

Mathematical Bibliotherapy for Pre-service Teachers: A Case Study

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Pre-service teachers often have negative memories of learning mathematics that can affect their confidence as teachers of mathematics. In this paper we explore the viability of an approach called *bibliotherapy* that has been used to help pre-service teachers to overcome their challenges with mathematics. We present a case study of one pre-service teacher who engaged in our ‘proof-of-concept’ study. We argue that the use of a fictional story and reflective essay provides the reader with the opportunity to connect with a variety of characters and thus has potential to expand on the bibliotherapy methods used previously in mathematics education.

Many pre-service primary teachers arrive at their compulsory mathematics courses haunted by bad memories of learning the subject. To loosen their stranglehold, instructors often ask students to write about these memories and reflect on them with others (Marmur & Darragh, 2024). Like all good therapy, this can be cathartic. Students gain insight into their experiences, recover a sense of agency, and realise they are not alone. But this kind of writing is not easy. It can be painful to revisit bad memories. Some may be so upsetting that students refuse to recall them, let alone write about them.

A gentler, less threatening alternative is to ask students to read stories about others facing similar challenges. Through reading, they may identify with a character emotionally and become invested in their success. They may experience tension and release as the character confronts and overcomes their challenges. They may learn new insights and apply them to their own problems, which may seem more manageable as a result. This use of literature for therapeutic goals is known as *bibliotherapy* and has been effective in clinical settings to treat youth and adolescents with behavioural issues (McCulliss & Chamberlain, 2013), and psychiatric patients recovering from depression and psychosis (Chamberlain, 2019). It has also been used in mathematics education to reduce mathematics anxiety among students (Hébert & Furner, 1997) and pre-service teachers (Wilson & Thornton, 2005).

The success of this approach is contingent on the choice of reading material. Research suggests that stories are more likely to have therapeutic value if the character is relatable and the problem they face corresponds to readers’ specific needs (Lutovac & Kaasila, 2020; Gerlach & Subramanian, 2016). In this paper, we report on one case study to demonstrate and explore our approach to bibliotherapy. We begin by reviewing research on bibliotherapy and how to select texts that can be used with pre-service primary teachers. We then describe the texts we used in our study, and the methods for collecting and analysing data. We report findings on the viability of our bibliotherapy approach, and end by extending the criteria by Lutovac and Kaasila (2020) for selecting appropriate texts.

What is Bibliotherapy?

Bibliotherapy is the use of literature to support therapeutic goals in the reader. These goals may be affective, such as increased empathy, positive self-image, and positive attitudes, or

cognitive, such as increased critical thinking, self-evaluation, and awareness of human behaviour (McCulliss & Chamberlain, 2013).

The therapeutic benefits of bibliotherapy were initially conceived as occurring over three phases: *identification*, in which the reader identifies with a character from the text; *catharsis*, in which the reader becomes emotionally involved in the story and releases their own emotional tension; and *insight*, in which the reader develops a new awareness of how to approach problems they face in their own lives (Hébert & Furner, 1997). Researchers have expanded these phases to include *involvement*, a primary phase in which the reader becomes interested and invested in the narrative (Heath et al., 2005); *universalism*, in which the reader looks beyond their own problems to realise that others may share or understand their challenges (Heath et al., 2005); and *projection*, in which readers consider what their newfound insights could mean for their future actions (Wilson & Thornton, 2005). Discussion of the text, and other follow-up activities like writing, play a critical role in the bibliotherapy process by promoting sharing and further reflection, which can enhance self-awareness and self-concept (Hébert & Furner, 1997).

In teacher education, bibliotherapy that is used “to help promote prospective teachers’ professional development” is known as *pedagogical bibliotherapy* (Lutovac & Kaasila, 2020, p. 495). Bibliotherapy has been used to help pre-service teachers reflect on the kind of mathematics teacher they want to be and what obstacles might stand in the way (Wilson & Thornton, 2005) and enhance their pedagogical knowledge and practice.

