# In the Serpent's Den: Contrasting Scripts relating to Fear of Mathematics

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*The author reports on data taken from a single case study of a mathsphobic student teacher engaging with a Mathematics content and method course as part of her pre-service course in primary teaching. Sample comments are given from the journals of both student and lecturer as the course progresses. The interpretation of this data is then explored from a variety of perspectives in order to begin to untangle the complex web of factors, which interact with each other in this topic.*

## INTRODUCTION

> For twelve years I watched it writhe upon my page; fearful of its poison – that feeling of hopelessness, which it can so easily induce.
>
> *'Maths is everything'* *'Without Maths you are nothing"*
>
> I passed. Every year I passed. At the end of school I derived much pleasure from the belief that I would never again have to bow down to Maths – the conqueror serpent. My delusion has since been shattered. I must now face Maths again. (Pegg 2001)

The above quotation comes from the journal of a student taking the one year pre-service Post-graduate Certificate in Education (PGCE) (Primary) at the University of Cape Town. Attaining this Certificate allows students to become a generalist teacher in South African primary schools. This means that one of the compulsory courses, which all students have to take, is a year's module on the Content and Method of Primary Mathematics. In a previous PME report (Breen 2000), I explored the occurrence of strong emotions of fear and anxiety towards mathematics experienced by these mature students. Later work (Breen 2001) has seen the development of a curriculum for the first semester of this course which attempts to address the mathematics anxiety found in the class and draws strongly from an enactivist approach to cognition (Davis 1996; Varela, Thompson and Rosch 1991). Carroll (1994) explores the occurrence of mathsphobia in a similar group of students training to become teachers. Her case study follows the earlier work of Buxton (1981) and Frankenstein (1989) in attempting to understand how mathematical achievement can became blocked by emotional and sociological factors.

## THIS STUDY

As suggested by the quotation at the start of this report, there are students in the above PGCE class each year that, right from the start, exhibit signs of a powerfully negative relationship with mathematics. Since it would be unethical to simply ignore and then just fail such students without engaging with them, this research report will focus on one such mathsphobic student, Marissa, who was registered in the same year as the author of the original 'serpent' quote.

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The Content and Method of Mathematics module is structured in such a way that I teach the first semester's work by means of a double lecture (90 minutes) twice a week for 12 weeks. Data for this case study was obtained from the journal that the student kept for the class as well as from her end of year Research Essay and Teaching Practice journals. Further data was obtained from recorded interview material of our end-of-year revision sessions and my own teaching journal for the class.

The data will be presented in the form of a time line of extracts from what I consider to be significant moments or utterances as recorded during the interaction. Then intention of these extracts is not to present the 'truth' of the event (as both lecturer and researcher I believe this would in any case be an impossible task), but rather to present the reader with as rich a picture as possible of an account of Marissa's engagement with the mathematics course and the lecturer.

## THE DATA

### First Term

***Marissa arrives: First session (27 Feb).***

In this first session of the year, each student is asked to come up to the board to write down their hopes and fears for the year. Shortly afterwards, Mr. Smith arrives in an academic gown and gives them a test. He supervises this test in an unpleasant way by shouting at those who make mistakes and putting pressure on the students in various familiar ways.

> I notice a small woman sitting near the front of the class chewing away frantically and blowing gum. She could be trying to draw attention to herself. Is she going to be one of those cocky students who think that they are wasting their time in this class because they can already do the maths? She doesn't say anything but I sense that this is not the case. At the end of the session I test the latter view out by saying to her that it seemed to me that she was chewing her gum furiously to try to ease her tension. She agrees with me. (Chris: Feb 27)

> *When I first realised Maths was inclusive in this course I immediately felt physically ill. I can honestly say I dreaded the first lesson. Maths since school for me has always been a stumbling block. I always felt inferior to those who were able to do it. I (and it is my own insecurity) always felt that people thought less of me that I did not do Maths. (Marissa: Feb 27)*

***Second Session: Matchsticks (2 March).***

In this session the students use matchsticks as a physical bodily activity to make the patterns from which they will generate formulae through visualization. My focus as teacher is to encourage all answers as being different ways of 'seeing' the pattern, and to discourage shouting out and competition as a way of encouraging diversity.

