As well as collecting data relating to the lesson itself, the pre-lesson interview also explored the teacher's background and influences of his or her development as a science teacher. This was partly to

strengthen our relationship with the teachers and reduce any apprehension about the lesson to be recorded, and partly because we wanted to relate their own analysis of influences on practice to what we saw in the lessons.

The actual lessons were recorded using a digital camcorder mounted on a tripod and usually positioned in the back corner of the classroom facing the teacher but set to record as much of the field of view as possible. The researcher was also present in the classroom but tried not to touch the camera or make any attempt to selectively record classroom activity. The aim was to generate a 'fly-on-the-wall' recording which would not focus attention on particular aspects of teacher or pupil activity but would require the teacher to decide on which events were significant or important in relation to his or her intentions and plans.

Where possible the post-lesson interviews took place on the same day as the lesson but in no cases was there a longer time interval than the following day. The interview started with a reminder of what would happen. We were going to watch the video together but the teacher would largely be in control of the playback. The interviews were audio-recorded for subsequent transcription so it was important that the voices and other classroom noise on the video while it was being played did not interfere with the teacher's stimulated recall commentary. Thus, the teacher was asked to pause the tape or turn down the volume when he or she wished to comment. The teachers were also told that they could fastforward through segments of the lesson which they did not have anything to say about or rewind if they wished to view segments again.

Researchers in some studies using stimulated recall from classroom video have edited the whole recording to focus on particular phases of the lesson in order to cut down the length of the interview. In our experience, the technique of allowing the teacher to fast-forward through less significant portions of the lesson meant that the stimulated recall interviews normally lasted about the same time as the lesson itself which were mostly 50-60 minutes in duration.

The question has already been raised about the researcher's contribution to the stimulated recall commentary. It is difficult to resist the temptation to reach out to rewind the recording if the teacher goes past some event which the researcher thinks is significant but the teacher chooses not to comment on. We tried not to intervene too much in the commentary but, when the teacher did pause the recording, we might then refer back to something that had been passed over. As we have explained our intention was not to hold to a claim that the stimulated recall commentary was an accurate reconstruction of the teacher's thinking in the lesson as he or she was thinking at the time. We wished to have a professional dialogue with the teachers to probe the way in which their knowledge for teaching is operationalised and they are able to articulate their actions to reveal the thinking which guides them. Thus, we did not adopt a totally neutral position in the stimulated recall interviews. Although the teacher was in charge of the replay of the lesson, when the recording was paused, we did engage in some discussion of the comments made. We also had the data from the prelesson interview and so were able to explore the relationship between pre-active and inter-active decision-making where the lesson deviated from the planned activities or the teachers had to respond to unanticipated events in the classroom. This seemed to us to be a rich source of data for our study but at the same time we recognised the dangers of compromising the 'purity' of the recall commentary as a record of the teachers' thinking. In the most part the questions we asked were for clarification and explanation rather than intervening more specifically unless the discussion drifted away too far from the context of the lesson itself. We tried to encourage the teachers to examine their own thinking but without appearing to be judgemental if we asked a simple question like 'Why did you do that?' We also tried to manage the conduct of the interview to ensure that within the total time available we had the chance to review the whole lesson.

The nature of discussion in our study

It is difficult to provide a feel for the nature of the discussion which took place in the stimulated recall interviews. The transcriptions themselves do not make a lot of sense without a lot of contextual information and particularly without seeing the video-recording which stimulated the comment.

However, perhaps two differing extracts would give an indication of the sort of discussion which was generated.

This comment was from Isobel's lesson. This was a revision lesson on chemical bonding with a group of 15-16 year old pupils. Unusually for a revision lesson, it took place in a school hall and was a very active lesson with the pupils acting out different examples of ionic and covalent bonding and using molecular modelling kits.

Researcher:

'When they've done it before they haven't done it in teams?'

