Bibliotherapy: mathematics anxiety and meta-affect.

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Mathematics anxiety has been identified as a specific learning difficulty characterised by feelings that mathematics cannot make sense, of helplessness, and lack of control over one's learning. This anxiety has been associated with receiving inappropriate teaching practices, and a belief that success in mathematics is determined by ability rather than effort. Many pre-service primary or early childhood teachers have anxiety about mathematics. Failure in mathematics can have a powerful emotional impact that may extend far beyond the mathematics classroom. For potential teachers of mathematics this emotional impact becomes doubly significant, potentially affecting not only their current study but also their future teaching of mathematics and hence the attitudes of their future students. Research at two metropolitan universities found that using readings with an explicit focus on school students' learning difficulties in mathematics provide a powerful additional element in addressing some of this well-documented anxiety felt by many pre-service primary teachers. Reading and reflecting about children's difficulties provided a stimulus for pre-service teachers to reflect more effectively on their beliefs about mathematics learning and teaching. In their reflections, the stages described in the literature on bibliotherapy - identification, catharsis, insight, universalisation, and projection - could be identified. This process also gives teacher educators a framework with which to understand the reflective process, providing them with a shared language to talk about pre-service teachers' emotional and cognitive responses in terms of the stages of bibliotherapy. This paper reviews the literature on bibliotherapy, and its use in addressing mathematics anxiety in school students. In particular, bibliotherapy provides a way of addressing meta-affect, that is, how the mind handles affect, understanding people’s awareness of and emotions about their emotional states, and as a way of monitoring and regulating emotion. These emotional states can be debilitating, or can enhance “the thrill of the ride” and be productive of learning and accomplishment. This paper describes how bibliotherapy can be a powerful tool for teacher educators to facilitate meta-affective change in pre-service by encouraging them to reflect on their own school experiences and reconstruct their assessment of their capacity to learn and understand mathematics, and hence re-examine their identity as teachers of mathematics.

Introduction

Mathematics anxiety has been identified as a specific learning difficulty in mathematics for many children (Dossel, 1993). It is characterised by a feeling that mathematics cannot make sense, a feeling of helplessness in the face of mathematics, and an inability to take control of one’s own learning. In some cases a teacher plays a powerful role in its development. In many cases, this anxiety can be traced to inappropriate teaching practices, and to a belief in the wider society that "some people can do maths and some can’t". Failure in mathematics can have a powerful emotional impact. Bibliotherapy has been used as a means to address this anxiety in school
students. It has been used to alleviate mathematics anxiety in school students, particularly with the number of children’s books that have mathematics as a particular focus. Previously, the technique of bibliotherapy has been used to help high ability secondary students overcome mathematics anxiety (Furner & Duffy, 2002; Hebert & Furner, 1997), to assist children with learning disabilities, and to remediate children’s social difficulties. Hebert & Furner, (1997, p. 170) found that “bibliotherapy is a therapeutic, discussion-generating technique which offers educators appropriate affective strategies for dealing with mathematics anxiety in secondary math classrooms so that students achieve success”.

Theoretical framework

Mathematics anxiety in pre-service teachers

Mathematics anxiety is a major concern in the education of pre-service teachers. Many pre-service primary or early childhood teachers have anxiety about mathematics (Haylock, 2001). In addition, it has been found that their beliefs and attitudes are hard to change. Pajares (1992) used the metaphor for pre-service teachers as “insiders in a strange land”. He noted that pre-service teacher beliefs about mathematics and mathematics teaching are established as a result of their own school experiences, and resist change. Researchers (Trujillo, 1999, Sliva and Roddick, 2001, Ellsworth and Buss 2000) traced the source of mathematics anxiety in pre-service primary teachers in the United States. They found that almost all the students in the study indicated the powerful role of the teacher in the development of their mathematics understanding, placing them on a continuum from “enabling” (patient and understanding, giving full explanations and answers) to “disabling” (intimidating students, not fully explaining concepts or not considering students’ feelings). Other factors in their development of mathematics anxiety related to the ways mathematics was presented (relevance, comprehension, and emphasis on skills and memorisation); self-perceptions; family influences and mathematics test anxiety. Many described a trend of fear, failure and then avoidance in their mathematics experiences. For potential teachers of mathematics this emotional impact becomes doubly significant, potentially affecting not only their current study but also their future teaching of mathematics and hence the attitudes of their future students. The impact of teachers’ beliefs about their mathematical efficacy on their teaching practice is a well-researched and ongoing problem. Overcoming mathematical anxiety among pre-service teachers is important for them to become effective teachers of mathematics.

