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RESPONDING TO TEACHERS: LEARNING HOW TO USE VERBAL METACOMMUNICATION AS A MATHEMATICS TEACHER EDUCATOR

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In this paper, I present the process of developing a framework for analysing verbal metacommunications, in the context of a new mathematics teacher educator working with in-service teachers of mathematics. The interest in analysing verbal metacommunication arises from reflecting on the process of becoming a mathematics teacher educator, as I am learning how to respond in-the-moment to teachers of mathematics as they talk about teaching. Responding to teachers with verbal metacommunication appears to be significant in terms of supporting teachers in their own learning. There is currently no existing framework, within the mathematics education literature, for making systematic distinctions between types of verbal metacommunications in supporting group discussion.

BECOMING A MATHEMATICS TEACHER EDUCATOR

As a secondary school teacher of mathematics, I worked hard to set up a culture in my classroom where an overall aim of the year was linked to "being a mathematician". Over years of teaching the same tasks, I became attuned to hearing comments and observing actions linked to this aim. A powerful mechanism for building this culture was an ongoing commentary from me that went alongside the doing of the mathematics and in response to what the children were saying or doing. For example, a comment in response to a student who said, "I've noticed it's going up in twos" could imaginably have been "one thing mathematicians do is look for patterns" or "write that down as a conjecture to work on". As a teacher of mathematics, my teaching was "constantly organized by meta-comments" (Pimm, 1994, p.165) such that "the utterances made by students are seen as appropriate items for comment themselves" (p.165). Meta-commenting provided me with an alternative to evaluating student utterances, or responding directly to what was being uttered. Another purpose for commenting about the students' comments, was to create an image of a way of working that supported the students in their approach to working on mathematics, to establish a culture where students were motivated through asking their own questions and working on their own conjectures.

Almost two years ago I moved from secondary school mathematics teaching to a university, as a mathematics teacher educator working alongside a group of pre-service teachers of mathematics. In reflecting on sessions with the group of pre-service teachers, one issue that arose for me was around hearing and responding. Having been

attuned to hear and respond to comments in a mathematics classroom, I was able to respond as a mathematics teacher but was not yet able to respond as a mathematics teacher educator. From this awareness developed a motivation to research how I am becoming a mathematics teacher educator and a research project commenced.

Within the field of mathematics education there is a distinction made between what is termed the education of mathematics teacher educators where the focus is on teacher educators learning through formal courses and the mathematics teacher educator as learner where the emphasis is on "teacher educators' autonomous efforts to learn, in particular, through reflection and research on their practice" (Krainer, Chapman & Zaslavsky, 2014, p.432). My study aligns with the second of these terms and concerns how I am learning to respond in becoming a mathematics teacher educator. Specifically, how to respond in-the-moment to pre-service teachers of mathematics and what, in addition to my classroom-attuned responses, I could be metacommenting upon.

VERBAL METACOMMUNICATION

The term metacommunication was introduced by Ruesch and Bateson (1951), where the concept was developed from detailed study of animal behaviour. Described as "an entirely new order of communication" (p.209) and defined as "communication about communication" (p.209), this new order of communication allowed Ruesch and Bateson (1951) to explain some complex and paradoxical attributes of social interaction. Any instance of interpersonal communication will consist of a "report" (p.179) aspect, synonymous with the content or data of the message, and a "command" (p.179) aspect, referring to the relationship between the communicants. According to Watzlawick et al. (1967), the report aspect of a message conveys information whereas the command aspect concerns how the communication is to be taken and therefore ultimately to the "relationship between the communicants" (p.33). It is the relationship aspect of communication, being a communication about a communication, that is, according to Watzlawick et al. (1967), "identical with the concept of metacommunication" (p.34).

Rossiter (1974) distinguished between two types of metacommunication: "that which is an ever-present aspect of all transactions and; that which constitutes additional commentary about communicative transactions" (p.36). The former type consists primarily of non-verbal cues, for example, tone of voice, body language or gesture, which can indicate whether the person communicating is, for example, serious or joking. These metacommunicational cues can provide information about how a message is to be interpreted "by indicating something about intentions and feelings of the message generator" (p.37). The latter type of metacommunication, which constitutes additional commentary, could be understood as simply 'talking about talking' and occurs whenever verbal and/or nonverbal communication becomes the topic of communication itself. The focus for this paper is on my verbal metacommunication in-the-moment of a discussion.

