

# “Better You Than Me”: Mathematics Anxiety and Bibliotherapy in Primary Teacher Professional Learning.

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Bibliotherapy as an approach to eliciting and understanding the affective responses of primary school teachers is investigated in this paper. In this pilot study, the author explores bibliotherapy as a reflective tool in teacher professional learning, by analysing affective responses of primary teachers. Year 6 teachers voluntarily wrote responses to readings about school students' learning, discussed their understanding of their own experiences in the light of the readings and gained some insights into the factors which impacted on them as learners and teachers of mathematics.

## Introduction

Bibliotherapy is a technique taken from psychology and library science. It uses guided reading and discussion to encourage individuals to overcome negative emotions related to their real-life problems. Bibliotherapy has been used in preparing pre-service teachers to teach students with emotional and behavioural disorders (Marlowe and Maycock, 2000), and students with special needs (Morawski, 1997) by encouraging pre-service teachers to identify with the teachers in the readings. Bibliotherapy has also been used to help secondary students overcome mathematics anxiety (Furner & Duffy, 2002, Hebert & Furner, 1997).

Previous research with pre-service teachers (Wilson & Thornton, 2006,2008; Wilson, 2007) suggested bibliotherapy as a promising new tool for eliciting and understanding pre-service teachers' affective responses and providing a framework and language for educators to understand and communicate about the reflective process. In that research, pre-service teachers reflected on their perception of themselves as learners of mathematics, identifying with students in case studies and re-evaluating their own experiences, developing a more positive self-image as learners of mathematics and gaining insight into how children's anxiety about mathematics can be minimised (Wilson & Thornton, 2006). These reflections had a dual nature, showing both affective and cognitive elements. These studies suggest that bibliotherapy has potential as a technique to address mathematics anxiety in primary school teachers.

The study extends the conversations about the use of bibliotherapy in mathematics education by exploring its use with primary school teachers. It describes a pilot study of the responses of teachers to the bibliotherapy process in a professional learning context. A smaller selection of the readings from the previous study (Wilson, 2007) was used, and a modified process of writing about a critical incident, followed by reflections on two readings, was followed. This study will be used to inform further research investigating how bibliotherapy might be used in teacher professional learning to allow primary school teachers to examine their attitudes towards themselves as learners and teachers of mathematics.

## Theoretical Framework

The theoretical framework is based on research on three components: bibliotherapy, teachers' beliefs, attitudes and emotions, and mathematics anxiety.

## *Bibliotherapy*

Bibliotherapy can be defined as “the guided reading of written materials in gaining understanding or solving problems relevant to a person’s therapeutic needs” (Riordan & Wilson, 1989, p. 506, quoted in Myracle, 1995). It is a technique which aims to assist individuals to overcome negative emotions related to their real-life problem by guided reading about another person’s problem. The reader identifies with the protagonist in the story, but feels safe because they are not the one experiencing the problem. Readers interpret through the lens of their own experiences. The process of bibliotherapy “requires a meaningful follow-up discussion” (Hebert & Furner, 1997, p. 169). Participants become involved in discussions and follow-up activities such as journal writing (Flores & Brittain, 2003).

Clinical bibliotherapy is a process where a therapist works with individuals with serious emotional or behavioural problems. Developmental bibliotherapy, as in this study, is used to refer to the use of guided reading with students experiencing problems (Hebert & Furner, 1997, p. 170).

The stages of bibliotherapy can be summarised as:

*identification* - the reader identifies with and relates to the protagonist.

*catharsis* - the reader becomes involved and releases pent-up emotions.

*insight* – because the reader has released tension, they are receptive to consider the experiences of others and realise that their problems might also be addressed.

*universalisation* – the recognition that we are not alone in having these problems, we “are in this together” (Slavson, 1950, quoted in Hebert & Furner, 1997, p. 170).

*projection* – the reader can envisage having a different concept of their professional identity. Wilson and Thornton identified this fifth stage in their study of pre-service teachers (2006).

In particular, bibliotherapy provides a way of addressing meta-affect, that is, how the mind handles affect. The concept of meta-affect was first described by DeBellis and Goldin (1997) as a way of understanding people’s awareness of and feelings about their emotional states, and as a way of monitoring and regulating emotion. Goldin (2002) contrasts the young child’s debilitating fear of the dark with the fear experienced on a roller-coaster which, providing the person feels safe, enhances the thrill of the ride. He claims that the different meta-affective states associated with fear arise from different cognitive beliefs and values. DeBellis and Goldin (2006) researched school students’ responses to mathematical problem solving. They suggest (p.137) that

the most important affective goals in mathematics are *not* to eliminate frustration, remove fear and anxiety or make mathematical activity consistently easy and fun. Rather they are to develop meta-affect where the emotional feelings *about* the emotions associated with impasse or difficulty are *productive* of learning and accomplishment.

