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TEACHER EDUCATION & DEVELOPMENT | RESEARCH ARTICLE

Maltese teachers' beliefs concerning the integration of children's literature in mathematics teaching and learning

Marie Therese Farrugia¹ and Natthapoj Vincent Trakulphadetkrai^{2*}

Abstract: This exploratory mixed-methods study set out to explore Maltese primary school teachers' perceived barriers to, and enablers for, the integration of children's literature in mathematics teaching. Data were collected by means of an online questionnaire and semi-structured interviews, and analysed thematically using Ajzen's Theory of Planned Behaviour. The responses given by the participants showed that integration of mathematics and stories was not a common practice. The perceived barriers were categorised as *Resource Constraint*, *Time Constraint*, *Lack of Pedagogical Knowledge and Confidence*, *Doubts about Outcome Expectancy*, and *Inhibiting Social Norms* while the three perceived enablers identified were *Pedagogical Benefits*, *Love of Stories*, and *Enabling Social Norms*. Given that the majority of the participating teachers acknowledged the potential benefits of the approach and expressed a wish for training, one key recommendation of the study is for teaching mathematics through stories to be explicitly included in pre-service and in-service professional development programmes.

Subjects: Mathematics & Numeracy; Language & Literacy; Teachers & Teacher Education

ABOUT THE AUTHORS

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Natthapoj Vincent Trakulphadetkrai is Associate Professor of Mathematics Education at the University of Reading (UK). His research interests are centred around the use of storytelling (particularly in the story picture book format) to help enrich mathematics teaching and learning experiences.

This paper is part of a series of papers in which the beliefs of teachers in different countries concerning the integration of children's literature in mathematics teaching and learning are investigated. This project is led by Natthapoj Vincent Trakulphadetkrai.

PUBLIC INTEREST STATEMENT

This paper focuses on the integration of children's literature and mathematics in elementary education in Malta. Recent research has shown that children's literature offers a good context for children to learn mathematics in a meaningful way, and since the Maltese national curriculum promotes cross-curricular and thematic teaching, it is important to give serious consideration to an integrated approach. However, there is limited research about what teachers actually think of the approach. Therefore, the authors made use of an online questionnaire and in-depth interviews to collect data about Maltese elementary school teachers' beliefs about the topic. The key foci were: What barriers do the teachers perceive with regard to implementing the approach? What enables, or would enable, them to implement it? The authors consider this information important to collect, because it can inform any future action to be taken to encourage the integration of children's literature and mathematics teaching and learning.

Keywords: mathematics education; children’s literature; teachers’ beliefs; the theory of planned behaviour

1. Introduction

The idea of integrating mathematics and storytelling as part of the school curriculum is not an altogether new one. In the early 20th century, Smith (1919), for example, published a book of number stories appropriate for supplementary reading in the primary school, expressing the hope of creating “a new interest not merely in the study of arithmetic but in the story of the development of our civilization” (p. vi). Linking mathematics with children’s literature has been given importance in recent decades since, as noted by Trakulphadetkrai (2018), children’s literature can provide a meaningful context for children to develop their mathematical thinking. Indeed, according to the review done by Ewing Monroe et al. (2018), wherein they cite various research studies, the use of children’s literature has been consistently found to enrich mathematics teaching and learning.

In the context of Malta, the use of children’s literature in mathematics teaching and learning aligns well with the aim of the Maltese National Curriculum Framework (Ministry for Education and Employment, 2012). Specifically, the Curriculum advocates “a move away from an exclusively subject-based approach that favours fragmentation and compartmentalisation of knowledge to a more cross-curricular, thematic, interdisciplinary and collaborative approach that reflects real life situations” (p. 31). Similarly, a related policy document *Learning Outcomes Framework* (Directorate for Quality and Standards in Education, 2015) also allows for an approach of integration. According to this document, in the first two years of Primary (Grades 1 and 2, ages 5–7), mathematics is expected to be integrated with other learning areas, and prompted by children’s interests. For Grades 3 to 6 (ages 8–11), “These learning outcomes are designed to be used in a range of delivery contexts and taught using different methods” (Directorate for Quality and Standards in Education, 2015, p. 7). Thus, using children’s literature to address mathematical ideas would appear to be a very suitable approach as part of the new curricular direction, but what Maltese teachers actually think about this approach (and the extent to which they adopt it) is virtually unknown.

Exploring teachers’ beliefs about teaching and learning are important, as Felbrich et al. (2014) state that beliefs constitute a central part of a person’s professional competence as they influence choice of actions. Consequently, as argued by pioneers in the research field of teachers’ beliefs, such as Thompson (1984) and Pajares (1992), any attempt to influence teaching must begin with an understanding of teachers’ beliefs. The current study thus set out to shed light onto Maltese teachers’ beliefs concerning the integration of children’s literature in mathematics teaching, particularly in relation to their perceived barriers to and perceived enablers for the adoption of the approach.

2. Integrating children’s literature with mathematics

While much is written about “children’s literature”, it is interesting to note that researchers tend to use the term without actually defining it. For example, one can query whether poetry, lyrics, drama and film productions intended for children can also be considered as forms of children’s literature. While we fully acknowledge the messiness in debates on the operationalization of children’s literature, we choose a definition by McDowell (1976) as our working definition. This describes children’s literature as texts that are “usually shorter, they tend to favour an active rather than a passive treatment, with dialogue and incident rather than description and introspection; child protagonists are the rule; [...] language is child-oriented” (pp. 141–142). Consequently, we can then think of “integration of children’s literature and mathematics” as a two-fold process: on one hand a teacher engages the children in literacy practices like examining and talking about the book jacket, identifying the author and illustrator, predicting events, listening to the story, reading for pleasure, learning new vocabulary, dramatizing, and so on. On the other hand, the teacher prompts discussion about mathematical aspects present in the book and plans related follow-up tasks and investigations.

Janes and Strong (2014) explain the benefits of using children’s literature within mathematics education. They explain that stories motivate learning since they are appealing, they are written about children’s experiences and/or lived world and reflect their emotions; they help children consider ideas and experiences in different ways. Furthermore, stories foster critical, creative thinking, problem solving and communication since they have the potential to engage children in meaningful and reflective conversations, discussions and investigations. More specifically, children will have opportunities to be exposed to and explore the language of mathematics.