In terms of verbal communication, metacommunicational clues may be highly ambiguous and can be easily interpreted in entirely different ways. It follows that the ability to metacommunicate appropriately "is not only the condition sine qua non of successful communication, but is intimately linked with the enormous problem of awareness of self and others" (Watzlawick et al., 1967, p.34). The position, that it is the ability to metacommunicate appropriately that is essential for successful communication, provides a further rationale for my study. In particular, how do I use verbal metacommunication when responding to pre-service teachers talking about teaching? Furthermore, what is the process of learning to respond in-the-moment in a metacommunicative way?

I have also found myself reflecting on my responses when working with in-service teachers of mathematics. I am currently working alongside a group of ten secondary school mathematics teachers working and learning through collaboration to develop the mathematical reasoning of the children in their classrooms and in their wider departments. Between each meeting of the collaborative group, the mathematics teachers try out ways of working in their classrooms and work with other mathematics teachers in their departments to do the same. My role in the group is to support a discussion where the teachers share ideas and stories and learn from one another through reflecting on what they have been doing in school. It is in this setting where I began to develop a methodology for researching my learning as a mathematics teacher educator through paying attention to what I was noticing.

THE DISCIPLINE OF NOTICING AS A METHODOLOGY

In the context of my research, the connection between self-awareness; awareness of others and; my own ability to respond with metacomments, has become a meaningful one. Having audio-recorded the first of my discussions with the group of mathematics teachers, it was in the slow transcription of this discussion that I became aware of a shift in my attention at particular moments of a teacher speaking. In feeling this reaction in-the-moment of hearing the audio-recordings, I was "noticing" (Mason, 2002), making a distinction by distinguishing "some 'thing' from its surroundings" (p.33).

Mason's (2002) description of the Discipline of Noticing as four "interconnected actions", specifically: "Systematic Reflection"; "Recognising"; "Preparing and Noticing" and; "Validating with Others" (p.95), offers me a framework for my research methodology. In attending to what I notice in a systematic way as I transcribe the audio-recorded discussions, I am able to "mark" (Mason, 2002, p.33) so that I can "re-mark upon it later to others" (p.33). This marking seems to manifest itself as an uncomfortable feeling, or a sense of surprise or confusion and signifies when a moment has salience. In "recording" (p.33) these salient moments they have become available for further evaluation.

Based on the idea that something may be salient because of "some hidden assumption or bias" (Mason, 2002, p.248), I wanted to minimise this issue by utilising multiple

perspectives and by practising "being in question" (p.248) through "seeking resonance with others in an ever-expanding community"" (p.248). In sharing these salient moments with others in the mathematics education community, I was "creating the conditions for the emergence of the as-yet unimagined rather than […] perpetuating entrenched habits of interpretation" (Davis, 2004, p.184). Through the process of self-reflecting and considering multiple perspectives, I began to understand learning to respond as a "recursively elaborative process of opening up new spaces of possibility by exploring current spaces" (p.184).

This process of sensitising myself to notice the types of comments that may prompt a metacommunicative response has been significant in terms of supporting me to consider possible ways of acting differently in the future, that is, becoming a mathematics teacher educator. Having worked for some time on developing these awarenesses through the slow transcription of the discussions with the group of teachers, and from the position that an ability to metacommunicate appropriately is essential for successful communication in supporting groups of teachers working collaboratively, my attention has now turned to analysing how I am responding at a metacommunicative level.

FRAMEWORKS FOR ANALYSIS OF VERBAL METACOMMUNICATION

Studies of the use of verbal metacommunication exist most predominantly within research on psychotherapy where the focus is on the relationship between the therapist and the client, and in research about the role of children's social pretend play. From literature related to more formal educational settings, I present two frameworks for analysis of verbal metacommunicative responses.

Firstly, Rossiter (1974) argues that to improve the ability to communicate at an interpersonal level, it is key to master the capacity to metacommunicate. In his paper (Rossiter, 1974), which concerns the instruction of "courses which focus on interpersonal communication" (p.36) based on the concept of metacommunication, Rossiter offers four functions (see Table 1) of "oral verbal communication about face-to-face interpersonal communication that is in process" (p.37).