## *Teachers’ Beliefs, Attitudes and Emotions*

Beliefs have both a cognitive and an affective aspect (Grootenboer, 2006). Borasi (1990, p. 179) emphasised the importance of students identifying their beliefs. Buerk (1982, p.19), identified students who believed that “mathematics is only a collection of correct answers and proper methods”, and whose views about mathematics knowledge conflicted with their general view of knowledge, and suggested that identifying and overcoming the disparity may address their negative feelings about mathematics.

The impact of teachers' beliefs about mathematics can be far-reaching. Thomson's (1992) review into affective elements of mathematics education concluded that teachers' beliefs limit their openness to change. A significant number of primary school teachers identified their school experiences as a factor in their beliefs about mathematics (Carroll, 2005). Askew, Brown, Rhodes, Johnson & Wiliam (1997) found evidence that teachers' perceptions of mathematics and how it is learned were more important in promoting positive outcomes for students than different teaching methods or ways of organising classrooms. The growth of teachers as reflective practitioners, able to examine their beliefs about mathematics, and themselves as teachers and learners of mathematics is an important aspect of their professional development.

Flores & Brittain (2003, p. 112) describe the use of writing "as a tool to help pre-service teachers reflect on their growth as they learn to teach mathematics". Ambrose (2004) states that reflection alone may not change pre-service teachers' belief systems and describes mechanisms which have potential for changing beliefs: providing emotion-packed, vivid experiences, becoming immersed in a community, reflecting on beliefs and developing attitudes which help connect beliefs. Taken together, these studies provide a case for focusing on teachers' perceptions of their own mathematics learning as an important strategy in addressing their attitudes towards teaching mathematics.

### *Mathematics Anxiety*

Mathematics anxiety has been identified as a learning difficulty for many children (Dossel, 1993). In addition, Hembree (1990) found that the level of mathematics anxiety of pre-service elementary teachers was the highest of any major on university campuses. Trujillo (1999) discussed the roots of mathematics anxiety in American pre-service primary teachers. Similarly, Haylock (2001) presented further evidence that many pre-service primary or early childhood teachers have anxiety about mathematics. Recent studies of pre-service teachers with high levels of mathematics anxiety have shown low confidence levels to teach elementary mathematics (Bursal & Paznokas, 2006) and low mathematics teacher efficacy (Swars, Daane & Giesen, 2006). Wilson and Thornton (2006) concluded that enhancing pre-service teachers' self-image as learners and practitioners of mathematics using the bibliotherapy process may help them see mathematics as making connections and to encourage the view that all students can learn mathematics (Australian Association of Mathematics Teachers, 2002) as well as help them address their own mathematics anxiety.

Research into primary teachers' effectiveness has emphasised the importance of deep and connected knowledge and a positive view of themselves as learners of mathematics (Askew, Brown, Rhodes, Johnson & Wiliam, 1997, Ma, 1999), suggesting that teachers' mathematics anxiety may impact on their ability to teach mathematics effectively. According to Carroll (1998) more than half Australian primary teachers have negative feelings about mathematics. This is of concern, as teachers who possess higher levels of mathematics anxiety may unintentionally pass on these negative feelings to their students (Wood, 1988).

A significant percentage of primary teachers identify with feeling anxiety about mathematics. The possible negative impact of this on their students is a matter of great concern. This study aimed to identify the potential of bibliotherapy as a means of addressing this issue.

## Methodology

### *Research Context*

The setting for this study was a professional learning project, in three rural schools. The project explored aspects of teaching mathematics. In addition to the project, teachers wrote reflections on and discussed two research papers that reported how school children feel about mathematics and about themselves as they learn mathematics and gave a broad overview of the difficulties that primary school students have in learning mathematics. The research papers comprised readings about mathematics anxiety (Dossel, 1993), and understanding in mathematics (Skemp, 1976). The readings considered psychological and sociocultural aspects of learning mathematics, addressing both the affective and the cognitive domain. Readings were chosen as they had been identified by pre-service teachers in previous research, (Wilson, 2007) as invoking an emotional response.

