

# Chapter 11

## Mapping the Territory: Using Second-Person Interviewing Techniques to Narratively Explore the Lived Experience of Becoming a Mathematics Teacher Educator



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### 11.1 Introduction

Does being a strong mathematician make you a strong mathematics teacher? Does being a strong mathematics teacher make you a strong mathematics teacher educator (MTE)? There are first-person accounts “conceptualising the terrain” (Tzur, 2001) and using narrative inquiry (Chauvot, 2009) that use self-reflective analysis and self-study, respectively, what we would term first-person techniques, to contribute to the literature on developing as a university MTE. We will use the term “university MTEs” when talking about MTEs working with prospective teachers. In this chapter, the focus is on exploring the lived experience of Alistair, an experienced (over 10 years) mathematics teacher, who is also a strong mathematician, when moving from being a teacher of mathematics in a school for 11–18-year-old students to working in a national role as an MTE. Alistair is now running a year-long professional development course, *Teaching Advanced Mathematics* (TAM), for groups of teachers who want to develop their teaching of mathematics at advanced-level (A-level Mathematics is a course for students from 16 to 19 years old, often a preparation for university-level studies). The course is provided by *Mathematics in Education and Industry* (MEI), a charity committed to improving mathematics education, and involves eight course days and two lesson observations in each teacher’s school. What changes in this journey from teacher to teacher educator? What is gained or lost in the transition? To explore these questions, Laurinda, his doctoral supervisor and herself an experienced university MTE, interviewed Alistair three

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times, at the beginning, middle and end of his first 6 months in his new post using what is termed “empathic second-person interviewing” (Metz & Simmt, 2015), which will be discussed in more detail later in the section on second-person interviewing. We will illustrate, through this process, how enactivism, as a theory of learning, can be used to investigate how MTEs learn and develop.

In investigating how the transition from mathematics teacher to mathematics teacher educator (MTE) is made, it is important to collect case studies from a range of contexts. Culturally, the work of MTEs is different across country boundaries; for instance, in Bristol, England, it is usual for university MTEs working with prospective teachers to visit them whilst teaching on their school placements, and in Alicante, Spain, university MTEs do not visit their prospective teachers whilst on placement. Many differences become apparent when working in international groups, such as in the thematic working group (TWG18) on *Mathematics Teacher Education and Professional Development* at the Congress of European Research in Mathematics Education (CERME). For instance, in TWG18 at CERME 10, there were:

Different points of views about errors in different teacher education programmes and how we use/understand errors in our teacher education programmes. Also differences in practices of “noticing”. (Zehetmeier, Brown, Mellone, Santos, & Akar, 2017)

The differences in our language use when using common words, such as errors, problem-solving, discussion or even MTE, become apparent when we talk in detail about what we do, our practices, rather than when expressing theories more generally.

In this chapter, there will first be sections on some theoretical underpinnings: the background theoretical stance of enactivism that seems particularly appropriate for researching the learning of MTEs with its focus on knowing being equivalent to doing; a discussion on what learning from experience is to us; and how it is possible to explore first-person experience through second-person interviews. A section on methodological issues, including what we did to generate data, is followed by an extended case study, uncovering similarities and differences between being an expert classroom mathematics teacher and a novice MTE over the first 6 months of transition. This case study of Alistair will contribute to extending our awarenesses of how MTEs learn. There is then a focus on exploring these awarenesses, written as straplines, through inviting narratives, details of experiences, from two other MTEs, one, Toby, having recently made the transition to working with teachers in professional development and one, Tracy, a university MTE who works with prospective teachers.

## 11.2 Theoretical Underpinnings

### 11.2.1 *Being an Enactivist*

Being an enactivist is underpinned by an acceptance of a biological basis of being, where we have evolved and continue evolving to act in our environment. (If you are interested in exploring more on the theory and practice of enactivism, see the ZDM

issue on *Enactivist Methodology in Mathematics Education Research*, edited by Reid, Brown, Coles and Lozano in 2015.) In essence, “All doing is knowing, and all knowing is doing” (Maturana & Varela, 1992, p. 26). This perspective is important in considering how we adapt to changes in our working practices, such as moving from teaching mathematics to students in school to working with groups of experienced mathematics teachers. In enactivist terms, our history of structural coupling with our environment leads to patterned actions. Varela’s (1999b) first key point of enaction is “Embodiment: The mind is not in the head” (p. 73) given that our frontal cortex only becomes active when we do not know how to act (Varela, 1999a, p. 18). As Clark (1997) put it, “Minds make motions, and they must make them fast – before the predator catches you, or before your prey gets away from you” (p. 1).

In the moment, there is no time for reflecting. In moving to a new job, therefore, we act using what we have done previously. As Maturana and Varela (1992) phrase it, “Knowing is effective action, that is, operating effectively in the domain of existence of living beings” (p. 29). Using what we have done previously in a new environment will be followed by adapting when what happens is not effective or good-enough (Zack & Reid, 2003, 2004) for the situation. Identifying feelings of being uncomfortable and staying with the detail of what happened can support our learning by opening up new possibilities for acting, whether we are novice or expert (Brown & Coles, 2011). The difference between a novice and an expert is that the expert can reconstruct with “deliberate analysis” (Varela, 1999a, p. 32; Brown & Coles, 2012), after the event, the awarenesses that led to action. However, “even the beginner can use this sort of deliberate analysis to acquire sufficient intelligent awareness to bypass deliberateness altogether and become an expert” (Varela, 1999a, p. 32).