Bibliotherapy

Bibliotherapy is a technique developed in psychology and library science. People are assisted in dealing with problems in their lives by reading and reflecting about similar situations happening to a third person. The technique involves the active, dynamic process of reading, enabling the person to identify with the protagonist in the story, followed by individual or group discussion in a non-threatening environment. When people read they interpret through the filter of their own experiences. When the reading involves a third person, the reader is removed from the situation and is able to experience the problem from an objective viewpoint. Thus, bibliotherapy aims to assist individuals to overcome negative emotions related to a real-life problem using
guided reading. Readers make connections between their personal and intellectual experiences, maintaining the relationship between the affective and cognitive dimensions of learning. Bibliotherapy can be described as “a process of dynamic interaction between the personality of the reader and literature – interaction which may be utilized for personality assessment, adjustment and growth” (Cornett & Cornett, 1980, p. 8).

The focus of bibliotherapy may be developmental or clinical. Clinical bibliotherapy generally involves clinical intervention. A therapist works with individuals with serious emotional or behavioural problems. Developmental bibliotherapy is used to refer to the use of guided reading with students (Hebert & Furner, 1997, p. 170). Traditional bibliotherapy aimed to elicit positive or negative individual reactions to readings. More recent studies concentrate on an interactive approach rather than a reactive approach. They aim for readers to make connections between their personal and intellectual experiences, enhancing the connections between the affective and cognitive dimensions of learning. Readers engage in reflective practices such as journal writing and group discussions, which strengthen the interactive process (Morawski & Gilbert, 2000).

Previous researchers had identified four stages in the process of bibliotherapy: identification (the reader identifies with the protagonist), catharsis (the reader becomes emotionally involved and releases pent-up emotions), insight (the reader becomes aware that their problems might also be addressed or solved.) and universalisation (the reader realises that the problem is shared by others). From these studies of pre-service teachers a fifth stage, projection, was identified. In this stage the reader projects a new identity, (in the case of the pre-service teachers) with the capacity to be an effective teacher of mathematics (Wilson & Thornton 2006).

The research

This paper describes an innovative approach to eliciting and understanding the affective responses of pre-service primary teachers from two metropolitan universities. Both studies involved developmental interactive bibliotherapy with a focus on personal responses to prior experiences.

The research attempted to identify the way pre-service teachers envisaged themselves as learners and doers of mathematics and how they might reassess their capacity to learn and teach mathematics as a result of specific reading and guided reflections. Pre-service teachers examined research papers reporting how school children feel about mathematics and about themselves as they learn mathematics. They focused specifically on difficulties school students experience in mathematics, as a consequence of specific learning difficulties and of cultural and attitudinal factors.

In the first study of thirteen pre-service teachers studying a Mathematics and Learning Difficulties elective, the readings and reflections formed part of the assessment for the unit (Wilson & Thornton 2006). At the second university, eleven pre-service teachers studying a Number Theory elective were encouraged to follow the same process, as part of their own professional learning. They could voluntarily submit weekly journal entries for the research project. Pre-service teachers wrote responses to readings about school students’ learning, reviewed their understanding of their own
experiences in the light of the readings and identified readings which impacted most on them. The research papers included readings about mathematics anxiety (Dossel, 1993), understanding in mathematics, how children learn mathematics, multiple approaches to learning mathematics, and children’s beliefs about mathematics. The readings featured psychological and sociocultural aspects of learning mathematics, addressing both the affective and the cognitive domain. Readings were chosen for their potential to stimulate an emotional response in the reader. The critical incidents and journals were not analysed until after the completion of the each unit at both universities.

As a means of preliminary orientation, pre-service teachers were asked to prepare a written description of a critical incident in their own school mathematics education that made a major impact on their image of themselves as learners of mathematics. During semester, they had a set reading each week, and were asked to keep a log of eight weeks of reflections on readings, personal observations in schools and voluntary further reflections from their own schooling. They were asked to recall and write about incidents that they experienced as a student at school or university that had an impact on how they felt about mathematics. Prompts were provided for journal writing, including:

“Something I learned”
“Something I felt reassured by”
“Something that surprised me”
“Something I disagreed with”
“Something I would like to know more about”

This was presented in an open-ended way and they were not required to address every prompt. The reflections formed the basis of a class discussion each week. A procedure was set up so that the critical incidents and journals were analysed after the completion of the each unit at both universities.