> *Fear and anxiety engulfed my entire body. The prospect of actually doing anything mathematical was beyond my realm of consideration. Even before*

*we began I said to myself I probably won't be able to do it so why bother? These words are remnants of 'my life with Maths' at school – my motto was I can't do it so don't even try! The matchstick exercise forced me to engage with Maths. The first answer I knew I would get wrong and did! So I thought here we go again – the idiot of the class. But when I did eventually work out one of the patterns I began to physically relax my tense body and mentally relax my mind. Chris, you seriously make me feel at ease, I am not saying this to 'score points' but I feel almost "safe" with you in the class. It is though you act as a 'buffer zone' between me and the rest of the class – who I feel are too confident in their ability in Maths. (Marissa: 2 March).*

***Fifth Session: Painted Cubes (9 March)***

The students have been working on getting formula for generalizing patterns for 6 hours by now, so I push the pace in this session. They are put into groups and given apparatus and asked to solve a multi-leveled problem.

Marissa comes to me and says that she can't cope with this problem and starts crying. She says she is going to vomit. I say that she can go outside to the toilets and vomit or she can use the bin and stay inside but she is not allowed to use the vomiting as an excuse to stop doing the maths. My recollection is that she left the room and then came back in. I suggested that she might like to work on her own and she could then ask me questions. (Chris: 9 March)

*Well the 'after shock' of Fridays lesson did not go away that easily. I hated myself for allowing myself to be so vulnerable and immature firstly in front of the class and because I could not do the work! From the moment you put the blocks in front of me I could immediately feel the anxiety building up. As I told you I really did feel physically sick to the point where I felt as if I could not breathe. You knew I wanted to give up and bolt from the class, I wished I could! To make matters worse I felt the pressure of everyone around me, their confidence to tackle the problem made me feel unworthy and stupid. Although I still felt uneasy when I went to sit by myself I really did try to calm down but as soon as I got stuck, panic seized up again…Chris, I seriously want to thank you from the bottom of my heart for your help and encouragement on Friday! It really helped me to know that you were on my side. (Marissa: 9 March)*

**April Teaching Practice (TP1).**

At the start of the second term, students are placed in schools for a five-week period to teach and have their teaching assessed.

*Today I had the opportunity to participate in a double Maths lesson, which I ran by myself with a little assistance from the teacher whom I had asked to be present. At this point I have to explain what an "achievement" this was for me even to enter a Maths class let along as a teacher! It was ironic*

*because the class was busy with equivalent fractions and before T.P.1, we were busy with equivalent fractions in our Maths method class. Therefore I used the same idea that was used for our lesson. The idea proved to be successful and I think the learners really enjoyed working from practical experience. I would see and relate to how their faces lit up when they got the answer right.* *(Marissa: April TP Journal)*

***The Mock Test. 25th May***

At the start of the term I give the class a content test, which covers the topics of basic operations, fractions, ratio and proportion and percentages, which will be covered in the second term. My aim is to check the level of the class, but also as a way of identifying concepts that need to be addressed in the sessions.

> Marissa left the room early in tears and stayed in the ladies toilet for a long time. I asked one of my female colleagues (J) to go in and talk to her. Marissa ended up spending a lot of time in J's room. J later told me that M's maths thing is serving as a "handle" to hold a lot of fears about the whole year in place. (Chris: 25 May)

Marissa gets the fewest sums correct in the whole class. She omits all questions containing division and fractions. She failed to attempt an answer to the questions: 4,9 ÷ 0,007 and 63000 ÷ 210.

***Content sessions during the rest of the second term.***

*Every Maths lesson comes with its new challenges for me, with regard to today's lesson I was obviously quite tense, knowing the outcome of my disastrous mock test and that I basically had to 'relearn' many concepts. I felt overwhelmed at this challenge.* *(Marissa: 30 May)*

*I still felt a bit 'edgy' with grasping the concepts due to the fact that basically this was 'new' to me. I felt that everyone else in the class 'clicked' on instantly while sometimes I didn't.* *(Marissa: 1 June)*

*Today I must admit was on the one hand relief, to be finished with all the content, but on the other hand, knowing that I still have to write the test…I really will try my best Chris.* *(Marissa: 13 June)*

***The first test proper. 20th June.***

Marissa completed the basic arithmetic content test without having to leave the room early and gets a total of 25 marks out of 75. She was able to answer the question 19440 ÷ 72 correctly, but attempted to answer the question 0,95885 ÷ 0,0245 by placing the two numbers in columns and then going no further.