In this chapter, we are exploring how a new MTE adapts, bringing forth new behaviours and keeping some. How is this adapting done?

### 11.2.2 What Is Learning?

The link between language and action is through basic-level categories (Varela, Thompson, & Rosch, 1993, p. 177). How do we come to recognise a chair, when there are so many different varieties? A chair is most often a “sitting-on object”. When there is a need to sit, we notice possibilities in our environment and act. For an experienced teacher of mathematics, walking into their classroom, much of what happens is already established through routines although the interactions in the moment are infinitely variable. When starting a new job related to teaching mathematics but working with teachers, the behaviours and routines fit for teaching children are what exist. How is it possible to learn in the new situation? Basic-level categories are positioned between the details of particular behaviours, say, sitting in our favourite comfortable chair, and superordinate categories, say, furniture, where there is no such clear link to behaviours in the praxis of living of most human beings. (Furniture would be a basic-level category for furniture removers, however, given that they know what to do with it.) Learning is done by changing or extending

the basic-level categories by adapting to the new environment. The process, that can be carried out after the lived experiences by novices and experts, is to focus on a time of feeling comfortable or uncomfortable and, staying with the detail of what happened, without judgements, open up the possibility of acting differently. There is through this process the potential for new basic-level categories to emerge and, over time, avoid the move, in the case we are interested in, into automatic behaviours from a previous job. This process is learning to act in the new environment. The collection of data for this chapter, through interview conversations focused on staying with the detail of Alistair's lived experiences of a new job as an MTE, seeks to answer the questions of what changes and what stays the same in the transition from school teaching to being an MTE.

### ***11.2.3 Second-Person Interviewing***

So, in wanting to write a case study of one expert teacher's move from their classroom to the first year of working with teachers, what seemed important was to access in some way the changes that led to new behaviours or what of their previous actions could be effective in the new environment? We are interested in first-person accounts such as used in phenomenology, but there was not time to train Alistair to become a phenomenologist. Claire Petitmengin (2006), a doctoral student of Varela, was in the same position when working with epileptics. Scans had shown that there were changes in brain function before the epileptic seizure took place, and Claire Petitmengin's challenge was to find a way of developing first-person accounts of what was happening at that time. The process developed was that of second-person interviews, and there was a protocol for the interviewer in our study, Laurinda, to work with. In Alistair's case, he would begin by talking about some lived experience. We recognise three fundamental ways of acting as such an interviewer, adapted from Petitmengin's (2006) paper:

- Stabilising attention: A regular reformulation by the interviewer of what the interviewee has said, asking for a recheck of accuracy (often in response to a digression or judgement). Asking a question that brings the attention back to the experience.
- Turning the attention from "what" to "how" (never "why").
- Moving from a general representation to a singular experience. This is what we term "story" in the case study that follows, a re-enactment, reliving the past as if it were present. Talking out of experience, not from their beliefs or judgements of what happened, often involves teachers in a move to the present tense. Staying with the detail is important, a maximal exhaustivity of description that allows access to the implicit.

With a colleague, Alf Coles (Brown & Coles, 2019), and being mindful of the enactivist take on learning through adapting basic-level categories, we have added a fourth fundamental way of acting:

- Getting to new basic-category labels: After dwelling in the detail, telling stories and exploring without judgement or digressions, the invitation is to elicit statements of what is being worked on. [...] In this way, new basic-level categories might be identified, such as the straplines (a word used in editing newspapers, memorable, usually less than five-word phrases) from this research of “listening for” or “setting up the culture”. These awarenesses, triggering and being triggered by the environment, can allow adapted and new behaviours to emerge.

### 11.3 Methodology and Methods

To develop the case study, there were three interviews where the extended Petitmengin protocol was used by Laurinda to support Alistair in staying with the detail of times that had been comfortable or uncomfortable. After the interviews were transcribed, again by Laurinda, Alistair was invited to highlight what seemed to be important aspects, what we have called straplines. Alistair identified 6 straplines from the transcript of interview 1 and 11 from interview 2. To look for resonance, the six straplines, from interview 1, were shared by e-mail with two other MTEs: Toby, starting a new role as an MTE working with the professional development of teachers mainly online, and Tracy, who 3 years ago left school to become a university MTE of prospective teachers and is a doctoral student of Laurinda focusing on a first-person narrative study of becoming a university MTE. They received the following message, having agreed to take part:

What I am interested in are any stories triggered by reading the straplines where either the issue seems similar to what you have experienced or where you feel uncomfortable because your experience is different. Try to tell any stories with a little context but then staying with the detail of experience without judgement or explication followed by talking about what you have just written to point the reader to the issue for you.

Involving the other MTEs serves to remind us of the many varied contexts in which MTEs work. A definitive answer to the questions raised is not possible, but reading case studies supports others in expanding their own range of possibilities to act, and the straplines begin to map the territory of potential development. Toby and Tracy both commented in detail on two of the six straplines, “setting up the culture” and “listening and listening for”.