More recently, Baltzersen (2013) contended that any metacommunicative utterance can be analysed in relation to all three of the following basic dimensions: What, how and when you metacommunicate. He originally investigated the impact of metacommunication in the supervision process in higher education in Norway through linking survey questions to the "metacommunication concept" (p.128). Though initially methods appear limited in terms of the conceptualisation of this metacommunicational concept (specifically, indicators of metacommunication are linked to: discussing the supervision process and; clarification of tasks and roles in supervisions) his study does suggest that "metacommunication may have a substantial positive effect on the quality of communication in thesis supervision" (p.130). Based on these findings, Baltzersen goes on to ask the question, "What kind of metacommunication is important to create good supervision in higher education?"

(p.130). Baltzersen's exclusive focus on verbal metacommunication enables him to develop a framework that, though not exhaustive, allows review of different definitions and examples of verbal metacommunication used in a one-one supervision context. Baltzersen (2013), as with Rossiter (1974), also offers four functions of verbal metacommunication (see Table 1).

The functions of metacommunication, described by both Rossiter (1974) and Baltzersen (2013), are presented in Table 1 in a way that demonstrates the parallels that I have drawn out from the two sets.

	Rossiter (1974, p.37)	Baltzersen (2013)
(1)	To focus conscious attention on the process of interaction	To create and establish a working alliance (p.133, p.135)
(2)	To clarify vague feelings about what is going on	To talk about intentions (p.133)
(3)	To determine if perceptions of what is happening coincide	To pose clarifying questions (p.135)
(4)	To provide direct feedback about speaker's communication behaviour	To evaluate some aspect of the relationship between the persons interacting (pp.133-134)

Table 1: Functions of verbal metacommunication presented in parallel (adapted from Rossiter, 1974, p.37; Baltzersen, 2013, pp.133-135).

To offer some further elaboration, I explore each pair of functions from Table 1 in turn. Firstly, Rossiter (1974) begins with what he describes as the "most important function of metacommunication […] that it focuses conscious attention on the process of interaction" (p.37). This attention to the process allows participants in the conversation to take a step back from the interaction itself and look at how the communication system is functioning. In the same sense, Baltzersen (2013) describes the need to create and establish a working alliance through agreeing on specific tasks; agreeing on goals; and identifying possible strains in the relationship between participants (p.133). Secondly, Baltzersen's suggestion that verbal metacommunication can function to communicate intentions through talking about what the speaker has said, or through disclosing or asking for opinions about the conversation, closely resembles Rossiter's clarifying "vague feelings about what is going on" (p.37) in that verbal metacommunication of this form can suggest how participants in the conversation arrived at their present state through paying attention to the process factors that influence emotional responses to the interaction itself. Thirdly, Rossiter's purpose of determining whether perceptions of what is happening coincide (p.37) concerns the need for perceptions to be made as explicit as possible so that other participants in the conversation know how to respond to them. In a similar vein, Baltzersen describes posing clarifying questions through clarifying the speaker's own prior opinion or another speaker's opinion; paraphrasing; repeating something said earlier;

commenting on language use; and regulating others (p.135). Finally, Baltzersen suggests evaluating some aspect of the relationship between the persons interacting through explicating disagreement and highlighting one's own role or another person's role in the relationship (pp.133-134). Similarly, Rossiter recommends verbal metacommunication in order to draw attention to *how* a speaker is communicating through providing direct feedback about the speaker's communication behaviour. These pairs of functions form a framework with which some of my responses from discussions with the collaborative group of mathematics teachers are now analysed in the next section.

ANALYSING RESPONSES

Before using the framework (Table 1) for analysing my responses as verbal metacommunications, I needed to consider which responses could be fundamentally considered as verbal metacommunications (a communication *about* a communication), or alternatively, as a communication in direct response at the level of the discussion. In order to exemplify this distinction, consider the following two vignettes. Each vignette comprises a short extract of transcription taken from audio-recorded discussions with the group of mathematics teachers. Both vignettes provide a different paradigmatic example that are representative of a set of similar responses.

Vignette 1:

Teacher: I was just thinking of a time a couple of weeks ago when I was doing conversions and um, we were doing area and volume conversions, but part of the starter was just simple conversions and a kid from a top set was convinced that to get from millimetres to centimetres, you times by ten and even putting examples up he still was convinced no it was times by ten so even though he knows there are ten millimetres in one centimetre he still was convinced you times by ten so I don't really understand how to…

Tracy: Well it is, isn't it, you kind of are timsing by ten, it's ten times bigger, I guess maybe that's where that's coming from.