Effective Texts for Bibliotherapy

Lutovac and Kaasila (2020) asked prospective primary teachers to read six case studies of prospective teachers’ experiences with mathematics and write reflections on the case study they identified with most. Based on these reflections, they propose that to encourage identification, reading material for bibliotherapy should meet the following five criteria:

1. be based on the first-person so-called true stories or documents of the common experiences of other (prospective) teachers and making reading as contextualised as possible,
2. portray coping and positive resolution,
3. include turning points portraying the changes in character’s knowledge, beliefs, emotions and actions, which will encourage prospective teachers to reflect on their own changes and may even influence them,
4. have a clear pedagogical message that can benefit prospective teachers’ future practices by promoting feelings of hope, raising (self) awareness, stimulating reflection and action-taking,
5. not only enable relating to the past and present experiences, but also, if possible, enable projection of experiences to allow prospective teachers to reflect on what may happen, loose [sic] fears, provide comfort and confidence, or if needed, take preventive actions. (p. 495)

Although Lutovac and Kaasila’s (2020) study shows that texts meeting these five criteria can engage prospective teachers in pedagogical bibliotherapy, research suggests that other kinds of texts can also be effective. Academic research articles have been used successfully with pre-service teachers (Wilson & Thornton, 2005), and children’s picture books (Heath et al., 2005), fiction (Pierce, 2015) and non-fiction self-help books (Floyd et al., 2004) have been used in other contexts. In this study, we explore the viability of using a fictional short story and reflective essay that draws on research to offer insight into the story. Our research question is: *To what extent can a fictional third-person story paired with a reflective essay support pre-service primary teachers in pedagogical bibliotherapy?*

Methods

Our study is part of a larger project researching the role of story and essay in supporting people (not just pre-service teachers) to reflect on their relationship to mathematics. Here, we report on one participant from our study, using a case study methodology (Yin, 2018).

Participant and Setting

Anna (pseudonym) was enrolled in a primary Initial Teacher Education program in a large New Zealand tertiary institution. At the time of the interview, she was on her final practicum. She had previously worked as an Early Childhood Education (ECE) teacher in NZ, was a mother to a 16-year old son, and had grown up in China (where she completed her secondary school education). Her responses to a questionnaire about her attitudes towards mathematics at the beginning of the study showed that she did not experience mathematics anxiety and viewed mathematics to be a worthwhile and necessary subject.

Data Collection

Anna read a short story called *Ouch* (described below), then wrote answers to some questions about the story, such as which character she identified with the most, and her perspective on certain events in the story. Then, she participated in an individual semi-structured interview with the first author, who asked about her thoughts on the story, what emotions she experienced, and the extent to which it related to her own experiences. These questions were informed by therapeutic questioning norms (see Yoon & Penwarden, 2021). Next, Anna read an essay that discusses *Ouch* and participated in a second round of interview questions, similar to the first. Finally, one week after the interview, she completed the same questionnaire about her attitudes towards mathematics and responded in writing about whether she had thought about the story or essay since the interview.

Data Analysis

Interview data were transcribed and analysed together with the written responses to identify the participant's life details, memories, reflections on the text as a piece of writing, reflections on the story (e.g. characters, plot), and the views on teaching. They were also coded to identify evidence of Anna engaging in the six phases of bibliotherapy, which were operationalised in the coding scheme shown in Table 1. The first author conducted the initial coding, then shared the coding with the co-authors, as well as the coding scheme. The co-authors used the coding scheme to analyse the transcript of another preservice teacher (not reported here), compared coding, and discussed the criteria. This led to a refinement of the coding scheme, and the establishment of a new code that identified evidence of distancing oneself from difficult experiences and emotions. Finally, the first author re-coded the data using the revised coding scheme.