What follows next are some exemplars from the transcripts illustrating the way the interview protocol worked including, unusually perhaps, the interviewer telling stories, when triggered, to seek further resonance from the interviewee. There follows a piece of writing by Alistair related to the strapline, “setting up the culture”, creating a narrative of a sequence of stories over the time of the interviews to illustrate learning and raise issues. This writing is largely taken from the interview transcripts, a support for him in producing this first-person account, telling stories that illustrate his change over time. Without the interviews, we suspect that this level of detail would have been lost.

### ***11.3.1 Using the Protocol for Second-Person Interviewing***

For each of the items in the protocol, a sequence from the transcripts has been chosen to give the detail of how the protocol is used. For the first three items, Laurinda is not saying very much. In the fourth item, however, a story from her own experience arises and is shared. This triggers another contribution from Alistair who identifies what is being talked about at the basic level.

### ***11.3.2 Stabilising Attention***

*From Transcript 3:*

*Alistair:* I feel like I'm getting to know them a bit better until you go into their classroom [...] sometimes it's surprising and other times it's not.

*Laurinda:* Can you give me a story of something that's surprising?

*Discussion:* This extract is taken from near the beginning of the last transcript. Alistair begins by talking about his experiences rather than being in the detail, so Laurinda's contribution attempts to support a transition into the detailed layer of what happened.

### ***11.3.3 Turning the Attention from What to How?***

*From Transcript 1:*

*Alistair:* For [the teachers] the course entails 8 days. I work with another person to deliver these days for the teachers.

*Laurinda:* How do you get to the point of delivery? What happens before that?

*Discussion:* This extract is taken from the beginning of the first transcript. Alistair's first contribution is related to what he is involved in. Laurinda aims to turn the "what" into "how" but realises that Alistair might need to say what happens before delivery starts before saying anything about "how". From Petitmengin's (2006) perspective:

Throughout any interview of this type, it is the question "how" which triggers the conversion of the attention of the interviewee towards [...] pre-reflective internal processes, and permits the awareness of these processes. This may be contrasted with the question "why", which deflects [...] attention to the description of objectives and abstract considerations, and must therefore be avoided. (p. 241)

It is hard to avoid "why" questions as a novice interviewer, but Laurinda is experienced enough to often recognise them arising and so asks something else. If a "why" question is asked without awareness, since Alistair is aware of the protocol, he comments "No, 'why' questions!"

### ***11.3.4 Moving from a General Representation to a Singular Experience***

*From Transcript 1:*

*Alistair:* Later in what I was asking the teachers to do after this, they became different actions for the teachers. But what this teacher offered that wasn't those things, was to take a point, if on the curve there's a point at which you want to find the gradient, they suggested taking two points an equal distance either side of that point and constructing a chord and finding the gradient of that.

*Laurinda:* What do you mean by distance either side?

*Discussion:* Here is an example of the move from a general statement ("Later in what I was asking the teacher to do after this, they became different actions for the teachers") to staying with the detail of experience (from "... if on the curve there's a point ..."). As an interviewer, Laurinda is concerned with supporting the interviewee to get to a maximal exhaustivity of description. To keep the focus on the detail, Laurinda has found it useful to be aware when she does not know what is meant. One way of becoming aware of this is when an image presents itself for which the detail has not been given. It is her own interpretation of what is being said. Her question, following Alistair beginning to focus on the detail, asks for more detail about what the image being described looks like. Many of our decisions, when teaching, are from theories that are implicit. We may not even be aware of them ourselves. Staying with the detail gives access to the implicit through the uncovering of basic-level categories.

### ***11.3.5 Getting to New Basic-Category Labels***

*From Transcript 2:*

*Alistair:* I was observing the first day; it was delivered by Simon, my line manager. But I remember being struck by how strong that message was. Whenever anybody offered something that was not from what was in there, they got challenged to justify it, every time, more strongly than I would have been able to do. I think I said I was blown away by that session and it was the recognition of how powerful they were setting up culture.

*Laurinda:* What I am personally interested in is where that comes from – the conviction of that person you observed. I was a head of mathematics [...] invited to do a professional development session. We did a visual activity, talking about what we see, that sense of maths not being about me standing there telling them things. There was a man who did not say what he saw but gave a label, above the heads of most of the staff, something like Lissajous figures. I wanted him not to be able to use what he'd already known. It did happen. [...] He realised that his initial statement didn't fit with where they had got to through talking. He couldn't use his memory anymore and he was at sea.

*Alistair:* That brings to mind a teacher who [...] would make strong assertions and I thought long and hard about how I was going to react to that. I followed Simon's lead, "Why, can you justify that?" Over lunch time, the teacher came to speak to me and said, "I was thinking about you getting me to justify that and what I wanted to do was question and sometimes it might be better to just ask the question rather than making a strong assertion that something else is the case".

*Discussion:* A statement from Alistair following this interchange highlighted a basic-level category, convincing, that arose out of this interchange, "A useful word that I said was convincing. Your role here is to convince us. Can you convince us of this that you've said?" The sections of transcript have been shortened, but in each case the focus was on staying with the detail of the experiences. The discipline is to tell a story that arises from listening to another person's story, and at some point, although Laurinda did not specifically invite a shift to talking about the descriptions of experience, Alistair moves to seeing "working with others to see convincing" as being part of mathematics teaching and learning. This is a basic-level category that can accrue a range of behaviours at the implicit level that he can apply in his new role. There is evidence in the final contribution from Alistair that the teacher he was working with has moved to have a potential new basic-level category for herself, "just asking the question", with the old implicit one, "making a strong assertion" becoming questioned. In writing this chapter, Alistair's current purpose is to act so that the teachers he works with try asking the children in their mathematics classroom to be convinced and convincing.