### *Data Sources and Collection methods*

In the first workshop, teachers were asked to describe a critical incident in their own school mathematics education that impacted on their image of themselves as learners of mathematics. They were then asked to write guided reflections on the two readings, discussing these and their personal observations from schools. Suggested prompts such as: “What did you learn that was new?”, “Something I disagreed with”, “Something that surprised me” and “Something that confirmed what I thought”, were suggested, with the option to write open-ended reflections. Teachers voluntarily agreed to participate in the study. The teachers were aware that reflections were not part of the project, but that they were completing the readings as a valuable contribution to their professional learning.

### *Research Sample*

The research sample for this study was a group of five female year 6 teachers from three rural schools. The teachers differed in their professional experience, ranging from beginning teachers to those with many years of experience. All five teachers agreed to participate in the study.

### *Data Analysis Methods*

The critical incidents and reflections were analysed for evidence of the stages of the bibliotherapy process. The quotations in this paper have been selected to provide an insight into the thinking of teachers who identified with the readings. This paper focuses on the extent of the bibliotherapy process in this context. Fictitious female names were assigned to the teachers to preserve anonymity.

## Results and Discussion

### *Critical Incidents*

The critical incidents indicated the teachers’ initial feelings. Most began their schooling with a positive attitude, but reported mixed or negative experiences of mathematics. In the description of the critical incident several mentioned the lasting

influence that an individual teacher had on their attitude towards mathematics. Doris recalled a new primary teacher who “had very little patience, and was not at all approachable.” Becky “grasped concepts well” in primary school, but had a Year 7 teacher who was “arrogant and didn’t explain things well. This meant I lost the basis of high school maths and spent the next few years struggling and trying to catch up”.

Anne described her enjoyment of mathematics in primary school, but stated that she found it more difficult in year 11 and 12 and consequently did not take the mathematics elective in university. This avoidance exemplified the coping mechanisms that some pre-service teachers use in situations which they find stressful (Sliva & Roddick, 2001) and is similar to the pre-service teachers whose written critical incidents reflections highlighted a cycle of fear, failure and avoidance reported in previous research (Wilson & Thornton, 2006). Cathy expressed her frustration in Year 7 struggling with a lack of understanding, and she “lost all confidence and went slowly downhill from there”.

### *Reflections*

The researcher had previously attempted to gauge which of a number of readings had the most impact by asking teachers pre-service in previous research, to identify the readings that had resonated most with them. Participants chose the Dossel (1993) article about mathematics anxiety, and the Skemp (1972) article. These were the articles used in this study.

Using readings to clarify teachers’ understanding of their own learning is central to the bibliotherapy technique. An important part of the teachers’ reflections revolved around the view of mathematics that they had developed during their schooling. I “didn’t learn well by rote. I didn’t see the relevance” (Doris). These views are consistent with those reported in the research literature. Taylor (2003, p. 333) investigated the common misconception among US students “about the nature of mathematics as being built on remembered procedures.” As Doris said: “I didn’t really have to understand the formula, just put the numbers in”.

The discussions provided evidence that the teachers had shown an emotional response to the readings, had reflected on their own experiences and had engaged in some stages of the bibliotherapy process.

#### Identification

The pre-service teachers’ reflections showed that they identified with the character (in this case the students in the articles) and the situation in which they found themselves. “Maths is definitely something I was anxious about.” (Anne). “I found it difficult coming to grips with maths.” (Doris). The use of bibliotherapy encouraged teachers to reflect on themselves as learners of mathematics.

#### Catharsis

Through their reading of the articles the teachers became emotionally involved. “If you can’t answer a simple mental quickly, it is always going to resonate” (Cathy). Becky found the Dossel article echoed her own experiences: “When I was in exams, I just wanted to get out”. These teachers responded emotionally and connected with the readings.

#### Insight

Through their readings and discussion the pre-service teachers gained a different perspective from the experiences of others and became aware that their problems might also be addressed. “I am sure the connections were there, but I couldn’t see them in the

textbook” (Becky). Doris realised they were “shaped by our early experiences”. Realising this was a valuable insight.

#### Universalisation

Reflecting on the readings and sharing their experiences, teachers were able to connect with each other and find that they were not alone in their feelings and experiences. Anne said “the first time teaching year 6 mathematics is a challenge”, and said other teachers commented on her teaching year 6: “Better you than me, there’s no way I could do it.” Becky shared her early teaching experience: “When I started teaching, I had to get the students to show me how to do borrowing”.