Isobel:

'No, they've done it on desks and having a bit of a play initially, just to get used to the models and stuff and then I'd put some on the board and just told them to see whether they could try making them and whether they thought they were right and we put the colours up on the board as well. So they haven't done it in a competition way. They've done it in a more generalised way having a bit more of a play and trying to do something physical. To finish off what is essentially quite a dry topic, because there aren't a lot of things you could do apart from do it on the board and show them how to draw them out. So this is a different way of doing that.

They're devastated [in response to a group not getting the right answer in making a molecular model]. I love the way they're looking at one another. They're so amazing initially "Miss, look at this" ... "No, no, no, you've got to come to me", which is quite funny.

What's interesting is that this group didn't work very well as a group, whereas all the other ones team-wise did quite well. This one, I don't know whether it was the different levels but they didn't work particularly well as a group.

I think from here they just do a few more of these and then it's trying to make a good use of time with packing up the models ... because obviously at the end of the lesson it comes to quite hectic timing and getting them into the idea of the fact that they're going to need some paper and start writing down some answers now, which they were absolutely pathetic at, which is really interesting because we did a whole lesson on the 'cross-over rule' [to work out numbers of atoms in particular molecules] and writing out formulae of ionic compounds and they so got it. They were brilliant and I could have asked anyone in the class. We went through these five steps and they were absolutely fantastic and ... [now] ... just couldn't do it! Which is fine because the biggie ... [is] ... I've now got to go back over that.'

This extract contains a mixture of types of comment. It is partly an explanation or rationale for the specific activity creating molecular models, partly observations which the teacher might have made at the time and partly observations which seem clearly to be in response to viewing the recording. Even in this short extract, there is evidence of pre-, inter- and post-active decision-making and the deployment of both subject and pedagogical knowledge. It is not disciplined by the researcher or the teacher to concentrate solely on what the teacher was thinking at the time, but does give a broader picture of the teacher's thinking and the complexity and multi-dimensionality of a lesson where past, present and future are brought together.

In the following extract the teacher is more focussed on what is going on in the lesson and the classroom dynamics. Iain) is teaching a lesson on in-vitro fertilisation with a class of 14-15 year-old pupils.

Researcher: 'What kinds of questions are you asking?'

Iain:

"Well in the first instance, ... I'm really trying to get them to work as a team. What happens is that Jasmine is sitting over there reading the cards and the boys are sitting there going "What's going on?" and I want them to work together on it and read it to each other or share in this collective, which ultimately didn't really work with that group because the girls did their thing and Nathan worked with the girls to a certain extent and the boys didn't really do a great deal or contribute a great deal.

There ... you see ... I'm trying to get them to be sensible and mature by bringing in something like the gay couple. Yes they're a gay couple, but that's the point. You've got to discuss whether they're any more entitled or less so than the others and what should they do? So Rob made some stupid comment that he thinks is stupid 'I'll go to the sperm bank'. "Excellent Rob, well done, but why should that affect the decision?" So Rob's sat there thinking he's made some sarky comment and in fact I've used that to go "OK, brilliant". And he thinks "Well that wasn't meant to happen. It was meant to be a sarky comment". So it didn't work with Rob, he didn't get more engaged.

I give Jasmine a bit of responsibility there. I'd spent too much time there and it was kind of obvious that I'd said everything I needed to about working as a group and discussing it and I needed to go and speak to some other groups and check they were OK, so as I walked away and I kind of did it on purpose, I looked at Jasmine and Sam and said "Jasmine, you're going to need to take control here and get these guys working with you" and so she immediately felt it was a bit of praise and responsibility.

I started to panic mildly because I heard Katia shout across to Jasmine "When do you work on a Thursday?" and at that moment I thought "Wait a minute. That's got nothing to do with what we're doing and it means Katia isn't engaged and she's trying to get Jasmine not engaged as well so I thought I'd better sort it out ASAP". I think I went across to Jasmine, got her back on task, encouraged her a little more and then came straight over here and sorted this group out because I knew they weren't doing what they were meant to be doing.'