## **11.4 Case Study Written by Alistair: Becoming a Mathematics Teacher Educator**

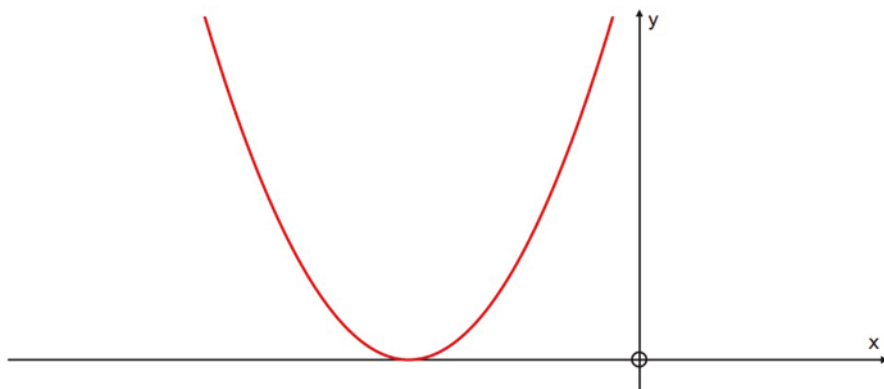
### ***11.4.1 Narrative for Strapline: Setting Up the Culture***

The narrative is told in three sections, each story, or detail from experience, being followed by reflections, also written by Alistair. After the three sections, there will then be a discussion pointing to other straplines and what might be considered to be findings.

1. Being fluent as a maths teacher and then doing those things when working with maths teachers but it not being the same

*Story 1:* I asked two people to stand outside the room whilst the rest of the group looked at a graph and were to design some clues.





I wanted to then take the graph off the board, invite the two teachers back in the room with the clues available, and see if they could get back to an equation and a graph. This was in the context of work introducing integration as the reverse of differentiation, and the plan was for the teachers that were still in the room to find an equation that could lead to that graph, differentiate to find a gradient function and say a point on the curve. Those two clues would be what would remain when the two teachers came back in the room. Now, the first question I asked the group was, “What clues could we give them [the two people outside] that might allow them to get back to the graph?” What came back were all sorts of things that I didn’t know how to handle. Things like, “It’s in the first quadrant.”; “There’s a line of symmetry.”; “It’s a parabola.” I felt uncomfortable.

*Reflections 1:* I wanted to use the pre-existing plans for the course delivery because I felt that by using these I would be forced to consider new ideas and new ways of working, but I was also conscious of working with the plans in ways that develop what I care about. In planning for the days, I placed importance on my opportunities to listen, because this is where I get a chance to show that teacher contributions are valued, by listening to them and using their contributions as we work together.

Despite having cared so much about my opportunities to listen, I found that in this case I wasn’t interested in the responses that were coming back from the teachers – I was only waiting for the responses that were in the plan for the day, which felt immediately uncomfortable.

A difference from my mathematics classroom is that there were time pressures within this session from there being two teachers waiting outside and there was a particular answer that was needed in order to invite them back (a gradient function and a point on the line). Comments like “It’s in the first quadrant” would not provide the two teachers outside the room with much information to narrow down the possibilities and also aren’t mathematically accurate. In my maths classroom, I would have wanted the students to take responsibility for deciding whether their suggestions were correct, but this new situation meant that we didn’t have time to think

about suggestions that were mathematically incorrect. There were mathematically correct statements that I still needed to reject because they wouldn't lead into the next activity on the plan.

This raises the question of what was different about my maths classroom that made this a natural question for me to ask. One difference is the nature of things that I intended to be learned. In my maths classroom, I take the role of deciding what it means to work mathematically and then set up tasks so that my students experience this. This kind of question might have helped to set up an openness to the questions that we might ask and explore, showing that mathematicians make choices and work on open tasks for extended periods. Somehow this feels less relevant to working with mathematics teachers, because they might have different views about the relevance of different ways of working mathematically for their students, which I don't want to influence. Instead, what I want to influence is how they work with their students and how they might communicate their own mathematical values (whatever they may be) to their students.

Another difference is the time pressure and regularity of sessions over the year. The setting up of a culture in my maths classroom was a larger priority at the start of the year because I had more time to work on the maths content once this culture was established. With only a few course days and bigger gaps between contacts, there is less time to establish a culture before having some specific aspects of A-level maths to work on and specific types of task to try out. There's less time to go off plan and explore.

## 2. What have I done to set up a culture?

*Story 2:* There was one teacher on the course who was strong about having a degree in mathematics, which is coming from a different place from most teachers on the course, and she would make strong assertions, offering methods that hadn't come out of the ideas and discussion within the room. I thought long and hard about how I was going to react to that, and I followed Simon's lead on challenging them to explain why and justify.