Results

The research indicates that this process has potential to impact positively on outcomes for both beginning primary school teachers and consequently for their students in their mathematics classes. In comparison to other reflective practices, bibliotherapy creates an opportunity to change the way pre-service teachers feel. It also provides a structure and language for teacher educators to analyse reflective writing in mathematics teacher education.

When the unit was finished, the critical incidents and journals were analysed for evidence of the stages of bibliotherapy. The quotations in this paper have been selected to provide an insight into the thinking of those who identified strongly with the readings, rather than as a representative sample from all pre-service teachers. This paper focuses on the extent that the bibliotherapy process was taken up by pre-service teachers. Fictitious female names were assigned to all students in order to preserve anonymity.

Individuals shared their feelings about studying mathematics as part of their teacher education course: “I almost changed degrees because I just didn’t want to face failure again” (Felicity). In her critical reflection, Hilary professed positive attitudes to mathematics, “At a basic level, I love maths. I love that there is an absolute right or wrong answer” but then described her reactions to her year 11 experiences, “I didn’t
understand and everything began to move away too quickly. I questioned and questioned but still couldn’t come to an understanding, so I quit.” This avoidance exemplified the coping mechanisms resulting in a cycle of fear, failure and avoidance that some pre-service teachers use in situations which they find stressful (Sliva & Roddick, 2001).

The responses to the readings, and their subsequent reflections demonstrated the impact of the teacher. Heather described her teacher writing continuously on the board and not explaining:

I can still see the teacher, I can picture her face as if it were yesterday, I can hear her accent and I can remember vividly the year in which my love of maths changed. The doubts that crept in back then creep in still now when I attempt to learn new mathematical strands.

Heather was a mature-age student, but these were vivid reconstructions of her mathematics experiences when she was young. This illustrated to the class the potential of individual teachers to have a lasting influence, (as another mature age student, Barbara, said “those teachers … still impact on me”). Writing about these memories caused strong emotions to be re-experienced and reflecting upon them enabled a catharsis. This led to the pre-service teachers’ awareness that there are alternatives to the approaches that they experienced, a common insight developed in the classes. The stages of the bibliotherapy process could be used to describe and understand the reflections of the participants.

The results of using these readings to assist pre-service teachers’ understanding of their own learning demonstrates one of the important stages and outcomes of bibliotherapy, namely that the person realises that they are not the only one who has the problem. Felicity wrote: “The biggest thing I have learned this week is that I am really not alone in this anxiety.” This illustrates the universalisation stage of the process.

These pre-service teachers questioned not only the views that they had developed of themselves as learners of mathematics, but also the image that they had previously held of themselves as teachers of mathematics. During the semester, pre-service teachers examined their identity as future teachers of mathematics, and were able to articulate that, as a result of the process, they were able to project a different identity, as a more successful teacher of mathematics:

This also leads me to my second thought that, for those teachers, who like me, have never believed maths to be their “thing”, there is the distinct possibility that our desire not to let students suffer our fate and to improve on our own childhood experiences in classrooms could well be the factor that makes us the more effective teachers. We are more open to the need for reflective teaching and professional development, and more willing to look for alternate explanations and examples. (Jenny)

Discussion

The bibliotherapy process is an innovative way of eliciting pre-service teacher reflections. This process produces a type of structured reflection that has been shown to provide potential in the education of pre-service teachers. It simultaneously
addresses affective and cognitive domains and can inspire pre-service teachers to change their assessment of their capacity to learn mathematics, and their image of themselves as teachers of mathematics. Bibliotherapy addresses Ambrose’s (2004) criteria for mechanisms which have potential for changing beliefs, as it provides emotion-packed, vivid experiences, encourages pre-service teachers to become immersed in a reflective community and connects beliefs and emotions.

One of the main features of the study was the strength of the emotional responses of the pre-service teachers. Bibliotherapy’s power comes from the way that pre-service teachers’ cognitive response is allied with their emotional response. In comparison to other reflective practices, the potential of this type of reflection lies in opportunity for the process to change the way pre-service teachers feel. An explicit focus on learning difficulties through the process of bibliotherapy may be a powerful force in addressing some of the mathematics anxiety felt by many pre-service teachers, and thus be a powerful tool in healing (Wilson & Thornton, 2006). There is evidence from the second study, that this may also be achieved even if this is not the teaching or assessment focus of the unit (Wilson, 2007).

