

To heal and enthuse: Developmental bibliotherapy and pre-service primary teachers' reflections on learning and teaching mathematics

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This paper advocates bibliotherapy as a powerful reflective tool in pre-service education. It can provide a new approach to understanding and improving the affective responses of pre-service primary teachers. In the study pre-service teachers analysing readings about school students' learning, reflected on and reconstructed their understanding of their own school experiences. The technique of bibliotherapy applied to readings about issues such as mathematics anxiety challenged their assessment of their capacity to learn and teach mathematics. This was a healing process that generated enthusiasm for teaching mathematics.

Introduction

Based on previous student evaluations, the researchers hypothesised that studying students' difficulties in learning mathematics, particularly the effect of mathematics anxiety, would cause pre-service teachers to reflect on their perception of themselves as learners of mathematics. The reasoning was that pre-service teachers could potentially identify themselves through the case studies of children and that guided reflections may enable pre-service teachers to re-evaluate their own experiences, develop a more positive self-image as learners of mathematics and gain insight into how children's anxiety about mathematics can be minimised by teachers (Wilson & Thornton, 2005a). The use of bibliotherapy as a strategy for pre-service teachers to examine their attitudes towards learning mathematics and its potential to enhance their confidence as future teachers of primary school mathematics was investigated (Wilson & Thornton, 2005b). This paper links reflection in pre-service teacher education to the technique of bibliotherapy, which is described below.

Theoretical Framework

The theoretical framework is based on research on three components: bibliotherapy, mathematics anxiety and pre-service teacher reflection.

Bibliotherapy

Bibliotherapy is a technique which aims to assist individuals to overcome negative emotions related to a real-life problem by guided reading about the dilemmas of a third person, followed by individual or group discussion in a non-threatening environment (Aiex, 1996). 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), the process summarised by Martin (2002, p. 34) as "to heal and enthuse". Underlying the application of bibliotherapy is the assumption that reading is a dynamic process. The reader is an active participant and identifies with the protagonist in the story. When people read they interpret through the lens of their own experiences. As the reading involves a third person, the reader is more

removed from the situation and is able to experience the problem from an objective viewpoint.

Developmental bibliotherapy

Bibliotherapy may have a developmental or a clinical focus. Clinical bibliotherapy generally involves a therapist working with individuals with serious emotional or behavioural problems. Developmental bibliotherapy, used to refer to the use of guided reading with students (Hebert & Furner, 1997, p. 170), is more relevant to this study.

Researchers using the process of bibliotherapy have tended to concentrate on three stages: identification, catharsis and insight. Halstead (1991, p. 80) refers to these three stages as “recognising”, “feeling” and “thinking”. A fourth stage, universalisation, has been described (Slavson, 1950, quoted in Hebert & Furner, 1997) and was evident in the pre-service teachers’ responses examined during this study. The stages of bibliotherapy can be summarised as:

identification — the reader identifies with and relates to the protagonist.

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

insight — the reader learns through the experiences of the character and becomes aware that their problems might also be addressed or solved.

universalization — 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). Aiex (1996) states that one of the reasons for using the technique of bibliotherapy is for an individual to come to the realisation that they are not the only one who has the problem.

The act of reading alone does not comprise the full process of bibliotherapy. Hebert & Furner, (1997, p. 169) stress that “successful bibliotherapy requires a meaningful follow-up discussion” It is important to become involved in discussions and follow-up activities such as journal writing in order for the reader to develop self-awareness, an enhanced self-concept and improved personal and social judgement. Flores & Brittain (2003) indicate that one of the benefits of sharing reflective writing is that students are exposed to a range of attitudes and experiences that may be familiar. The technique has been used to help secondary students to overcome mathematics anxiety (Furner & Duffy, 2002, Hebert & Furner, 1997).

Mathematics Anxiety

The background research for this study involves the factors contributing to anxiety about mathematics and the impact of teachers’ images of themselves as mathematicians on teaching practices. Mathematics anxiety has been identified as a specific learning difficulty for many children (Dossel, 1993), characterised by a feeling 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 prevalent belief that success in mathematics is determined by ability rather than effort (Stigler & Hiebert, 1992). Haylock (2001) found strong evidence that many pre-service primary or early childhood teachers have anxiety about mathematics. Hembree’s (1990) meta-analysis of research studies found that the level of mathematics anxiety of pre-service elementary teachers was the highest of any major on university campuses. Trujillo (1999) attempted to trace the roots of mathematics anxiety in American pre-service primary teachers.

