

How to look and what to see: noticing in a mathematics community

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As a new researcher in mathematics education, I am seeking to work through the ontological and epistemological challenges associated with setting aside the modes of observing that I have assumed, consciously or otherwise, and develop seeing in other ways. In this account of a workshop, I will discuss the presentation of different accounts of the same classroom episode constructed with different protocols and reflect on the mediating effect of the protocol and observer. Comparison with the experience of a direct viewing of the same episode provides a context for discussion of what has and has not been seen and what might be distilled as of wider interest, following Jaworski's guidelines for use of video excerpts – giving an '*account of*' before '*accounting for*'. I present some thoughts about the implications for possible frameworks in which to observe elements of 'mastery' in secondary-school classrooms.

Keywords: mathematics lesson observation; mastery; epistemology; ontology

Introduction

The Cambridge Dictionary of Grammar (2017) distinguishes between looking and seeing: "When we *look at* something, we direct our eyes in its direction and pay attention to it. *See* means noticing something using our eyes." My intentions for this workshop included drawing attention to how we pay attention and exploring some factors that influence what we notice. They arise from my own experiences of a change in emphasis in my observation of mathematics lessons. I start from my experiences of observing lessons as the head of a mathematics department in an 11-18 secondary school. In this context, my focus was identifying episodes that could be used in conversations intended to develop professional practice. Specific instances were useful in illustrating particular points as part of reflective conversations. In September of 2016, I moved from this school to take up a part-time teaching post in order to facilitate the start of a research project exploring the effects on secondary-phase students and teachers of an explicit focus on mastery. The purpose of lesson observations has shifted, as they become a source of data for analysis beyond a conversation. This change in purpose needs to be accompanied by a change in my approach to what I notice, since I am accepting a responsibility to the research participants and the wider research community to present my findings without distortion and with integrity (British Education Research Association, 2011).

My accounts of observations might, then, be characterized as accounts of disciplined *marking*, using Mason's distinction:

It is useful to distinguish between *ordinary-noticing*, or perceiving, in which sufficient memory is established accessibly to be jogged and reconstructed by

what someone else says, and *marking*, in which not only do you notice but you are able to initiate mention of what you have noticed. (2002, p.33)

This captures a sense of movement towards an informed and intentional state of observation which is, in the current context, constructed in the light of research questions and methodology. It also raises, for me, pressing questions about decision-making and observation which will demand further attention.

Whilst there is not yet extensive discussion of observation protocols to support research of mastery in secondary classrooms, there is an ever-growing body of discussion about the nature of and practices for mastery in mathematics, including at meetings of the British Society for Research into Learning Mathematics (e.g Al-Murani, Kilhamn, Morgan, & Watson, 2017; Simpson & Wang, 2017). In February 2015, the Education Endowment Foundation (EEF) published the results of a randomised control trial with ARK academy schools in the UK (Jerrim & Vignoles, 2015) based on implementation of an ‘off-the-shelf’ teaching programme. This was based on assessment outcomes rather than data relating to pupils’ interactions. In their discussion of the role of mastery, NRICH (a school mathematics enrichment project developed by the University of Cambridge) discuss developing problem-solving skills (2015). The UK’s National Centre for Excellence in the Teaching of Mathematics (NCETM) are adding to a set of case studies and teacher/classroom recordings (2017) in order to illustrate elements of teaching for mastery. A discussion of how we might find evidence of these elements in the classroom is not part of these documents and establishing an observation protocol for mastery remains challenging, particularly in the absence of any single, widely-accepted definition of mastery in mathematics. In this workshop, however, the discussion is not based around how to look *for mastery*, but a level removed from this: questions of *how to look* are, here, more generic, reflecting on the impact of the mechanisms we use on the features of which we become aware.