Indeed, using stories in mathematics teaching and learning allows for a meaningful cross-curricular opportunity where literacy and mathematics can complement each other. Research studies, such as those of Hassinger-Das et al. (2015) and Purpura et al. (2017), have empirically confirmed the positive impact of using stories to develop pupils’ language development, particularly their vocabulary knowledge. This is crucial particularly when, Trakulphadetkrai et al. (2020) have found connections between pupils’ mathematical and language abilities. Research over the past decades have consistently shown that language and literacy, particularly in the form of children’s literature, can be used to foster pupils’ mathematical thinking (Van den Heuvelpanhuizen et al., 2016) and also positive attitudes towards the subject (McAndrew et al., 2017). Ewing Monroe et al. (2018) carried out a systematic analysis of research that reported on the effects of using children’s literature in teaching mathematics at elementary level. Despite differences in methods and foci of the various studies considered, Ewing Monroe et al. noted that most of the studies reported increases in one or more of 15 benefits. The benefits included increased problem-solving abilities, mathematical confidence and mathematical vocabulary, amongst others.

According to the website *MathsThroughStories.org*, there are well over 500 children’s literature in the picture book format and in the English language which can be used to teach over 40 mathematical concepts, ranging from counting and basic arithmetic operations to equations and exponential growth. While some of these stories have an explicit mathematical focus (e.g., “Fractions in Disguise” [Einhorn, 2014]), others contain a much more implicit mathematical focus (e.g., “The Doorbell Rang” [Hutchins, 1986]), requiring teachers to put on a “mathematical lens” (Trakulphadetkrai, 2018), so that they would be able to identify meaningful mathematics teaching and learning opportunities in these stories. The fact that there exists so much children’s literature in English is potentially a great advantage to Maltese teachers and students, since English is one of the two official languages of Malta. Education in Malta has long been accessed bilingually through Maltese, the national language, and English. The prominence of English in Malta generally, and in Maltese education in particular, is due to the fact that the island was a British colony from 1800 to 1964 (for a discussion of the topic see, for example, Camilleri Grima, 2013) and the use of English texts in schools continues to be a common practice. However, it should also be noted that a very small number of mathematics-related stories have been translated into Maltese, and these stories may therefore be read in Maltese instead. One example is “*How big was a dinosaur?*” by Milbourne and Riglietti (2011/2016)).

3. Theoretical framework

Given our own conviction of the pedagogical benefits of integrating literature in mathematics teaching and learning as previously outlined, the current study set out to shed light onto Maltese teachers’ beliefs about the topic. More specifically, our research question was: *What are Maltese teachers’ beliefs concerning perceived barriers to, and enablers for, the integration of children’s literature in mathematics teaching?*

According to Philipp (2000, p. 259), “beliefs might be thought of as lenses that affect one’s view of some aspect of the world or as dispositions toward action. Beliefs, unlike knowledge, may be held with vary degrees of conviction and are not consensual.” Hence, our embarking on this study rests on the assumption that the beliefs of teachers are related to their actions performed in class, and ultimately to how their students learn. This is an assumption that is common to researchers in

the area, as may be found in various studies, such as those compiled by Bernack-Schüler et al. (2015) and Blömeke et al. (2014). Studies may focus on beliefs about the nature of mathematics (e.g., Felbrich et al., 2014) or on beliefs about the teaching/learning of mathematics (e.g., Burroughs & Schmidt, 2014). The latter type of study might then hone in more specifically on particular aspects of the curriculum, such as on beliefs related to the teaching/learning of arithmetic (Bräunling & Eichler, 2015) or the use of technology to enrich mathematics teaching and learning (e.g., Erens & Eichler, 2015). The current study also addresses one particular aspect of mathematics education, namely, the integration of children's literature with mathematics teaching and learning. As it will be highlighted shortly, this topic is very under-researched, and we believe our study's findings will contribute to the research area.

To help interpret our findings, we adopted Ajzen's (1991) Theory of Planned Behaviour (TPB). According to Ajzen, beliefs have a direct, and consistent influence on a person's behaviour. Specifically, the TPB highlights three key beliefs that could influence a behaviour: *Attitude toward the behaviour*, *Subjective norms* and *Perceived behavioural control*. *Attitude toward the behaviour* is "the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question" (Ajzen, 1991, p. 118), while *subjective norm* refers to the "perceived social pressure to perform or not to perform the behaviour" (Ajzen, 1991, p. 118). *Perceived behavioural control* refers to the "perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipated impediments and obstacles" (Ajzen, 1991, p. 118). In summary, the more favourable one's attitude towards an intended behaviour is, the more supporting the social norm is to that behaviour; and the easier it is to implement that intended behaviour, the more likely it is that such intended behaviour will get implemented.

We consider the theory to be useful to our research interest since the underlying assumption of the TPB is that beliefs may either enable, or present barriers to, a person's intention to change, and hence their behaviour (Ajzen, 1991). Furthermore, the theory will allow us to interpret our results, and hence answer our research question, in terms of *Attitudes toward the behaviour*, *Subjective norms* and *Perceived behavioural control*. This will allow us to categorise, and hence understand more specifically, the various beliefs expressed by educators with regard to their perceived barriers and enablers.

4. The current study and its contribution to the field

To the best of our knowledge, there have been three previous studies carried out related to the topic at hand, two of which were carried out in the US. Cotti and Schiro (2004) used a very structured questionnaire and targeted 109 pre-service and 18 in-service teachers. The participants were presented with a list of statements that expressed different reasons for using children's literature in mathematics, and requested to rank order the afore-mentioned reasons according to preference. The pre-determined foci of the questions were: instructional purposes, teaching, learning, knowledge, and children and evaluation. However, this approach prevented the emergence of beliefs that were not part of the instrument. A second study is that by Wilburne and Napoli (2008), wherein the researchers investigated the beliefs of pre-service teachers before and after the trainees were given the responsibility of designing and implementing a lesson that integrated mathematics and literature. Eight pre-service teachers participated, and themes that emerged from this study were: *literature motivates students to learn mathematics*, *integration helps to make the mathematics more meaningful* and *the need for teachers to make mathematical links with the literature*. The present study varies from these two studies in design as will be explained shortly.