I can't remember what they offered now, but there was a point where I labelled it as a strong assertion, emphasised that the comments should be aimed at the audience of teachers in the room and asked, "Can you justify that?" She sank right down. There was a sense of people around the room recognising that this is quite nice actually, because she couldn't justify it. Over lunch time, the teacher came to speak to me and said, "I was thinking about you getting me to justify that and what I wanted to do was question and sometimes it might be better to just ask the question rather than making a strong assertion that something else is the case".

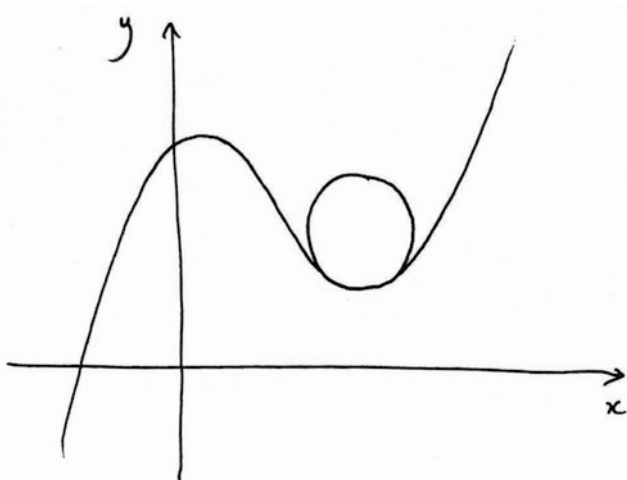
*Reflections 2:* A similarity between this situation and my maths classroom is the value placed on convincing others in the room of statements made, but a difference is that I was actively trying to find strategies to not allow someone to dominate. I was asking this teacher to justify her assertions with the hope that she wouldn't be able to do it, which feels unkind, and I'm not sure I would have done this to children in my maths classroom. I think I felt that there was more danger of a teacher with lots of conviction dominating and setting the tone for the course than there would be in my maths classroom, where I am the teacher and they are the students.

I was trying to establish a culture where people convince each other, so that someone who brings lots of rules and assertions doesn't have an advantage over others and doesn't gain an authority to tell others what maths is about. I was not establishing myself as a mathematical authority as I didn't involve myself in the maths content, but I did set an expectation about how people are to work mathematically in this space. I'm aware that I couldn't tell this person to ask questions rather than make assertions, but I could set up a culture of working mathematically where she can experience her assertions not being valued.

3. "I've got two more days of the course to do but I'm not worried about setting up culture – the teachers behave as I want them to now!"

*Story 3:* The teachers had been asked to consider a circle and a cubic function, and they were trying to work out how many points of intersection were possible between the two graphs. One teacher offered the idea that you could have a cubic function, looked at the curvature around one of the turning points and placed a circle to match the curvature in the turning points.

They had got a mini-whiteboard and were asking me what I thought of this. I didn't know how to respond to that but what I did do was try and draw it on the board. I thought there was something interesting about it.



I think the teacher had shared their image amongst their group. My sense was that there was a level of acceptance around that table of this idea and that then there were an infinite number of points of intersection, and they were suggesting this was the solution to the whole thing, I can get any number of points of intersection but that wasn't said explicitly. Having drawn it on the board and intervened with the group to say, "Can everybody look at this for a moment?" somebody shouted quite strongly, "No", in disagreement with the mathematics, which made everybody in the room laugh, and there was strong reaction to this image on the board. I just paused and let the image speak for itself and the "No" was hanging to some extent.

I think there was a sense of it causing disagreement or challenging each other. This table had been happy with their image, yet it caused real conflict with some other people quite immediately. I found something that got people's attention and has got people engaging and wanting to talk. It feels like I can back off a little bit. Something about the laughter was nice. There was a strange combination of relaxing and also feeling like eyes were on me to see what I'd do about the "No".

*Reflections 3*: This situation feels comfortable and similar to my maths classroom. The reaction of the room to the strong "No", with laughter and waiting to see what I would do about it, I believe is an indicative of this going against established norms of justifying any mathematical statements. My sense is that the teachers value the culture within which they're working, such that I'm not having to establish anything new anymore. I seem to have provoked difference of opinion such that teachers were reacting with energy, yet the group expect me to manage this energy such that the norms are maintained.

I find it interesting that there seems to be conviction about the different viewpoints, and yet people can't yet convince others of their convictions – there is work to be done. I like this combination of provoking difference of opinion, finding conviction and it being expected that people justify their views and convince others. This allows me not to involve myself with the maths but step back and allow the conviction and convincing to resolve itself.

## 11.5 Discussion of Case Study

Alistair is initially, story 1, grappling with the issue of setting up a culture in the new environment and feeling uncomfortable because of it not being the same as working with students in his classroom. However, through focusing on the detail of what is done, story 2, another awareness arises, in story 3, that the setting up of the culture has, in fact, now happened. The last paragraph of *Reflections 3* articulates, as basic-level categories, how the culture has emerged: provoking difference of opinion, finding conviction, justifying views and convincing others. These categories are not so different from in the mathematics classroom (comment at start of *Reflections 3*). Given the use of the interviewing protocol, the use of the present tense, "I found something that got people's attention and has got people engaging and wanting to talk", is striking. However, what is different is that what are being looked for are teacher behaviours, not student behaviours, and these felt different in story 1. Alistair felt uncomfortable. In story 2, Alistair felt uncomfortable but was able to act to challenge one teacher and yet support them to develop, and that felt different from the maths classroom because he did not want that teacher to influence others. In the maths classroom, there is less of a sense of one way being better than another. However, this teacher seemed to have conviction about how mathematics ought to be taught, and Alistair did not want them to influence less confident teachers. The teacher's intention was positive, trying to help the other teachers by giving them shortcuts. This was in conflict with setting up the culture of convincing and being

convinced. The use of her strong assertions served to highlight what maths was about in this room. By story 3, a similar behaviour to the maths classroom emerges, with Alistair about to “not involve myself with the maths, but step back and allow the conviction and convincing to resolve itself”.

