What follows are Emily’s weekly notes made during her first half-term of secondary teacher training – a diary of thoughts and observations about the course and her time in school. In the next issue of MT, we will publish her second half-term of notes.

**Week 1**

The end of week one – I feel scared and excited in equal measure. The past week has been overwhelming; an overload of people, places and information. One moment I want to jump straight in and the next I want to run away.

University session on the key aspects of mathematics: Hadn’t really thought about this fundamental question until now, but how can I teach something unless I have a belief about what it is and what its purpose is? My group concluded that the key aspects were problem solving, logic, real world applications and general ‘numeracy’ skills. But what about maths as a totally abstract system created in the minds of mathematicians and built up from axioms? Does maths exist without humans? Is it a natural part of our world? Very different ideas which we didn’t discuss much, but are still squirming in the corner of my mind.

Ways of thinking – started doing some reading for the course. Realised that I don’t like having to think (or at least one aspect of thinking, I’m fine with mathematical thinking)! Open-ended questions, where opinions are involved and there is no way to work through logical steps to get a correct answer, scare me. Maybe some of my pupils will be scared of maths in a similar way.

**Week 2 – the first week in school**

I discussed the point of maths with three high achieving, Y11 boys. They think pupils are interested in real life applications. I wanted to explore the idea that lots of maths is not obviously directly applicable. Could they appreciate the idea of maths for its intrinsic beauty? I don’t think they had a clue what I was talking about.

What does it mean to be good at maths? A Y9 opinion: “I’m better at maths than you, I can do more in my head”. Pupils have ideas about what being ‘good at maths’ means, this will probably affect their confidence, performance in, and like of, the subject. What sort of ideas are going to aid learning? What do I think and what do I want my pupils to think?

Discussion about maths GCSE policy at my school: 40% of pupils do foundation maths (and can only get a D or below) and this is decided at the start of Y10 – this really bothers me. How can you teach a class of kids for an exam, which is in effect, meaningless? Should the exam be made easier? Should teachers just ignore the GCSE syllabus and instead concentrate on teaching useful life-maths skills? Alternatively, at this late stage, should the aim be to get these pupils interested and confident in their ability to do some sort of maths?

Discussion about our responsibilities next term: I’m going to have proper classes and be a proper teacher! Obviously I have known this for a while but it’s only just sinking in, I still find it a strange idea. Very excited, but very scared.

**Week 3**

My first teaching task – the first time I have stood up in front of a class of pupils; I was shaking all over! A little bit disappointed that the banging on the glass followed by meaningful eye contact approach to shutting them up didn’t work, but couldn’t believe it when I raised my voice and managed to get their attention and then got them working on the sheet in silence. Unfortunately they didn’t stay quiet for long and I found myself using real teacher phrases – ‘As far as I’m aware there is no need for you to talk’ and ‘Please can we respect those who are still working and stay quiet’ – I don’t know where they came from, they just popped out, oh my
When I tried practising this in the pub with friends, as one teacher had suggested, I got very strange looks.

God, I am such a teacher!

Amusing anecdote:
“Miss, how old are you?” (the question I’ve been expecting and dreading).
“Teacher age” (quite a clever response, I thought).
“So, like, you’re 18 then?”
“Actually I’m 22.”
“My brother’s 22. Miss, do you want to go out with my brother?”

Observation topic for the week, classroom management: teachers have a magic ability to continue explanations/instructions/one-on-one or group work without being distracted at the same time as issuing management statements (eg, “Today we’re going to look at ratios; Chris you’re late, sit straight down please; So if you can get out your books; Jess, that includes you; and write the date and the title ratio; meaningful look at Jess; we’ll get started . . .). I need to learn to do this. They can also focus on one pupil and still see what’s going on in the rest of the room. When I tried practising this in the pub with friends, as one teacher had suggested, I got very strange looks. More practice required, obviously.