Research into the effectiveness of primary teachers has emphasised the need for teachers to have a deep and connected knowledge and a positive view of themselves as

learners of mathematics (Askew, Brown, Rhodes, Johnson & Wiliam, 1997, Ma, 1999). Thus, mathematical anxiety among pre-service teachers is an impediment to them to become effective teachers of mathematics.

Research investigating how studying subjects at university might impact upon this anxiety has focused on how teaching mathematics has assisted students to develop deeper knowledge (Chick, 2000), or on how studying mathematics teaching strategies impact on pre-service teachers' beliefs and attitudes (Frid, 2000). This research investigated the idea that enhancing pre-service self-image as learners and doers of mathematics may contribute their developing the capacity to see mathematics as making connections, to see learning as developing deep knowledge, to see their role as teachers as being to provide opportunities for school students to solve rich and complex problems, and to adopt a view that all students can learn mathematics (Australian Association of Mathematics Teachers, 2002). It did not examine pre-service teachers' own knowledge of mathematics or teacher effectiveness in a school situation.

Reflection

Researchers have reported on the benefits of reflection in pre-service teacher education courses. Borasi (1990, p. 179) emphasised “the key importance for students to *become aware of, and reflect on, their beliefs, as well as possible alternatives*, since beliefs are more powerful the more they are held unconscious and unquestioned.” Buerk (1982, p. 19), described students who believed that “mathematics is only a collection of correct answers and proper methods”, and how their view of mathematics knowledge may be inconsistent with their general view of knowledge, causing discomfort because of these disparate views, especially if they have a tendency to be reflective. She suggested that identifying and overcoming the disparity may lead to more comfortable feelings about mathematics. A number of recent researchers have discussed the role of reflection in teacher professional development. Tools to encourage reflection by pre-service teachers include mathematical autobiographies (Ellsworth & Buss, 2000; Sliva & Roddick, 2001). 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”. Morawski (1997) concludes that bibliotherapy can be a stimulus for these reflective practices at both the pre-service and inservice levels.

Methodology

Research Sample

The research sample for this study was a class of thirteen (twelve females and one male) pre-service primary teachers. The students encompassed a range of academic years from the second year to the fourth year of their degree and hence differed in the amount of professional experience that they had completed.

Research Context

The setting for this study was the elective unit Mathematics and Learning Difficulties, at an urban university in 2003. It formalised some powerful anecdotal evidence reported by students at the university during 2002. The unit focused specifically on difficulties school-aged children experience in mathematics, as a consequence of specific learning difficulties

and of cultural and attitudinal factors. Students examined research papers reporting how school children feel about mathematics and about themselves as they learn mathematics. The emphasis of the unit was on students who struggle in the mainstream classroom rather than those with severe learning difficulties. Readings were chosen to give a broad overview of the difficulties that primary school students have in learning mathematics. They included readings about mathematics anxiety, how children learn mathematics, multiple approaches to learning mathematics, children's beliefs about mathematics and conceptual mediation. They focused on psychological and sociocultural aspects of learning mathematics and included references about the affective and the cognitive domain.

Data sources and collection methods

In the first workshop, pre-service 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. During semester as part of the assessment for the unit, pre-service teachers kept a log for eight weeks of guided reflections on readings, personal observations in schools and voluntary further reflections from their own schooling as part of the unit assessment. Pre-service teachers who agreed to participate in the study chose which of these reflections were sent for the research project and had the opportunity to send additional reflections for the purposes of the research, directly to a third party without the lecturer's knowledge. The students were aware that reflections submitted for the research were sealed until the unit was finished.

The design of the study was examined by the university's ethics committee to ensure that results would not be skewed by pre-service teachers submitting spurious reflections purely in order to pass the unit. All thirteen pre-service teachers agreed to participate in the research, however the researchers did not know this until after the unit assessment had been completed. Journals submitted for assessment but not explicitly sent as part of the research were not reported in the study.

Data analysis methods

When the unit was completed, the critical incidents and journals were summarised. To validate the conclusions arising from the data, the data were triangulated by using three independent researchers who each identified common themes (Wilson & Thornton, 2005a). The quotations in this paper have been selected to provide a vivid description of the pre-service teachers' comments rather than as a representative sample from all pre-service teachers. This paper focuses specifically on the reflective nature of the pre-service teachers' journals and the different dimension added by the bibliotherapy strategy. Fictitious female names were assigned to all students to preserve anonymity.

Results and Discussion

Critical Incidents

As reported in Wilson & Thornton (2005a), pre-service teachers' written critical incidents reflections highlighted the cycle of fear, failure and avoidance. Pre-service teachers' retained intense memories of their experiences. This was consistent with the results reported by Buerk (1982, p. 19), "Many discuss experiences with timed tests on

flash cards that led to embarrassment, an embarrassment that can be felt even years later when recalling the events”.