Another strapline that feels important in this story is “listening and listening for”. In *Reflections 1*, Alistair was planning for opportunities to listen. Listening was important in his own mathematics classroom. He was listening for the question or statement to keep coming back to over an extended period of time, testing out some clues to see if they work to come back to and adjust. The extended period of time was important. However, working on maths for an extended period of time in this group is not particularly relevant. By the end, Alistair was able to let go, asking open questions but not being interested in listening to the answers; he was listening for something else. These teachers are working on maths with Alistair, and that can feel the same as his maths classroom, but what is different is that he wants to open up possibilities of what their maths classroom might be like. So, sharing from his classroom is an offer. He does not want them to do what he does but wants them to see alternatives to what they currently do. He does not want them to leave what they did but to see alternatives by looking for what is different.

Findings in studies such as this are not general but are able to be used by others in their work seeking resonance. Alistair talks about his first experience observing Simon, an experienced teacher of teachers, and being struck by their conviction when setting up the culture for the course. The importance of such observations, of someone at the same level as you doing the same job, seems to set up possible behaviours when the job starts and you need to act. Alistair uses the challenge of convincing when he was unsure what to do, channelling his observation. This finding is reminiscent of Winter’s (1996) finding that, with expert teachers on a course where there were a range of activities, the most powerful experience for the teachers was being able to go and observe one of their peers on the course teaching mathematics in a different school. We would offer the closeness to the actual doing as one explanation of why this might be so.

Another finding would be the way that, although initially Alistair did not know what to do and the classroom teaching seemed not to be useful, over time, his past experience and doings seem to be adapted to the new situation. The change or learning is not like putting on a new suit of clothes but is more expanding the range of possible actions.

## 11.6 Multiple Perspectives

After Alistair had identified straplines from the transcripts that were important to him, we invited Toby and Tracy, two other MTEs, to offer stories or writings about similarities with or differences from their own experiences for any of the straplines they were drawn to. The expectation is that such insights enrich the space of possibilities rather than that there is a search for definitive answers to what changes or

what is gained or lost. Inevitably, the three MTEs work in different contexts, but we have chosen writing related to the two common straplines, “setting up the culture” and “listening for”, seen as important by all, to illustrate similarities and differences. To begin, setting up the culture was an important strand for all three MTEs. Toby’s and Tracy’s writing, on each strapline, is followed by thoughts about similarities and differences across all the authors’ experiences.

### 11.6.1 *Strapline: Setting Up the Culture*

#### **Writing from Toby and Tracy on setting up the culture**

*Toby:* One of the things that I loved about classroom teaching was having the opportunity to build relationships with students over time. Trust is so important in a teacher-student relationship, and it is far easier to take risks in a classroom when you know that students are prepared to take that risk with you. Even in the cases when the risks didn’t pay off and things don’t go to plan, it was only ever a short amount of time until I would see the class again and be able to rectify any issues. With professional development, however, the vast majority of my work involves only seeing teachers once. When I do work with teachers over a sustained period, most of the contact is through online sessions, so it can be hard to establish a rapport. Whilst I used to always cringe during ice-breaking activities at professional development I attended myself, I now appreciate the value of such measures. Teachers’ time is valuable, so to have a whole day, or even afternoon, of their time is a great responsibility. Although this makes me want to get on with the content of my session right away, I know from teaching that people learn best when they feel secure and comfortable, so I have developed an appreciation for building this aspect into my work.

*Tracy:* I feel compelled to write about an experience of working with a class of 10–11-year-old students as part of a “transition day” from their primary school (5–10-year-olds) to secondary school (11–18-year-olds). The day would always include a mathematics lesson, and the reason this particular experience came to mind was, in rereading the strapline “setting up the culture”, it felt like this began before first lessons at the start of the new school, in this initial experience of secondary school mathematics.

The lesson began with the following displayed on the board:  $1 + 2 \times 3 + 4$ . There would then be an invitation to comment on the calculation or offer an answer. This invitation would usually generate the following list of possible solutions to the calculation – 13, 21, 11 – and possibly a few other different answers. Students were invited to discuss how they came to the different answers, resulting in some comments about the use of brackets, the order of doing things, where to begin and where to end and so on.

My purpose (linked to setting up a culture) was to comment *about* the students’ comments. For example, following a set of comments from the group along the lines of “We need to multiply first” or “You start from the left and work across”, I would comment along the lines of, “Mathematicians need some conventions in order to be

clear when they are communicating mathematically”, which might be followed up with, “So, in order for us to communicate with one another mathematically we will need to agree on our own conventions”. There is then time for discussion and agreement on the conventions we will be adopting for the next challenge, which is to find all of the numbers from 1 to 25 using values 1, 2, 3 and 4 along with the four basic operations: addition, subtraction, multiplication and division. All four values must be used and only once.