More recently, and more closely related to the current study, is the study by Prendergast et al. (2019) which explored Irish early years and primary school teachers' perceived enablers for and barriers to the integration of children's literature in mathematics teaching. Drawing from the open-ended questionnaire responses of 51 in-service teachers and 103 pre-service teachers, the study revealed 13 perceived barriers that were grouped under five themes, namely *Resource Constraint*,

Time Constraint, Lack of Pedagogical Knowledge and Confidence, Doubts about Outcome Expectancy, and Inhibiting Social Norms, as well as 12 perceived enablers that were grouped under three themes, namely *Perceived Pedagogical Benefits, Enabling Social Norms, and Love of Children's Literature*. The present study made use of the same open-ended questionnaire instrument as that used by Prendergast et al. (2019). However, in the present study, in-depth interviews were carried out as a follow up to the questionnaire responses, and thus this aspect was particular to the Malta study.

Apart from the research design, our study differs from others also in terms of the theoretical framework employed. The TPB is generally used within the field of social sciences in order to elaborate the determinants of individual decision making (Si et al., 2019). One purpose of such studies is to manage or influence individual behaviours and to increase awareness of social issues (Si et al., 2019). Various contexts have been studied with three examples being: environmentally relevant and sustainable behaviours (Si et al., 2019), University students' entrepreneurial intentions (Utami, 2017) and the prediction of breast self-examination intentions and behaviour in females (2009). Hence, the application of the TPB to a curricular aspect of mathematics education is a novel approach.

5. Research methods

5.1. Recruitment of sample

The current study adopted purposive non-probability sampling in relation to the questionnaire. 208 pre-service teachers (i.e., the whole population enrolled in the Bachelor of Education (Honours) programmes at the only teacher training institution in Malta at the time of data collection in 2016) were contacted. The majority were following Primary Education while a smaller number were reading for a degree in Early Childhood Education. Moreover, 279 in-service teachers were invited to complete the questionnaire. These teachers had graduated from the aforementioned institution and represented Graduation Classes between, and including, 2003 and 2013. Individuals were contacted through the University held e-mails and provided with information about the study together with the link to the online questionnaire. The questionnaire could be answered and submitted anonymously, but respondents were also invited to give their name and contact e-mail should they be willing to be contacted in case we wished to clarify, or follow up, a response. Prior to the data collection stage, the study had received ethical clearance from the first author's institution.

In all, 34 participants completed the questionnaire, including 11 pre-service teachers and 23 in-service teachers. The response rates for pre-service and in-service teachers were thus 5.3% and 12.2% respectively. We can only conjecture about the reasons for the low response rate; possibly, this was due to the large number of education-related online and school/University-based questionnaires circulated annually, a phenomenon familiar to Author 1 through her professional experience.

Table 1 summarises the key characteristics as collected through the questionnaire, together with some basic information reported by the teachers regarding the integration of stories. Of particular interest is that when asked how frequently they have incorporated children's literature as part of their mathematics teaching in the current academic year, almost 70% of the teachers indicated that they have either never used children's literature in their mathematics teaching or have done so very infrequently (i.e., less than five lessons a year). Only four in-service teachers reported that they have used children's literature frequently in their mathematics teaching.

Malta is a very small country (population of approximately 490 000 living on 316 square kilometres). Therefore the study's target teacher population was small to begin with and there are empirical studies (e.g., Underwood, 2012) that have explored teachers' beliefs using an even smaller questionnaire sample size. However, we still considered the low participation rate as a limitation. Hence, we decided that it would be good research practice to enhance our data through in-depth interviews, and invited the 12 respondents who had given their names. Seven accepted and were allocated

Table 1. Survey participants: Demographic characteristics and general use of literature

| Characteristics | Total | | Pre-service teachers | | In-service teachers | |
|--|--------|-------|----------------------|-------|---------------------|-------|
| | N = 34 | n (%) | N = 11 | n (%) | N = 23 | n (%) |
| Sex | | | | | | |
| Male | 1 | 2.9% | 1 | 9.1% | 0 | 0% |
| Female | 33 | 97.1% | 10 | 90.9% | 23 | 100% |
| Class taught | | | | | | |
| Kindergarten (3-5 year olds) | 2 | 5.9% | 0 | 0% | 2 | 8.7% |
| Years 1-2 (5-7 year olds) | 11 | 32.4% | 4 | 36.4% | 7 | 30.4% |
| Years 3-4 (7-9 year olds) | 11 | 32.4% | 6 | 54.5% | 5 | 21.7% |
| Years 5-6 (9-11 year olds) | 9 | 26.5% | 1 | 9.1% | 8 | 34.8% |
| A wide range of class levels/Not indicated | 1 | 2.9% | 0 | 0% | 1 | 4.3% |
| Teaching experience level (years) | | | | | | |
| 1-10 | n/a | n/a | n/a | n/a | 16 | 69.6% |
| 11-20 | n/a | n/a | n/a | n/a | 6 | 26.1% |
| 21-30 | n/a | n/a | n/a | n/a | 1 | 4.3% |
| > 30 | n/a | n/a | n/a | n/a | 0 | 0% |
| Whether training on integrating children's literature in mathematics teaching is/was provided as part of teacher training | | | | | | |
| Yes | 12 | 35.3% | 3 | 27.3% | 9 | 39.1% |
| No | 17 | 50% | 8 | 72.7% | 9 | 39.1% |

(Continued)

Table 1. (Continued)

| | Total | | Pre-service teachers | | In-service teachers | |
|--|-------|-------|----------------------|-------|---------------------|-------|
| | | | | | | |
| "Too long ago, can't remember"/Not indicated | 5 | 14.7% | 0 | 0% | 5 | 21.7% |
| Frequency of using children's literature in mathematics teaching within the current academic year | | | | | | |
| Never | 15 | 44.1% | 8 | 72.7% | 7 | 30.4% |
| Very infrequently (1-5 lessons) | 8 | 23.5% | 2 | 18.2% | 6 | 26.1% |
| Infrequently (6-10 lessons) | 4 | 11.8% | 0 | 0% | 4 | 17.4% |
| Frequently (>10 lessons) | 4 | 11.8% | 0 | 0% | 4 | 17.4% |
| Not indicated | 3 | 8.8% | 1 | 9.1% | 2 | 8.7% |

pseudonyms as follows: Sharon (kindergarten teacher, children aged 3–4 years), Naomi (Grade 1, aged 5–6), Lynne (Grade 2, aged 6–7), Emma and Daniela (Grade 3, aged 7–8), Alison and Greta (Grade 6, aged 10–11).