#### Projection

Their reflection on their own experiences was followed by a consideration of what it could mean for the future and the implications of their insights for their teaching. “I remember how it was for us. I try to make it different for the kids I teach.” (Doris)

Bibliotherapy is able to address Ambrose’s (2004) criteria for mechanisms which have potential for changing beliefs, as it can provide emotion-packed experiences, encourage teachers to become immersed in a reflective community and connect beliefs and emotions. Teachers are thus able to modify their self-concept and re-image themselves as teachers who do not only teach “just as they have been taught” (Wolodko et al., 2003). “I teach the way I would like to learn” (Anne). “I incorporate the methods by which I was taught, by doing the exact opposite” (Doris).

During the discussions, the teachers alternated between focusing on insights about their own experiences and discussing their observations of their students. “Some kids dread me asking them a question” (Cathy) “Students believe they can’t do maths. The shutters come down and they won’t even try.” (Doris) The teachers’ comments reflect a concern for their students that negative learning experiences will not reinforce negative beliefs and feelings about mathematics.

### Conclusion and Implications

Readings on learning (or learned) difficulties may be a powerful way to address some of the anxiety felt about teaching mathematics by primary teachers. The strength of the bibliotherapy technique is that the identification, catharsis, insight, universalisation and projection have the potential to allow the teachers to reflect more coherently on their beliefs about mathematics learning and teaching, and modify these beliefs and the emotions connected with them. Potentially bibliotherapy is a powerful tool in teacher professional learning. The strength of the bibliotherapy approach for teacher reflections lies in its ability to elicit both cognitive responses and emotional responses. In comparison to other reflective practices, the strength of bibliotherapy is its potential to change the way teachers feel.

The study investigated the extent to which the bibliotherapy process was taken up where only a small number of readings were presented to the teachers as a contribution to their professional learning. These observations have implications for the way the bibliotherapy process could be incorporated into teacher professional development activities. Even the use of only two readings evoked a response from the teachers and enabled them to develop insights into the impact of their beliefs on their teaching. More

time would be needed for teachers to go through the all stages of the process, and focus more on their own experiences, separately from those of their students.

Bibliotherapy provides a new framework for looking at teacher reflections that has much to offer. It is an effective way of thinking about their prior experiences. It gives teachers a framework and language to talk about the process. It provides them with a shared language to talk about their emotional responses in terms of the processes of identification, catharsis, insight, universalisation and projection. Continued research is necessary to identify articles or readings for stimulus materials which would form an appropriate foundation and provide impetus for the bibliotherapy process. Further research would also investigate the conditions under which the process would have the most impact on primary school teachers. The potential exists for teachers who have gained insights through this process, and, in addition, an understanding of the process, to use their experience to help their students address and overcome their mathematics anxiety.

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## References

- Askew, M., Brown, M., Rhodes, V., Johnson, D., & Wiliam, D. (1997). *Effective Teachers of Numeracy (Final Report)* London: King's College.
- Australian Association of Mathematics Teachers Inc. (2002) *Standards for excellence in teaching mathematics in Australian schools*. Adelaide: Australian Association of Mathematics Teachers Inc
- Borasi, R. (1990) The invisible hand operating in mathematics instruction: Students' conceptions and expectations. In Cooney, T. & Hirsch, C. (Eds) *Teaching and learning mathematics in the 1990's*. (1990 Yearbook). Reston, VA: National Council of Teachers of Mathematics
- Buerk, D. (1982). An experience with some able women who avoid mathematics. *For the Learning of Mathematics*, 3 (2) 19-24.
- Bursal, M. & Paznokas, L. (2006) Mathematics anxiety and preservice elementary teachers' confidence to teach mathematics and science. *School Science and Mathematics* 106(4) 173-80.
- Carroll, J. (2005). Developing effective teachers of mathematics: Factors contributing to development in mathematics education for primary school teachers. Paper presented at the Building Connections: Research, Theory and Practice. Proceedings of the 28th annual conference of the Mathematics Education Research Group of Australasia, RMIT, Melbourne 202-209
- Carroll, J. (1998) Understanding Professional Development Through the Analysis of the Mathematical Life Histories of Primary School Teachers. Paper presented at the annual conference of the Australian Association for Research in Education, Adelaide.
- DeBellis, V. & Goldin, G. (1997). The affective domain in mathematical problem-solving. In E. Pekhonen (Ed) Proceedings of the 21st Annual Meeting of PME, Vol 2, Lahti, Finland: Univ. of Helsinki, pp. 209-216
- DeBellis, V. & Goldin, G. (2006). Affect and meta-affect in mathematical problem solving: a representational perspective. *Educational Studies in Mathematics*, 63(2), pp. 131-147
- Dossel, S. (1993) Maths Anxiety. *Australian Mathematics Teacher* 49(1) 4-8
- Flores, A. & Brittain, C. (2003) Writing to reflect in a mathematical methods course. *Teaching Children Mathematics*, 10(2), 112-118.
- Furner, J. & Duffy, M. (2002) Equity for all students in the new millennium: Disabling math anxiety. *Intervention in School and Clinic* 38(2) 67-75
- Goldin, G. (2002). Affect, meta-affect and mathematical belief structures. In G. Leder, E. Pekhonen & G. Törner (Eds.), *Beliefs: A hidden variable in mathematics education* (pp. 59-72). Dordrecht: Kluwer.
- Haylock, D. (2001). *Mathematics explained for primary teachers* London: Paul Chapman.
- Hebert, T. & Furner, J. (1997). Helping high ability students overcome maths anxiety through bibliotherapy. *Journal of Secondary Gifted Education*, 8(4), 164-179.