The class work on the challenge. They are given a board pen to write the calculation on a common board that is already set up with space next to the numbers 1–25. There is an opportunity to disagree publicly with any of the calculations on the board, and alternatives are written down. I am spending my time pointing out any differences that appear within a student’s workings and prompting them to work on why it is different, encouraging conversations between those for whom the answers belong. If a student utters that one of the answers is impossible, I share this with the rest of the class, framed as a “conjecture” and written up for the class to see. A challenge to the students is to try and disprove the conjecture by counterexample or to try and convince if in agreement.

To offer a parallel, as a mathematics teacher educator working with prospective teachers of mathematics, there is the interview that happens before the chosen group of prospective teachers meets at the university. This is the setting where we first meet the prospective teachers so establishing a culture starts here. What follows is a piece from a diary entry I made on interviewing, written about 4 months into my new role as an MTE at the university. During the interview, the candidates work on a problem together.

Interviewing is something I have done a reasonable amount of since starting here in February. We are still recruiting for September. I am conscious of the fact that there has been a strong philosophy and approach to the teaching on the course and this begins with the interview. I reflect constantly, alone and with my colleagues. What are the rules?

During the interview, I take notes. I try to listen to what is said and capture that on my page. I find this difficult as I can’t write quickly enough and my urge is to watch the body language in this performance. I think I will miss out if I don’t watch, but notes are what we do. I become aware that I am not sure when it is OK to intervene in the group interview so I pay attention to my colleague who I am a little surprised by when he intervenes early on, not just once but a few times. I then feel like I can do the same. I say, “Try and focus on what the triangular number represents”. I am a little frustrated with the progress on the problem. On reflection, I have felt like this before – that sense of not knowing when to intervene and when to just let things take their course. What is the purpose of the group activity? To watch how participants behave in a group? To make sure they can do some maths? To find out if they can communicate? To see how they reflect afterwards? If this is the purpose, why intervene at all? Because otherwise, I guess, we might be there for a long time.

In terms of establishing the culture, the interview is a time where we talk about models of good mathematics teaching, in that there isn’t just one model. The course supports teachers in finding their own model. This not knowing how to act has been something I have become acutely aware of in the moment and has been the source of much deliberation within myself. It arouses a feeling of discomfort when it happens and prompts me to mark it as something to return to later on.

### ***11.6.2 Thoughts on Similarities and Differences for Setting Up the Culture***

Given that Toby and Tracy had been offered the straplines only, not the stories from Alistair's transcripts to write into, it was striking that having the time in classroom teaching to build relationships and culture was valued by all three MTEs. In moving from having professional development done to him to being the MTE, Toby has more conviction now in ice-breaking activities. Some changes in behaviour come out of personal histories, but the awareness of a range of experiences with ice-breaking activities seems important when offering one to teachers you are working with. Tracy's stories focus attention on how ways of working are set up before first lessons on a course or in school. Laurinda is reminded of the importance she attributed when she taught in a secondary school to the induction course, after the end of terminal examinations at 16 years, for students who wanted to enter the sixth form to take mathematics. Metacomments support the setting up of a culture in a classroom, such as, "Mathematicians need some conventions in order to be clear when they are communicating mathematically". In research carried out in Alf Coles's classroom, Laurinda observed that such comments were frequent at the start of the year but, over time, became fewer because the children knew what to do in their mathematics lessons, living "getting organised" or "generating conjectures" in what they did.

### ***11.6.3 Strapline: Listening and Listening for***

Another crucial basic-level category for Alistair is related to listening. This was also picked up by both Toby and Tracy in their responses. Tracy had already mentioned listening in her writing about interviews.

#### **Writing from Toby and Tracy on listening and listening for**

*Toby:* One issue I have faced is having to compromise between what I want to deliver in a professional development setting and what the teachers I am working with are looking for. Unlike most students, teachers have *chosen* to attend professional development sessions. Whilst self-selective participation has its benefits in terms of engagement, it also has the challenge of expectations being that much higher. I am naturally keen to explore pedagogy and encourage discussion about different ways teachers can approach new ideas with students. However, many of the courses I tutor on are designed to help teachers to understand the mathematical content. I therefore often find that they come on courses "wanting to get the knowledge" and see pedagogical discussion as a waste of time because they "already know *how* to teach". I can appreciate where they are coming from – they want to get the maximum learning from their professional development. However, I am conscious that they will be going back to work with students, and therefore whilst good



subject knowledge is vital, so too is good subject *teaching* knowledge. The distinction seems to be most stark with different levels of teacher experience. I ran a professional development session on using games to enhance geometric skills such as transformations and finding bearings. The group of teachers were many in their first few years of teaching. They were open to reflecting on the approaches and how such activities could enrich student experience. In contrast, I recently worked with a group of experienced teachers on a day focusing on new content in the A level. Once again, we spent some of the time looking at using interactive materials to stimulate student discussion. In the feedback were comments that this part of the day was the least useful, as they were more interested in learning the content rather than exploring ways to approach it with students. I have not yet reconciled how best to compromise here; should I simply give them what they want or continue to try to sneak in pedagogical reflection by the back door?