Table 1*Coding scheme for bibliotherapy phases for Data Analysis*

Phase	Indicators of engagement in bibliotherapy phase
Involvement	Expressions of interest, e.g. curiosity, surprise, appreciation Investment in the characters, e.g. imagining what happens to them next Engagement with the text, e.g. wanting to use the texts
Identification	Linguistic markers of identifying, e.g. relate, similar, empathise, know Relating to or recognising <i>relationships</i> between characters
Insight	Expressions of newness or surprise about information Insights into the characters, as well as into their own experiences
Catharsis	Expressions of emotions, attitudes, values, beliefs Tension and release
Universalism	Awareness that others may share their challenges
Projection	Reflections on what makes a good teacher Hopes and challenges for their own teaching Consideration of how their insights can bear on their future actions as teachers

Description of the Texts Used in the Research

Our study uses two interlinked texts, written by the first author:

6. A short story called *Ouch* (1608 words);
7. A reflective essay that analyses the events in *Ouch* (2225 words).

The *Ouch* story and its accompanying essay can be found in Yoon (2026), with an early version of *Ouch* published in Yoon (2025a). The story and essay are part of a larger collection that seeks to engage readers in reflecting on their relationship with mathematics, and to share research insights into mathematical teaching and learning (see Yoon, 2025b for a detailed discussion of the aims). The target audience for these stories and essays is parents, teachers, pre-service teachers, and anyone interested in how children learn mathematics.

The *Ouch* story features a mathematics-averse mother, Jenny, who observes her 4½ year old daughter, Rosie, playing with her friends at the early childhood centre. When Rosie counts some toy figurines incorrectly, Jenny remembers being humiliated as a child for making a similar mistake in front of the class, with her primary school teacher expressing her frustration and impatience. She turns to Rosie's teacher, Sunita, who is with her, watching the children play, and says, "She gets that from me, I was hopeless at maths, too... I don't have a maths brain ... I'm not a maths person." Sunita doesn't laugh. Gravely, she tells Jenny that she must "never say that again." Jenny is taken aback but Sunita is called away to attend to another child before she can explain the reasons for her request. The story ends with Jenny wondering why Sunita, who is usually so gentle and supportive, has told her off.

The essay explores Jenny's *maths brain/math person* speech and possible reasons behind Sunita's request, such as the intergenerational passing down of mathematics anxiety and avoidant behaviour through language that communicates a fixed mindset (Boaler, 2016). It uses the analogy of learning to drive a car to show how mathematics learning is dependent on practice and instruction, not talent alone. It discusses how negative attitudes towards mathematics formed in childhood can be reinforced by culture and society (Epstein et al., 2010), and ends by illuminating principles of counting, such as order-irrelevance and cardinality, as well as why children commonly omit the number 15 while counting due to its unusual construction as *fifteen* rather than *fiveteen* (Fuson, 1988).

Findings

Anna exhibited all six phases of bibliotherapy in her interview and her written responses.

Involvement

Anna was initially confused by *Ouch* (the story), saying she had expected it to be more like a standard research article, containing “goals, objectives, implementation.” Yet she was engaged with the story, describing it as “outside the box ... very narrative and illustrative, like a fiction ... like a novel ... very beautiful.” She called it a “good learning story” about how to help Rosie “find the fun of maths,” and clarified that a learning story was a narrative written by an ECE teacher or family member that describes and reflects on some aspect of a young child’s learning journey (see Carr, 2001). Anna described the essay as “the missing part of a learning story” that explained “all the theory, all the science ... behind learning.” For her, the essay completed the *Ouch* story to create a “perfect learning story now.”

Identification

Anna identified with Sunita, saying she appreciated Sunita’s strength and her ability to protect children from harmful messages, and acknowledged a similarity in having worked as an ECE teacher, too. Anna is also a parent, but she said she “wasn’t like the Mum (Jenny)” in her approach to her child’s learning. Yet despite not identifying with Jenny as a parent, she strongly related to Jenny’s experience as a child, saying the disapproval Jenny received from her primary school teacher “reminded me of other experiences that brought up similar feelings.” She shared a memory of her year 6 teacher who told her, “He never seen a girl like me [who] just had such a bad maths achievement.” Until then, she had enjoyed mathematics and performed well in it, but her teacher’s criticism forced her to reconsider this. She connected this memory to Sunita’s protection of Rosie, thereby relating to Rosie’s vulnerability as a child.