Due to the size of the study, we do not make any generalizations based on the findings. Instead, we focus on revealing insights and beliefs of the study’s participants. We consider our data as exploratory and as a foundation for further investigation. Furthermore, the data provide a potentially good starting point for prompting discussion amongst Maltese educators on the topic of integration of literature and mathematics.

5.2. The research instruments

The current study adopted the mixed methods research approach using an embedded design whereby one type of data (an electronic open-ended questionnaire) served as the primary source while the other (follow-up semi-structured interview) offered secondary support (Creswell & Plano Clark, 2011). Both the questionnaire and interview were conducted in English.

As stated by Burroughs and Schmidt (2014), the study of teachers’ beliefs is a “tricky” exercise, since beliefs are internal characteristics and therefore hard to measure. Indeed, Pajares (1992, p. 308) states that “belief does not lend itself easily to empirical investigation” and that therefore, for purposes of investigation, beliefs must, to some extent, be inferred. Thus, in the current study, we worked within an interpretative paradigm: as indicated by Cohen et al. (2007) “the central endeavour in the context of the interpretive paradigm is to understand the subjective world of human experience” (p. 21).

The questionnaire contained four key sections: the first section asked the participants to define and give examples of children’s literature; the second section asked the participants to write the first five thoughts that come to their mind when they think about “the integration of children’s literature in mathematics teaching and learning”; the third section contained eight questions relating to their experience (if any) of implementing this integrative approach; and the fourth and final section asked contextual information about the participants. The data reported in this paper were drawn from the participants’ responses to the two following questions in the third section of the questionnaire: 1) “*In your experience, what are the key barriers that stop you from incorporating (more) children’s literature in your mathematics teaching?*” and 2) “*If you have previously incorporated children’s literature in your mathematics teaching, what enabled/encouraged you to do so?*”. (Pre-service teachers were asked to refer back to their Teaching Practices in order to respond).

The questionnaire instrument was originally developed and piloted with 109 pre-service teachers in England, as reported in Trakulphadetkrai (2015), and was later used to collect questionnaire data from 51 in-service teachers and 103 pre-service teachers in Ireland, as reported in Prendergast et al. (2019). In the main, the questionnaire questions as used in the present study were retained as in the original, with only some amendments in the items that asked for participants’ contextual information.

The follow-up audio-recorded interview was of approximately 30 minutes in duration and held at a location of the interviewee’s choice. The participants were asked to expand on some of their written questionnaire responses.

5.3. Data analysis

The open-ended questionnaire data were initially tackled by having any vague or unclear responses discarded. The remaining data were then analysed manually and thematically whereby the survey participants’ perceived barriers and enablers were read and then re-read to identify emerging themes in order to develop the coding frameworks (see Tables 2 and 3). This thematic analysis was done in two stages: the focus was first on identifying “categories”, so that similar categories could then be grouped together into a set of coherent themes. For example, these three categories—*Perceived unsuitability of the approach for children of certain age groups*, *Perceived incompatibility between children’s literature*

| Table 2. Survey responses concerning perceived barriers to the integration of children's literature in mathematics teaching | | | | |
|--|---|------------------------------|--|---|
| Categories | Examples of statement | Total (N = 34/34) | In-service teachers (N = 23/23) | Pre-service teachers (N = 11/11) |
| | | f* (%) | f* (%) | f* (%) |
| Theme 1: Time Constraint (45.7%) | | | | |
| Limited or lack of time (unspecified) | "Time restrictions" | 9 (19.6%) | 7 (21.9%) | 2 (14.3%) |
| Curriculum pressure | "There is too much content to cover to have the luxury to incorporate literature with Maths" | 7 (15.2%) | 5 (15.6%) | 2 (14.3%) |
| Limited or lack of time to plan for and deliver lessons using this approach | "Limited time in class is one of the main problems. Incorporating literature would certainly result in much more lengthy lessons and since time is very limited in primary classrooms, having longer lessons would cause further issues." | 5 (10.9%) | 3 (9.4%) | 2 (14.3%) |
| Theme 2: Lack of Pedagogical Knowledge and Confidence (21.7%) | | | | |
| Limited or lack of awareness of suitable children's literature for specific mathematical concepts | "Also which ideal texts to choose and for which [mathematical] topics." | 6 (13%) | 4 (12.5%) | 2 (14.3%) |
| Limited or lack of awareness/knowledge/experience/training in the approach | "I don't know how to implement literature in Maths lessons." | 3 (6.5%) | 1 (3.1%) | 2 (14.3%) |
| Perceived difficulty and/or fear in implementing the approach | "Fear of taking risks when introducing new ideas." | 1 (2.2%) | 0 (0%) | 1 (7.1%) |
| Theme 3: Resource Constraint (15.2%) | | | | |
| Limited or lack of suitable children's literature at school | "Lack of availability of big books at school." | 7 (15.2%) | 6 (18.8%) | 1 (7.1%) |

(Continued)

Table 2. (Continued)

| Categories | Examples of statement | Total (N = 34/34) | In-service teachers (N = 23/23) | Pre-service teachers (N = 11/11) |
|--|---|----------------------|------------------------------------|--|
| Theme 4: Doubts about Outcome Expectancy (12.9%) | | | | |
| Perceived unsuitability of the approach for children of certain age groups | “Some stories might be too long and early years children might get bored” | 2 (4.3%) | 2 (6.3%) | 0 (0%) |
| Perceived incompatibility between children’s literature and mathematics teaching | “I prefer to focus on including literature in English/Maltese rather than on maths” | 2 (4.3%) | 1 (3.1%) | 1 (7.1%) |
| Perceived limitation of the approach in catering for different learning needs | “The low proficiency in English of some of the students.” | 2 (4.3%) | 1 (3.1%) | 1 (7.1%) |
| Theme 5: Inhibiting Social Norms (4.3%) | | | | |
| Perceived unwillingness of key stakeholders for this approach to be trialled | “Parents/SMT [Senior Management Team] wanting more written work—which is a pity after all.” | 2 (4.3%) | 2 (6.3%) | 0 (0%) |
| Total | | 46 | 32 | 14 |

* f is here taken to refer to the number of teachers who mentioned a particular belief. Beliefs repeated by the same teacher were not counted twice. Participants were able to state more than one perceived barrier, explaining why the total number of f (46) exceeded the total number of teachers who responded to this survey question (34).