How to look

As discussed by Jaworski (1990) and Coles (2013), explicitly stating an orientation to the act of viewing a recording of a classroom episode avoids the natural tendency of practitioner-observers to react by making judgements, through a lens of perceptions of their own classroom practices. A helpful discipline after viewing a recorded episode, therefore, is to make the first discussion explicitly about reconstructing what has been observed, in order to “move ... out of ‘judging’ and into a space where it is more likely [viewers] can learn and observe something new” (Coles, 2016, p.6). The frameworks and practical guidance offered by Jaworski, as developed in her work at the Open University, and by Brown & Coles (2008), relate to group discussions of clips of recorded lessons. Jaworski describes inviting everyone to spend a minute or more silently replaying what they have seen, trying to reconstruct for themselves the most significant parts of it. Participants are then asked to join together in pairs, and try to *agree* on what they have seen, if possible without overtly entering into interpretation. This is described as *giving an account of* what was seen. Discussion can then move into interpretation; the space has been opened to relate any interpretations to what was seen in the video excerpt. This stage is called *accounting for* what was seen — trying out possible meanings and explanations. Observers are less likely now to jump in with unjustified interpretations, and at this stage it is likely that personal feelings about the teacher and lesson being viewed have been deflected. Experience shows that extremely profitable discussion can result, that issues are

raised which are important to the participants, and that the constructive atmosphere can lead to genuine consideration of classroom consequences. This is the same progression from *account of* to *account for* captured succinctly by Mason (1987). Here, I am seeking to apply the same ideas to practices as an individual researcher and to consider how written accounts might provide an alternative to discussion.

Personal experience suggests that the discipline of giving an *account of* is non-trivial. My first attempts have been peppered with evaluative or judgemental comments, even when I have set myself to consciously mark them. Having access to a library of classroom episodes has, therefore, proved valuable in enabling rehearsal and development of observation and recording habits before moving to collect my own primary data. Whilst there are many public-domain sources of recordings of mathematics classrooms, (examples include the NCETM library mentioned above, the TIMSS video library at <http://www.timssvideo.com/timss-video-study> and many examples published on YouTube), identification of suitable source material highlighted a ‘looking’ issue at a very early stage: any video record is subject to a layer of value-laden decision-making that determines what is in the camera’s frame, what is audible and whether these factors change over the course of the recording. In seeking to focus on student interactions without interpretative commentary, the library hosted by the Video Mosaic Collaborative (<http://www.videomosaic.org/>) has been very useful. Videos in this library tend to focus on pupil conversations for considerable periods of time and are presented, in general, without editing. The particular episode used here is an 11-minute recording entitled ‘Designing New Rod Set: Students build a perfect set of rods’.

Written accounts of lesson observations tend to be presented as the end-product of a process that may or may not have incorporated accounts of and accounts for, and may or may not have been tested with others. This workshop was designed to explore the process in reverse, seeking to examine the experience of working from a written account before holding this up to a direct observation of the recorded episode. Prior to viewing the video, written descriptions were presented in two modes:

- i. an overview of entire episode, written as an account of a ‘first watching’;
- ii. using a simplified linguistic ethnographic approach to transcription.

Using this two-stage approach in previous work had raised interesting issues of the efficacy and limitations of seeing the entire episode as a single entity in contrast with drawing out the detail of the episode by fine-grained recording. In presenting such written accounts to my research supervisors, it had become apparent that viewing the episode *after* reading the accounts gave an impression of having awareness directed to particular features, either because they were anticipated or because they were in contrast to the impression already formed. In order to make informed and purposeful decisions about my own methodology, the same procedure was followed in the workshop, with participants invited to use a writing frame to record their thoughts at each stage.

What was seen

Having had an opportunity to read the written overview, workshop participants reported very different impressions of the duration of the episode (from five minutes to one hour). Discussions and written notes indicated a range of responses to the account: some participants had their awareness drawn to the details of the task and to their own attempts to frame the activity in a context (mathematical / instructional).

The instructions appear confusing.

It is hard to make out what is going on.

No clue what's going on here or why!

For others, the main awareness was located around the activity choices of the protagonists – pupils, teacher/researcher or both.

There is a chain of communication or dialogue for some time amongst students and/or teacher.

Use of rods to problem solve, think and explain.

Willingness to stay with one idea for a considerable length of time.

A few participants questioned what could be derived from being presented with such an overview and there is, indeed, something recursive about giving an *account of an account of*. It is certainly the case that participants became aware of features of the overview – and it seems appropriate to separate this from becoming aware of features of the classroom episode, since it had not been accessed at this point – so that a disciplined discussion that “stay[s] with the detail” (Brown & Coles, 2008, p.111) needed to be restricted to what was contained in the overview itself.