***Revision Sessions (25 Oct – 13 Nov):***

In the lead up to the final test at the end of the year, Marissa asked if I would help her with her revision. I agreed on condition that I could tape these sessions and also that I could interview her about some aspects of the year as well as her past experiences

with mathematics. The following extracts are taken from the last session before the final test where we are going over a problem she is tackling on division:

**Extract One:**

**C:** 6 divided by 3 goes like that, which number is first
**M:** this one – the 6
**C:** where does it go?
**M:** inside, that's what I thought
**C:** write it out in full, okay and outside – okay, so there we can do it, that's how it goes, because you go 6 divided 3, you can write that one down, that's the first step, not that, you couldn't do it here

**Extract Two:**

**M:** I know but I'm saying: Do I do this into this whole number or into that first?
**C:** Ja, just long division
**M:** 165 into 429 – it won't even go!
**C:** Would you just do it please? You get sulky and grumpy, that's what you do, and then you suddenly lose it. Just hang on, just hang on. Here this is a whole lot of rubbish because you didn't go for that as I told you.

***The final test: 14th November***

Marissa comes to my room to write the compulsory test. She is the only student in the class who has not obtained the sub minimum requirement for this topic. She correctly answers the first division problem of 42,90 ÷ 16,5 and manages the decimal comma for the first time in a test. For the second problem, 0,6 ÷ 0,0012 she gets the divisor the correct way around and has written 6 ÷ 2 in the margin (see above extract from interview). However, she reaches an incorrect answer of 0,05.

> *I would've given up, I really would have, I would've left it blank, if you weren't here, I would've gone, stuff this, big deal, can't do it, move on, and left it out probably. I am actually pleased that I've done it, I really am because I mean I can do it, you've just shown me that I can do it, but it has been tough mentally.* *(Marissa: post-test interview)*

## INTERPRETING THE ACCOUNT

Lather (1991, 91) identifies an epistemological shift in research methodology away from an emphasis on general theorizing to problems of interpretation and description. She argues that description/interpretation inevitably involves bringing to the fore one's own perspectivity, which presents a challenge to conventional views of objectivity. It has already been accepted that, since only a portion of the data has been selected for presentation here, this must already represent a subjective choice. But what of the analysis of the account which has been presented?

***Marissa's script as to what happened.***

I felt that I was incapable of learning any Maths concepts and my expectation of failure induced the behaviour that increased the likelihood of that outcome. I believe my failure in Maths was as a direct result of my negative self-expectancy (Research Essay). I think it all started in Form 4 when I couldn't understand a thing about

division (13 November interview). Indirectly my negative attitude towards Maths can be attributed to the fact that both my parents also believed that they weren't good at Maths and would often comment that "our family is just not good at Maths (Research Essay). This self-fulfilling prophecy was the legacy I brought with me into my Maths method course this year (Research Essay)

It helped such a lot this year to have a teacher who believed in me and that I could do the mathematics. I liked the way he asked us to visualize things with apparatus. Talking it through with him always helps as he has a calming effect on me (13 November interview). You can see that it worked because my marks improved so much during the year. I almost completely conquered my difficulties with division.

Chris asked us to keep a journal to record what we felt like after each lesson, I found this to be therapeutic in that it was the first time in my life that I was able to express my total anxiety with regards to Maths and to know that someone cared whether I passed or failed (Research Essay October 2001). The experience on teaching practice was the most significant event. I do not think anyone can realise what a personal triumph this was for me. I cannot believe that I did not panic or end up crying in the lesson. Although my anxiety towards Maths still exists I REALISED THAT I CAN DO IT! I felt as though years of suppressed anxiety had literally been lifted off my shoulders (Research Essay).