Catharsis

Anna was surprised that the *Ouch* story brought up old memories for her, saying, “I didn’t expect it ... to go back into my, the someone’s personal experience,” changing the reference to herself with the vaguer “someone”. Some of her memories were ones she had repressed: “It’s like something that’s buried deeply in my mind and never touched that. But when I read this story, it also gave me a chance to open a little bit and just dig into [it] and check.” For Anna, there was a strong connection between her emotional experiences and those in the story: “This story is like a path or like a tunnel, just connected to my experience of studying math. And it’s not quite the same, but I think the emotion and feelings [in] that story ... [are] really similar.”

Insight

When Anna initially shared her experience of being criticised by her Year 6 teacher, she defended him as “a great teacher” who had “very high standard professional skills.” But as she reflected on how much she valued Sunita’s intervention to protect Rosie, she came to acknowledge the harmfulness of her Year 6 teacher’s actions, saying, “Maybe I feel sorry. I feel sorry for myself when I was young and had that discrimination. Yeah, something like that. Yeah.” Later, she reflects on the parallel experience Jenny had with her childhood teacher, saying the teacher “just shouldn’t have done that.” She also expressed gratitude for the new insights the essay gave her into mathematics learning, such as why 15 is frequently omitted by children learning to count.

Universalism

In the final reflection one week after the interview, Anna acknowledged the similarity between her own experience and Jenny’s, saying that Jenny “carried trauma from her own

family and school experiences”. Anna explained that Jenny’s fear of failure stayed with her and was passed on to her daughter, which prompted her to say she was “not a maths person” and tried to justify her daughter’s similar struggle. Crucially, she commented that Jenny’s struggles with mathematics were not her fault: “She simply didn’t have the right resources, teachers, or teaching approaches to support her learning. She should not blame herself for that.”

Projection

Throughout the interview, Anna frequently reflected on what makes a good teacher in response to the texts and the memories they evoked. She was critical that Jenny’s primary school teacher made her frustration with Jenny’s mistakes visible, calling it unprofessional, an over-reaction, and that teachers should express their emotions in ways that don’t hurt the child. In addition to reflecting on her Year 6 teacher’s harsh criticism, she also mentioned a physics teacher who “gave up on me,” a chemistry teacher who “ignored me,” and an excellent chemistry tutor whose passion and dedication re-ignited her interest in the subject. In response to the analogy in the essay about learning to drive a car, she talked about a wonderful driving instructor who instilled confidence in her when she was “so scared,” and taught her carefully and “step-by-step.” She recalled her mother, who was a “genius,” not being able to teach her when she asked her a question, as she couldn’t understand what her daughter was struggling with. She said, “How to teach is really important,” that it can determine a child’s path, and that teachers and parents should not get upset with children when they find learning difficult. She said that she wants to be the kind of teacher who can relate to a child’s struggle in learning, who can regulate their emotions around children, who can instill confidence, who knows their students’ developmental stage, and can teach effectively to fit with their needs. Overall, Anna participated in all six phases of bibliotherapy while reflecting on the *Ouch* story and its accompanying essay.

Discussion

Anna’s case study challenges three of Lutovac and Kaasila’s (2020) criteria for selecting texts for pedagogical bibliotherapy.