In the description of the critical incident, some reflected on the type of teacher that they aimed to be. They mentioned the lasting influence that an individual teacher could have on a student and were explicit in describing the impact that they felt their previous learning experiences could have on their future teaching. The cycle of fear, failure and avoidance reflected the coping mechanisms that some pre-service teachers used in situations which they found stressful. The critical incidents provided a snapshot of how pre-service teachers felt when they started the unit (Wilson & Thornton, 2005a).

Journal reflections

The themes that emerged in the critical incidents were developed more fully in the journal reflections. Using readings to assist pre-service teachers’ understanding of their own learning was central to the bibliotherapy technique. The journal entries provided evidence that students had shown a powerful emotional response to the readings, had reflected deeply on their own experiences in the light of the readings and had engaged in all four stages of the 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. “The article by Steve Dossel (1993) presented issues that I was able to relate to personally... I related deeply to the ‘unconscious defends itself’ statement by Walkerdine, 1985” (Barbara).

Catharsis: Through their reading of the articles the pre-service teachers became emotionally involved and shared and released pent-up emotion. “I experienced the being ‘stupid’ and ‘vague’ discussed by Walkerdine through shutting myself off from the pain of a ‘competitive classroom’ and protecting myself from ‘the effect of public failure’”, Dossel (p. 5)” (Barbara). “This represented the final humiliation in a long battle with mathematics and justified my belief that I was no good at mathematics. My maths anxiety was now fully fledged and is something I battle with even now” (Jenny). These are classic examples of students responding emotionally and connecting the readings with their past experiences.

Insight: Through their readings and discussion the pre-service teachers became aware that their problems might also be addressed or solved. “Instrumental and relational learning [as described by Skemp, 1976] was a bit of a mind blower for me and funnily enough gave me a little more confidence within myself, that it was the way I was taught that has made me mathematically challenged not my actual intelligence”(Felicity).

Universalization: Using their reflections on the readings and sharing of their experiences pre-service teachers were able to connect with each other and find that they were not alone in their feelings and experiences. Stories show that others have the same issues and one is not alone (Rizza, 1997). Felicity wrote: “The biggest thing I think I have learned this week was that I am really not alone in this anxiety there are lots of my peers and children still there with me”.

Bibliotherapy as a reflective tool

An important part of the pre-service teachers’ reflections revolved around the view of mathematics that had developed during their schooling. “This is how I viewed maths, as long as I knew the set of rules and applied them appropriately then I didn’t really need to know why [reflecting on Skemp, 1976, p. 3]. To me maths was all about getting the right

answer” (Mandy). “I do not feel I was provided with the opportunity to construct knowledge of mathematics” (Odette). 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.” Buerk (1982, p. 19) associated the “dualistic perception of mathematical knowledge” and discomfort which comes with it with the development of the “math avoidant” student. Jenny’s reflections about the foundations of mathematics anxiety for teachers “in the conflict between the method by which they became ‘subjected’ to the teaching of mathematics (Walkerdine 1990) and the current research and practices being taught to them as pre-service teachers” is consistent with Buerk’s analysis of how her students’ view of mathematics knowledge may be in conflict with their general view of knowledge.

The use of bibliotherapy encouraged pre-service teachers to reflect deeply about themselves as learners of mathematics: “The article helped answer many questions I had about my own experiences of learning maths” (Barbara), “[students] just aren’t making the connections so this in turn affects their self-confidence and they feel stupid and have to start employing coping strategies. I know that’s what I did, it was better to be the class clown than the class idiot” (Felicity), Odette’s grades from school were “a reflection of my ability to observe and imitate”, not of her mathematics understanding, “Basically I feel a bit cheated — like I got a second rate education” (Jenny). Realising that it was not their fault was part of the healing process.

Their reflection on their own circumstances was followed by a consideration of what it could mean for the future. “I can only hope that at the end of this semester I can turn this around and actually make a difference to another child so that they don’t experience what I have” (Felicity). The pre-service teachers discussed the implications of the readings for themselves as teachers and identified the effects of the readings on their intended teaching practices. In several cases during the eight weeks of the journal reflections the focus of the comments moved from reflections about how inadequate they felt to a recognition that the best teachers were not always those who had performed best in mathematics at school: “it gives me great comfort to know that although I may not graduate at the top of the mathematics class, this will have no lasting bearing on my ability to teach it” (Jenny, reflecting on Askew et al, 1997). They felt that this unit would help them to teach students who were experiencing difficulties. “This subject has given me awareness that while a lot of students may be experiencing difficulty in maths, there are many resources available to assist.” (Cathy).