***Chris's script: Version 1***

It seems that I'm really getting somewhere with this course on two levels. In the first instance, the focus on enactive principles has allowed Marissa to voice her feelings in a reasonably 'safe' environment. She has been forced to stand back a bit from the events of the day in the class by the set task of keeping a reflective journal which forms part of the assessment portfolio. This work is really important and it showed when she plucked up the courage to teach maths on TP and it worked for her! It also proved to be important to be strict with her at times as shown, for example, in the incident where she wanted to revert to her school strategy of leaving the room for the rest of the class with a headache. Even in the final revision session, being firm with her allowed her to bring the taught example of using $6 \div 3$ as a reference point for understanding how to order the numbers in a division sum. The gradual improvement in her ability to tackle division problems during the year was also encouraging, especially as this was the very same topic that had started off her whole path of negativity towards mathematics. Marissa also showed me the important lesson of always believing in a student no matter how much they might challenge you.

**WAIT A MINUTE…**

The above interpretations mirror claims from a research report on an intervention programme with a similar aim in which there were resulting 'genuine and sincere affective changes' (Grootenboer 2003, 419). However research such as that by Evans (2000) and Blanchard-Laville (1992) provide an opening for an alternative and less comfortable interpretation of events, which might read as follows.

***Chris's script: Version 2.***
Over the years I have developed a strategy to get students who struggle with maths to talk to me. It's based on the good cop, bad cop routine. In the very first session I introduce them to a nightmare teacher called Mr. Smith who draws out memories of bad times in their school maths classrooms. At the end of the role-play I remove the symbol for my transformation to Mr. Smith (an academic gown), and return to the class as the good guy, Chris. The acceptance of feelings and the use of apparatus and visualization as ways of getting into the mathematics, helps distance both my class and me from Mr. Smith and his world. It also promises the students the possibility of a different mathematics experience.

Marissa's mathsphobia basically stems from a mathematics script written many years ago. In fact, it is probable that most of it was written in her very early years before she encountered school mathematics. This powerful condensation of mathematics is considered by many to be a common heritage for all students (Tahta 2002).

In this particular class, I am both a teacher and a teacher educator, but not a psychologist so I cannot engage with this early script. My task then is to play along with the idea that this fear has everything to do with mathematics. I tackle this problem with mathematics as a short term problem needing patching up as quickly as possible. However, I also aim to leave open the possibility for Marissa to choose to work on whatever else comes up - in her own way. In Marissa's case my strategy of positioning myself as a good guy works and she comes to view me as someone who at last has belief in her. I listen to and read about our interactions in class and in her journal writings. I try to pick up her cues as to when to be firm and when to give her space. Even on the day before the final test she still does not understand division, so I am forced to take her on one of those meaningless step-by-step routines where she ends up with correct answer because I have been firm and she has been anxious to please. Fortunately, this lesson stayed with her (almost) for 24 hours as is shown by the improvement in her performance in division problems. However I choose not to dwell on the fact that she is unlikely to still be able to do the problem next week.

Cabral and Baldino (2002) discuss the concept of pedagogical transfer where positive transfer is identified with love. However, they warn that this 'love is to be distrusted, since the student is only seeking the way to produce the right answer, so that …(s)he will be recognized as one who knows'. Marissa ends the examination session by checking whether I will be in my office the next day, as she wants to bring me a gift of appreciation. I'm relieved at the end of the year that it has all worked out, even though at times it became increasingly difficult to be supportive. She has had a good teaching practice experience and she has improved from a mark of around 10% to one of about 60%, and has passed the year. However, a year later, she has still not arrived with the present! Is this proof that the love is to be distrusted?

## CONCLUSION

The mathematics anxiety that student teachers bring to their training as primary mathematics teachers is a serious and complex issue with many levels. This report

has attempted to provide a window for the reader to enter into the lived experience of one such student as she engages with a mathematics class which has been specially designed for students with similar difficulties. The provision of an alternative interpretation of the account has attempted to begin to unwrap one additional possible layer of the complexity. Readers are invited to attempt to continue this process by providing their own interpretation of Marissa's story.

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