A second stage, therefore, was to provide an alternative written account of the same episode, one that set out to record transactional details by way of a transcript. The act of transposing observation of a classroom episode into a transcription is inherently value-laden (Ochs, 1979), being shaped through both conscious and unconscious decisions. Should the transcript develop down the page? Or be separated across the page? Where utterances overlap, which is recorded first? What level of non-verbal interactions should be incorporated? Should these be embedded with the verbal, or recorded in parallel? (see, for example, Rampton, Maybin & Roberts, 2014). For participants presented with the transcript, these decisions had already been made and, in this case, little access was given to the underpinning reasons. Indeed, presenting a second format of transcription for a section of overlapping dialogue, albeit briefly, did prompt participants to notice different features.

Reactions to encountering the transcript were varied, with participants apparently trusting the greater level of detail much more, even before seeing the recording:

The account is paraphrase. The transcript captures word-for-word.

The surprising thing for me, with the transcript, was recognising the silences and pauses, which had not come across from the overview.

Much more dynamic: some crucial bits [were] missing from the overview.

These comments are largely elicited because of activity in comparing and contrasting awarenesses generated by the two written accounts. Participants' comments after watching part of the video recording seemed to have a much more direct and personal connection:

Expressions in the children's voices created emotional responses for me; the children also had an emotional impact on each other.

It's more about the children. And their sustained mathematical talk. They worked really hard! I was smiling throughout.

Hearing the pace of the teacher's speech affected my interpretation of what was said... I want to see the [teacher's] physical responses to the student ideas because this could affect my interpretation ... after reading the overview.

Being in a position to hold up what had been seen through the written accounts against what had been noticed through a direct viewing of the recording allowed the

start of *accounting for* differences. One participant conjectured that the focus of the research was verbal, not gestural, something that might more normally be established at the outset of a report and an observation that goes to the heart of this workshop process, since it highlights the interaction of method of recording/presentation and the awarenesses generated.

Reflection

What, then, does this say to me about the role of the researcher? This process speaks to me of the responsibilities entrusted to the researcher and to the wider community that listens to and reflects on reported findings. When engaging in educational enquiry, it is incumbent on me to develop and articulate, as clearly as I am able, the rationale for a research design. This means laying out the basis for a particular approach to data collection, in terms of why these choices are appropriate and why other choices have been rejected, and being clear about how those choices will frame the nature of the data collected: how I look will frame what I see. Creating an overview account forces me, as researcher, to stay with the detail of an episode across its arc; it also means that I bring certain awarenesses to any subsequent transcription process which can, in turn, act as a prompt to first give an *account of* but can also direct my attention to certain features I have already marked as significant. It has acted as check and balance to the framework built around the research questions at hand, a looking around before looking at. My mode of recording becomes part of my data.

Since it is rarely feasible to present such written accounts or, indeed, video records in research reports, it is also my responsibility as a researcher to be able to account for consideration of the likely impact my modes of data preparation and analysis has on what I produce as data. If I present an account of an episode in a classroom, I am really presenting an account of what I have noticed under certain conditions and asking the wider community to work with this, rather like asking participants in this workshop to begin with an overview account as an *account of*. If what we see is shaped by how we look, then it seems to me more sensible for me to adopt the language of being *aware* of certain features rather than of *knowing* what happened. Being relatively new to education research, this speaks to ontological concerns: I am not giving an account of what happened so much as giving an account of what I observed. The same, of course, can be said of presenting a transcript. It might be argued that this is true even of presenting a video record, in that decisions of presentation have already been made. As reflected in workshop discussions, there is an apparent difference to the quality of this experience (and even more so when sharing being physically present in the classroom) if this is to be used as the source material, since others can compare what they notice with what has been presented in an account. In the words of one participant,

Noticing is very difficult to be exact and objective. [We] need to be aware of putting [our] own values, judgements, filters in the observation process and collecting data. [We] must guard against 'seeing' and noticing what proves our point.

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