- Hembree, R. (1990). The nature, effects and relief of mathematics anxiety. *Journal for Research in Mathematics Education*, 21, 33-46.
- Grootenboer, P. (2006). *Mathematics educators: Identity, beliefs, roles and ethical dilemmas*. Paper presented at the Identities, Cultures and Learning Spaces: Proceedings of the 29th annual conference of the Mathematics Education Research Group of Australasia, Canberra 270-277.
- Ma, L. (1999). *Knowing and teaching elementary mathematics*. Mahwah, NJ: Lawrence Erlbaum.
- Marlowe, M., & Maycock, G.A. (2000). Phenomenology of bibliotherapy in modifying teacher punitiveness. *Journal of Genetic Psychology*, 161, 325-336.
- Myracle, L. (1995). Molding the minds of the young: The history of bibliotherapy as applied to children and adolescents. *The Allan Review* 22(2). Retrieved February 8, 2009, from <http://scholar.lib.vt.edu/ejournals/ALAN/winter95/Myracle.html>.
- Morawski, C (1997). A role for bibliotherapy in teacher education. *Reading Horizons*, 37(3), 243-260.
- Riordan, R. & Wilson, L. (1989). Bibliotherapy: does it work? *Journal of Counselling and Development*, 67, 506-507.
- Skemp, R. (1976). Relational understanding and instrumental understanding. *Mathematics Teaching*, 77, 20-26.
- Sliva, J., & Roddick, C. (2001). Mathematics autobiographies: a window into beliefs, values, and past mathematics experiences of preservice teachers. *Academic Exchange Quarterly*, Summer 2001 5(2) 101.
- Stigler, J & Hiebert, J. (1992). *The teaching gap - best ideas from the world's teachers for improving education in the classroom*. New York: Free Press.
- Swars, S., Daane, C & J. (2006) Mathematics anxiety and mathematics teacher efficacy: what is the relationship in elementary preservice teachers? *School Science and Mathematics* 106(7) 306-315.
- Taylor, A. (2003). Transforming pre-service teachers' understanding of mathematics: dialogue, Bakhtin and open-mindedness. *Teaching in Higher Education*, 8(3), 333-344.
- Trujillo, K. (1999) Tracing the Roots of Mathematics Anxiety Through In-Depth Interviews with Pre-Service Elementary Teachers. *College Student Journal* June 1999
- Wilson, S. (2007) My struggle with maths may not have been a lonely one: Bibliotherapy in a teacher education number theory unit. In J. Watson & K. Beswick (Eds) *Mathematics: Essential research, essential practice*. Proceedings of the 30th annual conference of the Mathematics Education Research Group of Australasia, Hobart (pp. 815-823).
- Wilson, S. & Thornton, S (2006). To heal and enthuse: Developmental bibliotherapy and pre-service primary teachers' reflections on learning and teaching mathematics. In P. Grootenboer, R. Zevenbergen & M. Chinnoppan (Eds) *Identities, Cultures and Learning Spaces*: Proceedings of the 29th annual conference of the Mathematics Education Research Group of Australasia, Canberra (pp. 36-44).
- Wilson, S. & Thornton, S. (2008) "The factor that makes us more effective teachers": Two pre-service teachers' experience of bibliotherapy. *Mathematics Teacher Education and Development* (pp. 22-35)
- Wolodko, B., Willson, K., & Johnson, R. (2003). Preservice teachers' perceptions of mathematics: metaphors as a vehicle for exploring. *Teaching Children Mathematics*, 10(4) 224-230.
- Wood, E. F. (1988). Math anxiety and elementary teachers: What does research tell us? *For the Learning of Mathematics*, 8(1), 8-13