Vignette 2:

Teacher: I was just thinking back to a session I went to… and a lot of what we are discussing now here is very talk based, and is there almost a case with some of the things we are modelling to promote reasoning, we say a lot less, just show them, break it down into manageable steps, so I did this, linking area of rectangle to area of triangle, I taught that normally last term, it didn't go down very well.

Tracy: What do you mean by normally?

In vignette 1, the teacher is describing an issue with a student who was converting millimetres to centimetres. My response, "Well it is, isn't it, you kind of are timsing by ten, it's ten times bigger, I guess maybe that's where that's coming from", which I do not consider to be a verbal metacommunication, was a direct response at the level of

the original communication. I was suggesting an explanation for the situation being described.

In vignette 2, the teacher is describing a lesson where he presented to the students, in silence, a series of images linking the area of a rectangle to the area of a triangle as an alternative to an approach he had used previously to teach the concept. He describes this previous approach as being taught "normally" to which I respond immediately with "What do you mean by normally?" In relation to the functions presented in Table 1, I would argue that the purpose of this response was "to determine if perceptions of what is happening coincide" through posing clarifying questions. Working on an account of the notion of "normally", allows others to create an image of this teacher's classroom that might otherwise not be possible.

I now present one further vignette comprising of another short extract from a discussion with the group of mathematics teachers. I have chosen this final extract as a paradigmatic example of a response that I understand to be a verbal metacommunication but that becomes problematic when trying to describe it using the functions presented in Table 1. For context, the extract from vignette 3 follows on shortly from the extract from vignette 2 and is the same teacher speaking. Having described using the set of images for areas of rectangles and triangles, the teacher goes on to describe offering the students a problem, involving finding rectangles with equal area and perimeter. In the comment from vignette 3, the teacher is reflecting about having noticed a change in the energy of the students compared with previous lessons.

Vignette 3:

Teacher: Um, yeah, from what I thought would be kind of do and review of something at quite a low level and I'd have to really go over here's how you do area, here's how you do perimeter, actually it then turned into they did it all themselves, and you know in the class you get hands up all the time, it wasn't sir help me, it was sir look at this, look at this, look at this I did it!

Tracy: Oh, that's nice, so the difference was in hands.

In isolation, "Oh, that's nice" is ambiguous. However, the second part of the response, "so the difference was in hands" offers an indication as to what I was valuing in that moment, using "so" as the link would suggest the "nice" was in recognition of the previous speaker's acknowledgement of an observed difference, in this case, a different reason for hands going up. Is this communication about communication? Having made the comment myself, I do of course have an insider perspective. One awareness that I know I have is when a teacher talks about a change in their behaviour or that of their students. When this happens, I often find myself highlighting that a difference has been noticed and how this difference has been observed. One function of doing this is to direct the attention of others; to invite others to consider differences in their own classrooms and; to emphasise the importance of these types of observations as a classroom teacher working on their teaching. This function seems to me to be in a difference place to those in existing frameworks.

REFLECTING ON THE PROCESS OF LEARNING TO RESPOND

There is a motto of noticing which Mason (2002) alerts us to that is "I cannot change others, I can work at changing myself" (p.248). As a mathematics teacher, my conviction came from having an image of what teaching could look like and I worked hard to establish a verbal metacommentary that went alongside my students working on mathematics. In becoming a mathematics teacher educator through the process of sensitising myself to notice when a verbal metacommunication may be appropriate, and for what purpose, I am learning how to support and enable teachers working and learning through collaboration.

As I continue researching how I am learning to respond as a mathematics teacher educator, it is inevitable that further categorisations of verbal metacommunicative responses will emerge. One contribution to the field of mathematics education and, in particular, to mathematics teacher education and teacher educator learning might be a framework for systematically categorising verbal metacommunicative responses when working with teachers of mathematics. The classifications that emerge will principally be of value to me as a researcher of my own learning who is immersed in the process of developing this framework. By making these categorisations or distinctions, I am supporting further possibility of responding differently both now and in the future and I am reminded to return to an image of learning from Davis (2004) as a "recursively elaborative process of opening up new spaces of possibility by exploring current spaces" (p.184).

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