Table 3. Survey responses concerning perceived enablers for the integration of children's literature in mathematics teaching

| Categories | Examples of statement | Total (N = 19/34) | In-service teachers (N = 16/23) | Pre-service teachers (N = 3/11) |
|--|---|----------------------|------------------------------------|------------------------------------|
| | | f* (%) | f* (%) | f* (%) |
| Theme 1: Perceived Pedagogical Benefits (72%) | | | | |
| Encouraged and inspired by teacher's own perception that teaching mathematics through children's literature makes the teaching more engaging and fun | "Stories provided children a fun way of learning and engage more in lessons." | 11 (34.4%) | 8 (33.3%) | 3 (37.5%) |
| Encouraged and inspired by teacher's own perception that teaching mathematics through children's literature helps children to make meaningful connections between their mathematics learning and their everyday life | "These stories give young children a realistic picture of why they are being asked to use certain mathematical concepts." | 6 (18.8%) | 4 (16.7%) | 2 (25%) |
| Encouraged and inspired by teacher's own belief in the value of cross-curricular teaching | "My belief that an integrated approach to learning benefits children much more than segregating different subjects." | 3 (9.4%) | 3 (12.5%) | 0 (0%) |
| Encouraged and inspired by teacher's own perception that teaching mathematics through children's literature helps children recall what they have learned | "I also wanted them to remember it, so if I want to refer to the concept of addition I will say "Do you remember the story about Santa when he wanted to know how many toy rabbits he had to make to give to the children?" | 2 (6.3%) | 1 (4.2%) | 1 (12.5%) |
| Encouraged and inspired by teacher's own perception that teaching mathematics through children's literature helps children become better at reading comprehension | "It enhanced comprehension." | 1 (3.1%) | 1 (4.2%) | 0 (0%) |

(Continued)

Table 3. (Continued)

| Categories | Examples of statement | Total (N = 19/34) | In-service teachers (N = 16/23) | Pre-service teachers (N = 3/11) |
|---|--|-------------------|---------------------------------|---------------------------------|
| Theme 2: Love of Stories (21.9%) | | | | |
| Encouraged and inspired by teacher's (and children's) love of stories | "Young students love stories and I remember that when I was a child I also learned through stories so I decided to integrate them with Maths." | 7 (21.9%) | 5 (20.8%) | 2 (25%) |
| Theme 3: Enabling Social Norms (6.3%) | | | | |
| Encouraged and inspired by training | "Learnt this approach after reading B.Ed." | 2 (6.3%) | 2 (8.3%) | 0 (0%) |
| | Total | 32 | 24 | 8 |

* *f* is here taken to refer to the number of teachers who mentioned a particular belief. Beliefs repeated by the same teacher were not counted twice. Participants were able to state more than one perceived barrier, explaining why the total number of *f* (32) exceeded the total number of teachers who responded to this survey question (19).

and mathematics teaching, and Perceived limitation of the approach in catering for different learning needs—were later grouped together under a theme labelled *Doubts about Outcome Expectancy*. Each category itself is made up of teachers' responses relevant to that particular category. For example, the *Perceived limitation of the approach in catering for different learning needs* category is made up of teachers' responses, such as "The low proficiency in English of some of the students" and "Certain stories might need to be adapted because it uses [...] challenging wordings might be barriers for some children to understand a story."

Participants were able to state more than one perceived barrier and more than one perceived enabler in their written response, but any beliefs repeated by the same teacher were counted once only. The frequency in which each category is mentioned is presented in Tables 2 and 3.

To ensure the reliability of our coding, one researcher coded both the perceived barriers and enablers datasets himself twice (two weeks apart). This coding was subsequently moderated by the other researcher to ensure the consistency in the interpretation of the data. Any disagreements in coding were subsequently discussed until a decision was agreed upon. One example of this process relates to responses such as "Time restrictions" or "Not enough time". Initially, these responses were considered too vague and were therefore going to be discarded. However, through discussion between the two coders, it was decided that an additional category ("Limited or lack of time (unspecified)") would be created to retain these responses in the analysis. This decision was taken to highlight the fact that despite the somewhat vagueness of such responses, a large portion of the teachers in the study highlighted it as being one of the key perceived barriers (see Table 2).

To ensure the validity of our interpretation of the questionnaire data, the teacher interview data were used to allow us to better understand, and further illustrate, the categories identified from the questionnaire data. The interview data themselves are however not the unit of analysis.

6. Results

In this section, we now present the perceived barriers and enablers as reported by the participants in the questionnaire; frequencies are tabulated, together with examples of participants' responses relevant to a particular categories. To further support our discussion, interview excerpts are also

presented as further elaborations. Excerpts may be shortened for the sake of conciseness, with omissions indicated by [...].

6.1. Perceived barriers

All 34 questionnaire participants responded to the following questionnaire question: “In your experience, what are the key barriers that stop you from incorporating (more) children’s literature in your mathematics teaching?” As some participants indicated more than one perceived barrier, the total number of coding occurrences (49) was thus larger than the number of participants. One of the coding occurrences was discarded for being too vague, and another two coding occurrences were also discarded as the participants indicated that they did not have any barriers to integrating children’s literature in their mathematics teaching. This left 46 coding occurrences to be analysed.

Eleven perceived barriers were identified, which could be grouped under five themes, namely *Time Constraint*, *Lack of Pedagogical Knowledge and Confidence*, *Resource Constraint*, *Doubts about Outcome Expectancy*, and *Inhibiting Social Norms*. The themes are presented in Table 2, together an exemplar from the responses of the questionnaire for each type of perceived barrier. The number of teachers, and percentage of the sample, who mentioned a particular barrier, is also given.