Conclusion and Implications

One of the overriding features of the pre-service teachers’ journal reflections was that the pre-service teachers responded emotionally. The bibliotherapy process is an innovative way of eliciting pre-service teacher reflections. Its power is in the way that pre-service teachers’ cognitive response is allied with their emotional response. In comparison to other reflective practices, the potential of bibliotherapy lies in opportunity for the process to change the way pre-service teachers feel.

“People will forget what you said, people will forget what you did, but people will never forget how you made them feel.” - unknown

Clearly such a study, conducted over a short time in a university environment, cannot reliably predict how these pre-service teachers might convey their feelings about

mathematics to students or how they will actually teach mathematics in the classroom. An obvious direction for future studies is to research the teaching practices of these pre-service teachers in the future to examine the long-term and situational effect of the bibliography process. Despite their goals, there is the possibility that once in the classroom they will teach as they were taught. “Our challenge is to help preservice teachers confront their past experiences and anxieties about teaching and learning of mathematics. If these are openly dealt with during their university education, fewer teachers may be content to teach just as they have been taught” (Wolodko, Willson & Johnson, 2003, p. 224).

Teaching mathematics well, in an engaging way, to pre-service primary teachers is clearly important in their teacher education, however, an explicit focus on learning difficulties may well prove a powerful additional element in addressing some of the well-documented anxiety felt by many pre-service primary teachers. The significance of the bibliotherapy technique is that the identification, catharsis, insight and universalisation developed allows the pre-service teachers to reflect more effectively on their beliefs about mathematics learning and teaching and realise that negative experiences in school mathematics were not their fault. This suggests that bibliotherapy has the potential to be a powerful tool in healing. These reflections may convince pre-service teachers of the need to achieve positive attitudes in their classrooms. Pre-service teachers are thus enthused to make sure that the experiences of their students will be different from their own.

This enthusiasm is palpable in the pre-service teachers’ comments which reflect a determination that negative learning experiences will not be transferred to their students and continue a cycle of negative attitudes, beliefs and feelings about 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. (Jenny)

Practical Implications

Bibliotherapy provides a radically new focus for a particular type of structured reflection that has been shown to provide great potential in the education of pre-service teachers. Bibliotherapy is a technique which aims to assist individuals to overcome negative emotions related to a real-life problem by guided reading, followed by individual or group discussion in a non-threatening environment the process summarised as to “heal and enthuse”.

The impact of teachers’ beliefs about their mathematical efficacy on their teaching practice is a well-researched and ongoing problem. This piece of research adds to the knowledge about pre-service teacher reflections on their beliefs about themselves. Self-reflections have become a bit of a catch cry. Although a lot of good reflection takes place the word may have lost some of its meaning. The bibliotherapy process is an innovative way of eliciting pre-service teacher reflections. Its power is in the way that pre-service teachers’ cognitive response is allied with their emotional response. In comparison to other reflective practices, the potential of bibliotherapy lies in opportunity for the process to change the way pre-service teachers feel.

Bibliotherapy provides a new framework for looking at pre-service teacher and student reflections that has much to offer. It is an effective way of thinking about their prior experiences and looking at the reflective process. It gives teachers a framework and language

to talk about the process. It provides teachers with a shared language to talk about students' emotional responses in terms of the processes of identification, catharsis, insight and universalisation. It is therefore possible that if one of the parts of the process isn't happening then teachers can confer and change what they do and reframe their questions in ways that promote that part of the process.

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. There is the opportunity to transfer the process to other learning areas and use it to address issues other than mathematics anxiety.

The process consists of the following steps:

- Encourage pre-service teachers write about and reflect on a critical incident
- Carefully select weekly readings that relate to the experience of learning mathematics in a classroom, particularly for those students who find it difficult or suffer anxiety. Choose readings that provoke an emotional response.
- Arrange for pre-service teachers to write a guided reflection each week, which will encourage them to think about the reading and their own experience of school mathematics
- Organise for students to share their reflective writing. This is an important part of the bibliotherapy process and is different to various other practices of reflection in pre-service education.
- De-emphasise the mechanics of planning lessons.

This process may be more important than learning mathematics and more important than planning lessons because it might be the one thing that changes the way students feel about themselves, and think about themselves as learners and potential teachers.

Although pre-service education is the focus of this particular paper, the technique of bibliotherapy has been used already, to an extent, with school students. It has potential to be used to alleviate mathematics anxiety in school students, particularly with the number of children's books that have mathematics as a particular focus.

Ultimately the power of the bibliotherapy technique lies in its potential to heal and enthuse students.

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