A troublesome lesson: Y8 were doing congruent triangles for the first time. The teacher wrote on the board ‘2 triangles are congruent if . . . (a diagram and words by each one) SSS (side side side), SAS (side angle side), AAS (angle angle side). Pupils then completed a worksheet where they spotted pairs of congruent triangles from groups of three triangles. My big problems were that the pupils did not have a definition or idea of what congruency means and they had no concept of why the listed properties ensured congruence. The pupils also had no concept of what they were doing or what it meant, they just checked which properties of the list they held and wrote that down – did they really learn anything? I wanted to give them bits of paper, rulers, protractors and scissors and get them constructing triangles and investigating. It probably wouldn’t be that easy though – when I asked one of the pupils if she could see that two triangles with the same length sides but reflected, were congruent (the same) and asked her to imagine cutting them out and laying them on top of each other she just responded ‘but why, it’s just SSS, that’s all’.

**Week 4 – the week I dislocated my elbow**

Use of the word ‘obviously’: During a university session on geometry somebody said “It’s obvious that . . .”. From the looks on our faces (or certainly mine) our tutor realised that maybe this fact was not obvious and pressed for further explanation, before making the pedagogic point that we must be aware that what is obvious for us may not be obvious for our pupils. Was very pleased that we discussed this, as my pet hate is teachers/lecturers using the words obviously, trivially and clearly. This stems from a particularly difficult university lecture in which my friend and I became so irritated by the lack of explanation of these so-called obvious facts that we spent most of the lecture counting the occurrence of these three words in our printed lecture notes. We found about fifty uses in a one-hour lecture! I never want my pupils to feel how I felt in that lecture. If anybody hears me using such phrases in a lesson (which, upsetting though it is to admit, I probably will) please, please be very nasty to me.

The disastrous protractor lesson: Arrived to lesson ready to do an observation and found a cover teacher. She was about to give out instructions for a textbook exercise about measuring angles using protractors, the first time the class had covered this. Rather over eagerly, I offered to start the lesson with an explanation and some recap of the previous work on acute, right and obtuse angles. I gave what I thought was a fairly good starter; a bit of group questioning about the previous work, a little bit of class management to get them listening to each other, some clear examples of different angles were put on the board, great visual aid from huge wooden protractor which I asked the pupils to show me what to do with . . . and off they went with their work. Then it all went wrong. Firstly, just because one pupil can show you what to do doesn’t mean the rest of the class have a clue. Secondly, using a protractor is very complicated. Thinking about the common misconceptions (even in the one second I had to prepare) would definitely have helped. Pupils didn’t have a clue what they were measuring, where they were measuring from, which scale on the protractor they were using and why, and didn’t seem bothered that they were measuring obviously acute angles (which yesterday they had recognised perfectly) as much greater than 90°. Not such a great starter then! As the teacher put it in her cover report, they’ll definitely need another lesson on that.

Theory into practice: was very pleased to be able to use some theory in school as I had been feeling that the two sides of the course were fairly disconnected. I’d read about ‘cognitive conflict’ where you question pupils leading them to a contradiction. Their resolution of this conflict will hopefully enable them to understand the correct point. This worked very effectively in the protractor
lesson mentioned above when pupils were incorrectly measuring acute angles as greater than 90° (or vice versa):

Teacher: Is this angle acute or obtuse?
Pupil: Obtuse
Teacher: Why?
Pupil: Because I measured it and it’s bigger than 90
Teacher: Could you use another method to tell me if it’s acute or obtuse?
Pupil: Hmmmm
Teacher: Think about yesterday
Pupil: Hmmmm
Teacher: Let’s just look at the angle and ignore the protractor
Pupil: Hmmmm
(Eventually after a lot of prodding we get there — the introduction of a new idea seems to entirely have wiped out the old ones!)
Pupil: It’s acute
Teacher: Great, so does that mean it’s less or more than 90°?
Pupil: Less
Teacher: True, and you’ve measured it as 140°, which is . . . (pause, meaningful look)
Pupil: Bigger
Teacher: So . . . ?
Pupil: I’ve measured it wrong haven’t I?

We looked at and measured it again together using the protractor and then I suggested that she thought about her other measurements in the same way. Cognitive conflict in action.