As can be seen in Table 2, the first theme, *Time Constraint* (three categories) was the most predominant cluster of perceived barriers (45.7%). Concerning the pressure of syllabus coverage, Alison (Grade 6) elaborated further in the interview:

“We follow the government syllabus for every subject. It’s very, very vast [...] So I think it’s difficult to include certain activities [e.g., using children’s literature].”

Alison’s view resonates that of Greta’s, who described teaching mathematics as *a rush against time*, whereby she had to teach twenty mathematical topics in a year. She argued that reducing the syllabus would make it easier for teachers to integrate children’s literature in mathematics lessons “because there would be less topics to cover and instead of spending a week on Addition, we’ll have two weeks, so this [the integration of children’s literature] would be [possible]”.

Lack of Pedagogical Knowledge and Confidence (three categories) is the second most predominant theme (21.7%). The most recurring category within this theme is to do with teachers’ limited or lack of awareness of suitable children’s literature for specific mathematical concepts. To illustrate this point, Emma (Grade 3) said in her interview that:

I think it depends on the topic [...] For example, ‘Shapes’ is an easy one [topic], but [...] I can’t really think of a story [related to] Angles. So I think I would need support with that one.

Within this theme, limited or lack of awareness, knowledge and experience of the approach which in turn may stem from the lack of training in the approach, was also mentioned. Consequently, some teachers also indicated perceived difficulty and/or fear in implementing the approach. To address the issue of lack of training, some specific ideas were offered by Sharon in her interview:

I think that offering teacher training during working hours, such as through an in-service course, would encourage teachers to teach Maths using stories. [...] I strongly believe that if teachers are shown how they can integrate maths and literature in the classroom, in a practical manner, they will be more motivated to teach mathematics through stories.

The third theme, *Resource Constraint* (15.2%) includes just one category about limited or lack of suitable children’s literature at school. Again, Sharon highlighted ways to address this barrier:

I found my way around this [barrier] by communicating with parents who are usually very happy to provide a variety of [story picture books] they may have at home [...]. Moreover, addressing the issue directly with the headmistress, when I really think a particular resource is important, usually seems to work. I also resort to on-line stories at times, if I cannot afford to buy a particular book. YouTube has a vast selection of read-along stories.

Doubts about Outcome Expectancy (12.9%) is the fourth theme and is concerned with teachers' concerns about the effectiveness and suitability of the approach. Three categories of responses were found here. Some teachers perceived the use of children's literature in mathematics teaching as not being suitable for very young children due to their short attention span, while others said that it would be more difficult with older children as Lynne (Grade 2) explained during the interview:

[Older children] have their own interests in certain stories or in certain genres. So if I present a particular story they might not like it and they would lose interest just the same. That is, not every story [will] appeal to them.

Emma (Grade 3) echoed Lynne's view by saying that older children may think that "stories are for babies". However, Emma went on to argue that such view was incorrect, and that the use of children's literature in mathematics teaching can be used with children of any age as long as the way they are presented matches the age and "ability" of the children.

The final theme, *Inhibiting Social Norms*, accounted for 4.3% of all the coding on perceived barriers. The one category here was the perceived unwillingness of key stakeholders for this approach to be trialled. Some teachers cited their worry that any attempt to incorporate children's literature in their mathematics teaching might not be received positively by their pupils' parents and/or their school's senior management team (SMT). Emma, for example, said that:

I think it depends on the attitude the SMT has towards innovative teaching [...]. If the SMT is [...] conservative and they're always telling you to keep to the syllabus, 'make sure you don't lag behind' and so on, I would feel restricted, in the sense that I cannot take all the time that I need to explore that particular topic and to [incorporate] stories.

This view resonated that of Daniela (Grade 3) who explained that the telling of a story during a mathematics lesson would take away time for pupils to do written work, and that "when the children go home and the parents see just a few sums, the parents will be shocked [...] and the parents have quite a lot of influence at our school." She went on to say that such an expectation for pupils to do lots of written work also came from her school's head teacher. However, she also alluded to the fact that all of these worries were her own, and that if she actually talked and explained to the parents and the SMT the value of integrating children's literature in her mathematics, they might very well be willing to let her implement the idea.

Overall, the three most-cited categories accounted for 50% of all the coding on perceived barriers (*limited or lack of time*, *curriculum pressure* and *limited or lack of suitable children's literature at school*). Proportionally, most perceived barriers were cited equally by in- and pre-service teachers. A small exception was the *Limited or lack of suitable children's literature at school* category which almost 20% of in-service teachers cited, compared to just 7.1% of pre-service teachers. This might be expected as pre-service teachers would not be as familiar with the book collection of their placement school's library as their in-service counterparts.

6.2. Perceived enablers

Nineteen of 34 questionnaire participants responded to the following questionnaire question: "If you have previously incorporated children's literature in your mathematics teaching, what enabled/encouraged you to do so?" Of these participants, 24 were in-service and 8 were pre-service teachers. As some participants indicated more than one perceived enabler, the total number of coding

occurrences (35) was thus larger than the number of participants. Three of the coding occurrences were discarded for being too vague, leaving only 32 coding occurrences to be analysed.

From the thematic coding analysis, seven perceived enablers were identified, which could be grouped under three themes, namely *Perceived Pedagogical Benefits*, *Love of Stories* and *Enabling Social Norms*. These are elaborated upon, and illustrated, in Table 3.

The first theme, *Perceived Pedagogical Benefits* (six categories) accounted for 72% of all the coding occurrences on perceived enablers, making it the most predominant cluster. Within this theme, many teachers highlighted that they were encouraged and inspired by their own perception that teaching mathematics through children's literature: helps makes the teaching more engaging and fun (34.3%) as well as more cross-curricular (9.4%); helps children to make meaningful connections between their mathematics learning and their everyday life (18.8%); helps children recall what they have learned (6.3%); and helps children become better at reading comprehension (3.1%).

The next theme, *Love of Stories* (21.9%), represents just one category concerning how teachers are encouraged and inspired to integrate children's literature in their mathematics teaching due to their and their children's love of stories. Lynne (Grade 2) expanded on this point in her written questionnaire response by stating that "I love children's literature and I love to see children in awe, smiling, showing interest, paying attention". Lynne also commented that the use of stories can make pupils become more interested in their mathematics lessons because the stories would keep them thinking about what is going to happen next in the story. This comment also nicely illustrated one of the perceived enablers in the previous section: *helps makes the teaching more engaging and fun*.