It might be assumed that Iain is reconstructing his thinking at the time by his use of the present tense. However, Yinger (1986, p271) suggests that this could also indicate a reconstruction in the present build around the viewing of the video. Despite this possibility, the way in which Iain is able to comment on the event (whether this comment relates to as it was in the past or is as seen in the present) reveals a depth of thinking which shows the sensitive way in which he handles some potentially difficult discussion employing his knowledge of his pupils, as well as holding on to his learning objectives, and keeping the pupils engaged.

Analysing the data generated in our study

In our research study we transcribed the dialogue in the lessons themselves as well as the pre-lesson and stimulated recall interviews. These data were then imported into a qualitative data analysis software package – NVivo (QSR 2009). This software not only provides an easy to use data management tool but allows different levels of analysis. Our use involved applying a coding system to the transcript data built around a number of themes which emerged from the interviews. The software could then search for and aggregate codings to produce documents containing all instances of a particular code across the entire data set or sub-sets of it.

We also identified instances of particular knowledge categories and the way these are brought through the teachers' action and evidenced through their decision-making. These were then used in generating accounts about the practice of each teacher which attempted to show the quality of thinking that underpinned his or her planning and classroom teaching. In the accounts we generated for our research, we were able to integrate our own commentary³ on the lesson, the transcript of the lesson and the transcripts of the pre-lesson and stimulated recall interviews.

We found that the stimulated recall transcripts provided a rich source of data to form the central thread of the accounts around which the contextual data could be woven. The extent to which the teachers in our study were *recalling* their thinking at the time or *reconstructing* what their thinking was is a matter open to question. In reality they may well have been doing both and perhaps other things such as relating experiences from the lesson under study to other lessons. For our purposes this was less significant that the potential in gaining insights into the teachers' minds and their ability to explain their actions. These insights might be hard to expose in general discussion with accomplished teachers like those with whom we were working; the stimulus of a real lesson enabled them to talk about their teaching and what has informed their practice and influenced their professional development in ways which we believe will be accessible to other teachers.

So, what do we know?

We would like to summarise some key questions emerging from previous studies (including our own) using stimulated recall to explore teacher thinking and professional knowledge and then suggest ways in which the method might be used in other fields.

Perhaps the most important question to be addressed relates to the purpose for the use of stimulated recall. If it is to investigate teacher thinking where stimulated recall is being used as a proxy for the sort of commentary that a teacher at the time of a lesson might give if he or she was not caught up in the actual act of teaching, then the issues about the authenticity of the account and the nature of the primary source of data for recall become important.

It is worth noting that those providing the most detailed critical appraisals of the technique (Yinger 1986; Lyle 2003) do not dismiss its use out of hand and support its use for exploring tacit knowledge and implicit theories of teaching. The point is an epistemological one relating to the knowledge claims one might wish to make from the recall data. It is possible to use stimulated recall to investigate teacher thinking provided that one recognises its limitations.

Other questions relate to procedural aspects in using stimulated recall. These are presented in no particular order and are clearly inter-related in developing a research design:

How long after the event should the recall interview take place?

The general guidance suggests 'as soon as possible' but practicalities often impose a delay before the teacher is available and not under pressure to undertake the interview. It would seem a common-sense perspective to believe that the longer it is between the event itself and the discussion of it, the more chance that thinking will be constructed or reconstructed rather than recalled. However, claims have been made that recall is possible as much as 48 hours after the event. This would seem to be a maximum time interval.

The risk of 'recall decay' needs to be balanced with the time available for the recall interview and the conditions under which it takes place. For example, it might be better to wait for a few more hours after a lesson to conduct the interview at the end of a working day rather than immediately after a morning lesson with pressure of teaching other classes in the afternoon. It is important that the teacher is relaxed and that the interview takes place somewhere without outside disturbance where he or she can concentrate on the viewing.

 $^{^{3}}$ Each of the accounts we constructed were fed back to the teachers to offer their views on the validity of our interpretations and to give them the opportunity to clarify further anything they had said to us.

What length of time should the recall interview take?

Too long and the participant may become fatigued; too short and recall may not be as full as possible. There are few recommendations here but the point stressed is that it should be decided in advance and communicated to participants.