First, *Ouch* is a third-person limited story of fiction with Jenny, a parent, as the protagonist, so it fails the criterion of being a “first-person so-called true [story]” of a “(prospective) teacher.” Nevertheless, it offers several opportunities for identification. In Lutovac and Kaasila’s (2020) study, the opportunities for identification were individual and conscious. Participants were given six case study biographies of prospective teachers and were asked to choose the one they identified with most. This instruction, together with the closeness of the first-person narrative, potentially created a binary effect where the participant either identified with the protagonist and their experiences or they did not, creating a one-to-one mapping between the chosen biography and the participant. In contrast, *Ouch* introduced Anna to multiple characters, and although Anna identified with the teacher (Sunita) the most, she also related to aspects of the other characters who were not teachers. For example, she did not identify with Jenny as a parent due to differences in their attitudes towards mathematics learning, yet she found herself recalling childhood experiences she had long forgotten that were similar to Jenny’s as a child. These memories surprised her and fed into her reflections on the kind of teacher she wanted to be. The variety of characters in *Ouch*, and the more distant third-person point of view may have created more subtle opportunities for Anna to explore repressed memories than she might have otherwise.

Ouch also fails Lutovac and Kaasila’s (2020) second and third criteria by not portraying a “positive resolution” or “turning points portraying the changes in character’s knowledge, beliefs, emotions and actions” (p. 495). This is because *Ouch* does not follow the classic story structure of ‘a hero overcoming a challenge’ but rather portrays a ‘slice of life’ that introduces

a problem without resolving it. The story ends with Jenny aware of a problem with her *maths brain/maths person* speech, but unsure what the problem is, or what to do about it. The essay on *Ouch* opens the possibility of a positive resolution to this problem by inviting the reader to wonder whether Jenny's attitude towards mathematics could change. Yet it does not show this change occurring and focuses on illuminating the problem rather than fixing it. Thus, Anna's case study shows that pedagogical bibliotherapy texts do not have to be first-person nonfiction accounts of teachers who positively resolve a problem and experience turning points in their beliefs and actions.

Anna's case study supports Lutovac and Kaasila's (2020) fourth criterion that texts should have a "clear pedagogical message that can benefit prospective teachers' future practices." However, it fulfils this through two texts, not one. The essay that accompanies the *Ouch* story uses research to unpack questions raised in the story—how negative attitudes towards mathematics are formed, how they can be unintentionally passed down, and how children learn to count. Anna appreciated these pedagogical insights and said they were directly applicable to her own teaching. It would have been possible to communicate these insights in a standalone essay, but such an essay would have missed the emotional resonance created by the link to the story. Similarly, it would have been possible to communicate these insights in a standalone story (for example, by having Sunita teaching Jenny about how children count), but this would have required reducing the information to maintain the credibility of the story. We are also mindful that expecting stories to deliver a message places an unnatural burden on the literary form: "The notion that the story has a message assumes that it can be reduced to a few abstract words, neatly summarised ... if that were true, why would writers go to the trouble of making up plots, scenery ... why not just deliver the message?" (Le Guin, 2005, para. 5-6). For us, having two interlinked texts meant that each could perform the function they were most suited to: the story sparking the reader's curiosity about an imaginary scenario, the essay offering analysis and insight.

Anna's case study provides preliminary evidence that story-essay pairings like *Ouch* can be viable texts for pedagogical bibliotherapy with pre-service primary teachers. Based on our findings, we propose incorporating the following into Lutovac and Kaasila's (2020) criteria for selecting texts for pedagogical bibliotherapy:

- Third-person stories involving multiple characters involved in the mathematics learning context, with a variety of identities (not all teachers);
- Stories that frame or present a problem without necessarily showing a positive resolution to it, nor accompanying changes in the character's beliefs and actions;
- Story-essay pairings in which the essay analyses and offers insight into the problems of learning and pedagogy presented in the story.

More research is needed with a wider variety of texts to expand these criteria further and reframe them in terms of the functions the texts should perform, rather than specifying the form they should take. In our research, we are currently exploring the bibliotherapeutic possibilities of additional story-essay pairings (e.g. *Whiskers* from Yoon, 2025a), with other participants, including parents of young children, practising primary teachers, and pre-service primary school teachers at the beginning of their initial teacher education with a range of attitudes towards mathematics.

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