Enabling Social Norms (6.3%) is the third and final theme, and it represents a category highlighting the role of training in encouraging and inspiring teachers to adopt the approach. Naomi (Grade 1) elaborated this point further by saying that:

Awareness is key [...] workshops, training, professional development sessions, and where teachers could see [things] in action. [Also, the] promotion of different children's books. Teachers are not always aware of the different literature that are available [...] because they may have a restrictive school library.

Beyond face-to-face training, other teachers also commented how they would use the Internet (e.g., websites and blogs) to search for inspirations as a form of professional development. Lynne (Grade 2) said: "The internet obviously! [...] [For example] I just Googled 'even and odd' and the book *Even Steven and Odd Todd* came up! But it doesn't always happen like that." Moreover, Emma (Grade 3) said that "there should be a forum, or a blog, where teachers can upload their resources [story-inspired mathematics lesson ideas] for other teachers to use."

Overall, it is worth noting that the three most-cited categories accounted for 75% of all the coding on perceived enablers. These categories were: *teacher's perceptions that literature makes teaching more engaging and fun*, and that *it helps children make meaningful connections*, and *teacher's/children's love of stories*. Proportionally, most perceived enablers were cited equally by in- and pre-service teachers. An exception was the *Encouraged and inspired by teacher's own belief in the value of cross-curricular teaching* category where over 10% of in-service teachers cited this, but no pre-service teachers cited it.

7. Discussion

The aim of this exploratory study was to examine Maltese teachers' beliefs concerning the integration of children's literature in mathematics teaching. Getting a sense of the situation is important if any future action is to be taken in this regard in Malta. The contextual data of the

teachers in this study indicated that over 70% of them have either never used children's literature in their mathematics teaching or have done so, but very infrequently. Given that empirical international studies over the past decades, as previously highlighted, have shown pedagogical benefits of using children's literature to help children learn mathematics, this high figure gives pause for thought. The findings of the current study provided some insights into what the participating teachers perceived to be some of the key barriers that hinder them from using children's literature in their mathematics teaching, and what they perceived to be some of the key enablers that would make that incorporation possible. Hence, in line with Ajzen's (1991) Theory of Planned Behaviour, we now discuss the emerging themes, and their prevalence amongst the respondents, in terms of *Attitude towards the behaviour*, *Subjective norms* and *Perceived behavioural control*. For each aspect, we offer some recommendations for further action. The recommendations, while based specifically on the present study, and hence immediately applicable to the Maltese educational scene, may also be relevant to other international contexts.

7.1. Perceived barriers

7.1.1. Attitude towards the behaviour

The theme *Doubts about Outcome Expectancy* is concerned with beliefs concerning doubts about potential outcomes of the approach. Such beliefs form a negative attitude towards the integration approach. According to Ajzen (1991), such an attitude could, in turn, make it less likely for one to take a certain action, in this case less likely to teach in a certain way. Thus, it is recommended that the misconception that children's literature and mathematics are incompatible—both for different age groups and for different learning needs—is addressed first in pre-service training and later in professional development programmes. With appropriate exposure to the idea, teachers may come to see, for example, that there are a variety of formats of mathematical stories, and these may require varying amounts of reading; furthermore, there exist stories that are suitable for older children and thus, stories need not be considered as “babyish”. Children's literature that are suitable for older readers are, for example, most titles in the *Sir Cumference* series as well as “*Bean Thirteen*” (McElligott, 2007) and “*Fractions in Disguise*” (Einhorn, 2014) which can be used to introduce the concepts of prime numbers and equivalent fractions, respectively, among several other examples.

7.1.2. Subjective norms

Inhibiting Social Norms is about how some teachers felt a sense of potential disapproval from key stakeholders—namely, parents of their pupils and senior management team members—should they choose to integrate children's literature in their mathematics teaching. This highlights how important for people in general (and teachers, in the context of this study) to feel a sense of approval by others for them to feel enabled to behave or teach in a certain way. The influence of pressure from school-related stakeholders on teachers' teaching has been well documented (e.g., Perryman et al., 2011). To address this barrier, parents and senior management team members could be drawn to the approach by convinced teachers who, through their teaching, illustrate the benefits of the approach.

7.1.3. Perceived behavioural control

Time Constraint was the most predominant cluster of perceived barriers for this sample of Maltese teachers. Time constraint as a key barrier to adopting a teaching method has also been documented in other studies, for example, with regard to using technology (Pierce & Ball, 2009) or in the teaching of English grammar (Underwood, 2012). In our study, teachers cited the pressure of having to cover the mathematics curriculum and having limited or lack of time to plan for and deliver mathematics lessons as being key barriers. This theme highlighted teachers' impression that using stories for mathematics implies “adding on something extra” to an already lengthy syllabus. However, it should not necessarily be the case. Since, as explained by Thiessen (2004), a story book can serve to present a mathematical concept, to launch an investigation and to form the basis for generating problems, it can be a good resource through which to achieve the school syllabus. Furthermore, stories can help not only with children's learning of mathematics, but also

with their language and literacy development, and with other areas of the curriculum (Janes & Strong, 2014). One way to address this perceived barrier can be through awareness-raising training, a point raised by teacher Naomi, who was the teacher who used integration most. Apart from face-to-face sessions, teachers could also use online platforms. Ideally, local platforms could begin to promote the use of stories although, of course, overseas-based platforms offer a rich source of stories (e.g., *MathsThroughStories.org*).

The second theme is *Lack of Pedagogical Knowledge and Confidence*. Here, teachers reported limited or lack of awareness of suitable children's literature for specific mathematical concepts as well as limited or lack of awareness, knowledge, experience and training in the approach as being perceived barriers. Similar to the first theme, it could be argued that this perceived barrier can be addressed through training to help raise teachers' awareness of the approach and of available resources. In the context of Malta, such training could be offered as Continuous Professional Development (CPD). Every year, the Ministry for Education and Employment offers a list of CPD topics for teachers in Malta to choose from, as part of in-service training that teachers are expected to carry out. A training workshop on enriching mathematics teaching using children's literature would be a useful addition to this list, and one way to achieve this goal would be to approach the Ministry through its Education Officer responsible for primary mathematics. Of course, attendance at such courses is no guarantee that beliefs or practices will change. A more sustained discussion with teachers may prove more effective. A school-based project/research study is an example of a more sustained method that have the potential to give more agency to teachers. On the other hand, teachers who are already using the approach of integration can be encouraged to share their practice and ideas with colleagues during seminars or conferences. An ideal context for this would be the annual conference on mathematics education organised by the Ministry, during which teachers present examples of good practice from their classes and schools.