*Tracy:* As a teacher of mathematics, I was *listening for* certain remarks made by students that might be identified as a mathematical behaviour. There are examples of this in my story from strapline 1, “Mathematicians need some conventions in order to be clear when they are communicating mathematically”. Other examples would include hearing a student say, “It’s going up half a square each time” and responding with, “That is a lovely example of thinking mathematically, mathematicians often look for patterns and generalise”.

As a teacher educator, I began not knowing what I was listening for and what the equivalent of “It’s going up half a square each time” would be. I remember running a session with prospective teachers called *algebra* and beginning with collecting responses from them to completing “Algebra is ...”. Having created a list on the board of their contributions, I was not sure how to respond myself. Some of the responses were closer to something I might say myself than others, and I was conscious of not wanting this to become apparent. I think a response *about* the list might have been around the diversity of responses, same/different, or how rich a set of descriptions we have to work with. Some recognition of the complexity of the question, “What is algebra?”, that invites such diverse responses? I am aware of not knowing how to act sometimes in these sessions because I am searching for the *about*. For any comment or behaviour, how can I respond in a way that is a response about what has been said or done?

One thing I find myself doing, more automatically now, is not directly answering questions from my experience as a teacher (this is all I had to begin with) but using stories from my experience as a teacher educator of other schools, teachers, prospective teachers and so on, for example, in a session about jobs, being asked what I thought about being on interview and trying to negotiate more pay. Instead of responding to this question with my previously held head-of-maths hat on, I relayed two stories from prospective teachers in previous years. The two stories demonstrated the complexities of the issue, both stories conveying completely different outcomes. There was a sense that this was far more powerful than me just talking from my own experience.

### ***11.6.4 Thoughts on Similarities and Differences for Listening and Listening for***

Metacommenting is clear in Tracy's mathematics classroom, and she was listening for what to comment on. There is not a particular trigger that generates a particular metacomment, but there are behaviours that Tracy recognises as supporting the doing of mathematics in her classroom and she is listening for them. For all three MTEs, in the new situation, they do not know what to listen for as they start their new posts. Toby is hearing resistance to working on pedagogical issues and so does not know what to do or say in response. Alistair channels Simon in asking for justifications on his journey to feeling comfortable letting go and listening to his teacher group convincing and being convinced. Tracy collects responses from a group of prospective teachers to "What is algebra?" but then what? She reacts internally to what she would or would not have said, but this does not feel like a response. In a classroom, listening to a group of children working leads, for all three MTEs, to actions that are implicit. They have things to offer that come out of their past experiences and conviction in what they think mathematics teaching is. The awareness that listening to teachers is different brings the question, "What am I listening for?" Tracy's final story, as the most experienced of the three, reminds us that, with experience, it is possible to respond from that experience. So, although initially all she had to go on was her experience as a teacher, now she can respond with the lived experiences of other prospective teachers.

## **11.7 Final Discussion**

Deliberate analysis allows us to work with each other in international groups and for novices to develop into their new roles becoming experts. Many years ago, Laurinda travelled to a seminar being given by a mathematics education researcher from the USA whose work she read and appropriated. For the first time, she was able to watch a video of the classrooms being described. She was in shock. When it was time for questions, she raised her hand and said, "Is that what you mean by discussion?" From her current enactivist perspective, this is a good example of how we bring forth our world. When she read the papers of this research group, she saw classrooms where discussions looked different to those on the video. We do not believe that it is wrong that this happens, just that we need to talk and write in the detail of our practice linked to the labels that we use so that we can explore such differences. We have tried to show ways how this works in detail in this paper.

In moving to be an MTE, a common theme was related to what role the doing of the mathematics has compared to being in the classroom. Both Tracy and Alistair are articulate about their practice as mathematics teachers; however, in moving to work with teachers both practising and prospective, there was a process of letting go of one image of mathematics teaching to support the people they are working with

to extend their own images of teaching the subject. What they are listening for is different. In the case of moving to work with groups of teachers, the teaching of the mathematics in Alistair's case remains about convincing, but in Tracy's case, working with prospective teachers, she seems to have let go of the mathematics. More work needs to be done on case studies to begin to have some suggestions of differences between the role of working with practising teachers and working with prospective teachers. However, in both cases, there seem to be extra layers involved in being an MTE. As a teacher of mathematics, the children do the mathematics. You let go of that but support them in doing mathematics through metacommenting. What happens as a teacher of teachers of mathematics? The teachers and prospective teachers are now doing the teaching and you are doing something else. What are the equivalents to metacomments as an MTE? Tracy's story gives one suggestion, that she is now letting go of her own experience of teaching mathematics to be able to make comments about learning as a prospective teacher through the experiences of previous prospective teachers on the course. As an MTE you want the teachers and prospective teachers to extend their basic-level categories or teaching purposes. As a new MTE there are only your experiences in schools teaching mathematics to work with. Opportunities for the prospective teachers and teachers to be able to observe teaching of mathematics and talk about what they see in detail to identify issues seem an important part of the journey.

We have identified "setting up the culture" and "listening and listening for" as important aspects of mapping the territory and have a tool, second-person interviewing, that, from an enactivist perspective, supports first-person accounts to identify straplines or basic-level categories. The use of straplines by themselves, in this case by e-mail to other MTEs, seems useful when seeking resonance by triggering accounts or stories of experience without the need for more interview data.

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