Note to self — don’t pick on one child just because they are the only pupil whose name you know. Yes, management, questioning and praise are much more effective when you know a name, but it isn’t fair on the pupil.

Note to self — do not become distracted by other conversations when walking round the classroom to work with pupils; they’re probably not really interested in why you like maths and aren’t going to suddenly be persuaded that it isn’t ‘boring, dull, difficult, irrelevant’, they’re just looking for a legitimate excuse not to work!

Dislocated my elbow trampolining — in between yelling for drugs I remember screaming out that this couldn’t happen to me because I had to teach a lesson the next morning and they had to make everything normal again because I was a teacher and had to be able to write on the board! A later thought when I looked down at the rather unnatural angle my elbow joint was now making was that I could do a starter for an angle topic based on my x-ray pictures. The course is taking over my life! Also, more seriously, I am quite scared about coping with the rest of the term with my right arm out of action. Enthusiastic people keep getting excited about all these opportunities for alternative lesson ideas but quite frankly the prospect of teaching was daunting enough when I had full use of all my body parts let alone without the use of one of the more vital bits.

Student attitudes: Read a discussion about making pupils believe that maths ability is not fixed but incremental and can vary across topics. Exactly the point I have been trying to get across in the numerous conversations I have had with pupils who tell me that they ‘can’t do maths’. I’m always amused by the pupils who put up their hands before even attempting to look at the work to tell you ‘I don’t understand it ’cos I never get any maths stuff’. Except it isn’t funny; it’s a huge attitude problem, which maths teachers need to address.

Week 5

Are fractions numbers? “But 4/5 isn’t a number”, a Y10 pupil commented. An understandable misconception, if you have been taught about numbers and are then introduced to fractions.

The zone: Big discussion with my mentor about planning lessons to work in the learners’ ‘zone of proximal development’. Want to giggle as we talk about ‘entering the zone’; it just sounds so much like we’re talking about some sort of drugs high and quoting words from a rap song! Seriously though, it’s inspiring to hear a teacher actually refer their work to a piece of theory.

My first lesson. Felt awful at the end of the lesson because although it was OK, I know it could have been so much better and there were so many things I did wrong. I know it’s good to learn from mistakes but it doesn’t seem fair that the pupils are my guinea pigs.
Pupils assume things, beware: When lots of examples are done on the board and they each have a common feature (eg, multiplying mixed numbers by proper fractions with the answer always greater than 1) pupils will generalise and assume this feature is always true. This may cause problems later in their understanding of the topic (eg, they may think they are wrong when they correctly do a sum with a proper fraction answer). I have seen this occur in a variety of lessons and topics. I guess the important thing is to remember to include a variety of examples.
Pupils need links made explicitly: I feel that many of the pupils think that maths involves a huge set of disjointed topics and exercises and they only need to think about one idea at a time. In a Y7
I feel that many of the pupils think that maths involves a huge set of disjointed topics and exercises and they only need to think about one idea at a time.

A lesson on co-ordinates and drawing line graphs from equations, pupils who could plot co-ordinate pairs at the start of the lesson were unable, at the end of the lesson, to label the co-ordinates of points on the graphs they had drawn. It was as if a door had shut on the co-ordinate activity when they started the graph activity. As teachers we must work towards helping pupils see maths as a big hall with lots of open rooms off it, rather than a corridor with locked doors opened one at a time.

Pupils will try and produce what they think is required even if they are doing things another way: I was amused by the pupils in the lesson above who were drawing their lines from two points and then adding on all the other points afterwards. Although this caused me to smile inwardly, I was a little disappointed that these pupils had discovered the key fact that two points fix a straight line but didn’t realise this and instead thought it was necessary to add on the other points.

An introduction to algebra, using the dislocated elbow: Without even thinking I introduced a Y7 class to the idea of using letters to represent variables, simply because ‘I can’t write whole words on the board with my left hand so I’ll have to use letters instead.’ I then continued to write formulæ with these variables. I’m not sure that the learning benefits were worth the pain of the dislocation; maybe next time I’ll just tell them ‘I’m too lazy to write whole words’.

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