The related theme *Resource Constraint* theme is concerned with reported limited or lack of suitable children's literature at school. It may be the case that, with increased awareness, teachers themselves would suggest the purchase of books, thus helping to build up a bank of stories for mathematics teaching. Furthermore, school librarians may also be targeted; these are key persons who can contribute to a sizable collection of suitable stories for mathematics. Having said this, as argued by Trakulphadetkrai (2018), provided that teachers put on a *mathematical lens*, they would still be able to draw from any existing children's literature to plan for their teaching of mathematical concepts, without the need for their school to purchase brand new literature with explicit mathematical focus.

It is interesting to note that these same five themes (*Time Constraint, Lack of Pedagogical Knowledge and Confidence, Resource Constraint, Doubts about Outcome Expectancy, and Inhibiting Social Norms*) also emerged in Prendergast et al. (2019) study with Irish teachers. This could signify the fact that teachers in different countries have a very similar belief system when it comes to the use of children's literature in mathematics teaching and learning. That said, more replication studies in other socio-cultural contexts are needed to confirm this emerging belief system.

7.2. Perceived enablers

7.2.1. Attitude towards the behaviour

In relation to the *Perceived Pedagogical Benefits* theme, it was encouraging to see that the teachers in the study were aware of some pedagogical benefits of the approach. However, the majority of teachers who mentioned pedagogical benefits talked about them mainly in terms of how the approach helped to make mathematics teaching more engaging and fun. Cognitive benefits of the approach (e.g., providing students with meaningful contexts of learning concepts; helping students to make connections between their mathematics learning and their everyday life; helping students to recall what they have learned, and to help them become better at reading

comprehension) were largely overlooked. This highlights the need for any future training to be explicit about the fact that the approach has a lot to offer in terms of cognitive benefits.

In relation to the *Love of Stories* theme, it was evident that teachers were encouraged and inspired to integrate children's literature in mathematics teaching by their own (and their students') love of stories.

7.2.2. Subjective norms

Enabling Social Norms relates to how some teachers felt reassured by others' message (e.g., through training) that integrating children's literature in mathematics teaching is not only acceptable, but actually encouraged. Other sources of approval could be from senior management team and parents as well as policy documents. Indeed, the National Curriculum Framework of Malta (Ministry for Education and Employment, 2012) promotes holistic, and thus integrated, learning, and this should encourage teachers towards the approach.

Interestingly and just like the five Perceived Barriers themes, the three Perceived Enablers themes (i.e., *Perceived Pedagogical Benefits*, *Love of Stories* and *Enabling Social Norms* themes) also emerged in Prendergast et al's (2019) study with Irish teachers, which again could signify an emerging common belief system in relation to the use of children's literature in mathematics teaching and learning among teachers teaching in different socio-cultural contexts. That said and as noted, more replication studies are needed to confirm this belief system.

7.2.3. Perceived behavioural control

None of the questionnaire responses explicitly reflected *perceived behavioural control*. This seems to imply that the participating teachers did not see themselves as having the agency with regard to the integration of mathematics and literature. On the other hand, it is interesting to note that, during one interview, the teacher Naomi (Grade 2), who worked in an Independent private school did, in fact, express an element of control. Naomi explained that in the Early Years section of her school, they had recently transitioned to developing a curriculum that emerges from children's interests. Thus, the teachers had a lot of flexibility as to how to develop the curriculum. As Naomi explained: "We've made a transition from more traditional teaching methods to this [...] [for example] I had a boy who was really interested in the sea and sea creatures, and he was bringing things [to school], so as a class, we chose that we would go with that [theme], and I chose a book and we worked off this [book] for a few weeks".

Noami was in an advantageous position in that Maltese independent schools enjoy a certain level of autonomy with regard to the development of the curriculum and the implementation of syllabi. In the State sector, which caters for 60% of the student population, several steps have been taken in recent years to devolve more autonomy to individual schools, but the sector is generally still centrally organised (e.g., one syllabus, common national end-of-year exams, curricular decisions that bind all schools, and so on). Similarly, in the Catholic Church sector, which fall under the local Secretariat for Catholic Education and which caters for 30% of the school population, there is a lot of coordination between the Secretariat and the schools, and between the various schools. On the other hand however, despite the general centralised situation, teachers have always been free to use their own preferred teaching methods. Hence, if teachers can be convinced that using stories will still allow them to fulfil all curricular obligations, they may develop a stronger sense of behavioural control. Furthermore, the element of centralisation might be taken advantage of; as previously mentioned, the Ministry offers CPD to all teachers. Being able to collaborate with the Ministry to offer training for teachers across the country on how children's literature can be used to enhance mathematics teaching as part of their CPD offering would thus be effective. Similarly, within the Catholic Church schools sector, CPD and projects are often organised across schools.

On the other hand, the participating teachers clearly indicated that they would appreciate training in the approach. To a large extent, as training is an enabler that makes teachers become more knowledgeable and confident in implementing an approach, we might conclude that the teachers recognised a path to increased behavioural control.

8. Conclusion

The aim of this exploratory study was to offer a starting point for the discussion on integrating children's literature with mathematics education in Malta. Although the number of participants was small, the open-ended responses of the questionnaire, together with the elaborations during the interviews, allowed us to gain insight into the teacher's beliefs on the subject. One key conclusion is that awareness and knowledge on the approach are somewhat limited, but on the other hand the teachers appeared keen to receive training in this regard. Of course, teachers who are already using the approach can be encouraged to share their practice and ideas with colleagues during seminars or conferences.

In conclusion, despite the various perceived barriers, the Maltese teachers in this study could clearly see the potential benefits of teaching mathematics using children's literature. Given that Malta's recent policy documents are promoting flexibility in teaching strategies, the time may be opportune for Maltese teachers to take the idea forward.

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