This research also adds to the knowledge about pre-service teachers’ reflections on their beliefs about themselves, both personally, as learners of mathematics and professionally, as future teachers of mathematics in the primary school. Teacher role identity includes the way individuals think about themselves as teachers, that is, their image of self-as-teacher. Alsup (2005, p. 188) calls the creation of new discourse and shifts to imagining what might be “borderland discourse”, and states that affect-related discourses help “integrate personal and professional identities and beliefs, and heighten metacognitive awareness of self” (p. 188), and that for the pre-service teachers in her study, “engagement in transformative discourse was central to beginning the development of a professional identity”(p. 188). She also explores the notion that forming a professional identity is pivotal to becoming an effective teacher. Grootenboer, et al. (2006, p. 612) view identity as “how individuals know and name themselves”. Researchers view the defining of identity as bringing together complex ideas. “Identity is a unifying and connective concept that brings together elements such as life histories, affective qualities and cognitive dimensions” (Grootenboer & Zevenbergen, 2008, p. 243). White andMoss (2003) discuss the importance of mapping the culture of pre-service teachers’ identities to foster understanding in the context of the future of the profession, as the bulk of the current workforce reaches retirement age.

Bibliotherapy provides a new framework for looking at pre-service teacher reflections that has much to offer. In particular, bibliography provides a way of addressing meta-affect, that is, how the mind handles effect. The concept of meta-affect was first described by DeBellis and Goldin (1997), as a way of understanding people’s awareness of, and emotions 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.

Overcoming mathematical anxiety among pre-service teachers is important if they are to become effective teachers of mathematics. The research suggests that it will help many pre-service primary teachers studying mathematics education to go through a carefully constructed bibliotherapy process. It provides a process that others could adopt, thus it is very practical in its potential applications. This process may be at least as important as learning mathematics or how to plan lessons because it has potential to change the way students feel about themselves, and think about themselves as learners and potential teachers. Ultimately the power of the bibliotherapy technique lies in its potential to heal and enthuse students (Wilson & Thornton, 2006).

Bibliotherapy also provides a new framework for looking at pre-service teacher reflections that provides a new tool for teacher educators. It is an effective way of thinking about their prior experiences and examining the development of the reflective process. It gives teacher educators a framework and language to talk about the process. It provides educators with a shared language to talk about students’ emotional responses in terms of the processes of identification, catharsis, insight, universalisation and projection. It is possible that educators can select further readings to promote various parts of the process.

Conclusion and Implications

The research indicates that bibliotherapy has potential to impact positively on outcomes for both beginning primary school teachers and potentially for their students in their mathematics classes. The paper proposes that it will help many pre-service primary teachers studying mathematics education to go through a carefully constructed bibliotherapy process. It provides and describes a process that others could adopt, thus it is very practical in its potential applications. This was a healing process that generated enthusiasm for teaching mathematics. The strength of the bibliotherapy technique is that through the identification, catharsis, insight, universalisation and projection stages, pre-service teachers are encouraged to reflect more coherently on their beliefs about mathematics learning and teaching, and empowered to overcome the restrictions of their perceived identity as a teacher of mathematics. In comparison with other reflective practices, the potential of bibliotherapy lies in its focus on changing the way pre-service teachers feel. The unique feature of using bibliotherapy to address mathematics anxiety is that, unlike other studies which encourage pre-service teachers to identify with teachers, the pre-service teachers in this study identified with the students in the readings.

Although pre-service education is the focus of this particular paper, the technique of bibliotherapy has been used already, with school students. Future research could also further investigate the application of the techniques used in the study, such as critical incident analysis and bibliotherapy through guided reading and journal writing, to investigate their potential to combat mathematics anxiety in primary and high school students.
It is important to realise that each person is unique and there is no set schedule for the stages of the process. From the responses of the pre-service teachers, it is apparent that the stages are not linear and did not only happen once for each person. Each reading has the potential to stimulate a new cycle of responses which can be described as identification, catharsis and universalisation. With each cycle pre-service teachers develop greater insight eventually leading to an enhanced projection into their future as teachers.

There is an opportunity to transfer the process to other learning areas and use it to address issues other than mathematics anxiety. It is important in future research to identify useful articles or readings which impact on pre-service teachers, and to investigate successful ways of integrating bibliotherapy into a range of teacher education courses in ways that benefit all students, not only those who suffer from mathematics anxiety. Teacher in-service, other areas such as primary pre-service teachers’ anxiety about science education, secondary pre-service teacher education or parental beliefs and actions, are important foci for further research that could potentially be addressed by the bibliotherapy process.

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