Issues such as facility with language and capability of participants to articulate their thinking might influence decisions made. An intuitive rule of thumb might be that the interview should not exceed the total length of the event/lesson. Assuming the ability to fast-forward through some segments, this would be possible but may require some steering of the interview by the researcher.

What is the nature of the stimulus material?

Although video-recording is commonly used to provide source material to encourage recall, consideration should be given to whether other material/media could perhaps provide an appropriate stimulus. Several examples are given by Gass and Mackey (2000) including use written outcomes from classroom activities.

If using a video-recording, how much of the recording should be used?

In its 'pure' form, the participant should perhaps have the recording of the whole event to view in the recall session but there might be arguments for the researcher pre-selecting segments to view particularly if the event was very long and there were long periods of a single activity (e.g. writing an extended prose response or watching a video). The question here is clearly what criteria the researcher might apply in selecting segments. This could be on the basis of capturing different classroom activities or in relation to some theoretical framework underpinning the research. It seems to go against the principle of allowing the teacher to be in control of the recall interview for the researcher to pre-select what is viewed, but there may be circumstances in which this is necessary. The time taken to identify segments and perhaps edit the recording may have an influence on how soon after the event the recall interview can take place.

What guidance should be given to the interviewee?

A variety of approaches have been used here. Beyond the technical guidance about how to control the viewing of the recording, the main issue is the extent to which the researcher might give guidance to the teachers about what they should be looking for and commenting on. There seems to be an inductivist-deductivist spectrum in methodological terms. Should the researcher try to be neutral and allow the teacher to identify significance without any intervention from the researcher? Or is the use of some non-directive questioning or prompting acceptable? Or should the researcher 'steer' the viewing towards points which may give insights within a pre-determined framework? This is a difficult balance for the researcher to achieve in keeping the interview moving (particularly if it is taking place within an inflexible timeframe) and directing the teacher towards events which are significant to the researcher but perhaps not to the teacher.

In our study, we were somewhere between the two ends of the spectrum. We did not have a standardised set of questions for the interview but we did comment on particular aspects while viewing the recording. The teacher was in control but, as described earlier, we did engage them in a professional dialogue about what was taking place in the lesson. In terms of the stimulated recall interview itself, the balance seems to be towards the non-directive approach with any imposition of theoretical frameworks coming through the data analysis.

Where could a stimulate recall approach be used?

As Gass and Mackey (2000) suggest in their extensive review of stimulated recall, there are many ways in which it might be used. Our focus has been on its use in the exploration of teacher knowledge, thinking and decision-making but this is not the only field. It might be used to study learning more directly by, for example, a teacher talking to pupils about their learning using the stimulus of the video-recording of them in the lesson. In the field of second language learning there are a wide variety of potential uses and these might be applicable in other subject areas.

One other field which has been explored where stimulated recall approaches seem to have potential is that of teacher development, both in initial teacher training and continuing professional development contexts. Reitano and Sim (2004) used stimulated recall in a longitudinal study with beginning teachers, arguing that professional development should take into account the 'social situatedness' of teachers' work (Clarke & Hollingsworth 2002) and claiming that stimulated recall could have an important part to play in professional development as well as educational research. Because teachers are actively involved in the stimulated recall interview and because the focus of there is on their practice in its social context, they will have the opportunity to reflect on their practice and come to understand it more clearly. This would then form the core of an approach to their professional development working with other teachers or outside agents. With current interest a more schoolfocussed approach and use of coaching in professional development, there may be potential for this approach. In England, the National College for School Leadership has drawn on work in Australia by McMeniman et al (2000) to promote the use of stimulated recall as a way of evidencing the impact of educational research on practice. There could be particular value in using stimulated recall as a way of novice and expert teachers working together, or as Ethel and McMeniman (2000) put it, 'unlocking the knowledge in action' of expert practitioners.

In our study we did not collect systematic data about the impact of the teachers' involvement on their own professional development but anecdotal comments suggested they found it a useful experience in giving them the opportunity to talk about and learn from their practice in this way. We hope that, with awareness of the limitations of the technique, others will use it in research on teaching and with teachers.

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