Pre-service teachers' perceptions of a Mathematics specialist teacher's role in grades 6-8 classrooms

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Abstract: This paper is part of a larger study focusing on the perceptions of five different stakeholder groups about the role of a specialist teacher in the teaching of Mathematics in grades 6-8. Using a research questionnaire, the perceptions of 21 pre-service Mathematics teachers, regarding whether they would consider becoming Mathematics specialist teachers (MST) and what they considered to be the benefits and shortcomings of a Mathematics specialist teacher, were obtained. It is on these perceptions─ both the positive and negative sides of the spectrum relating to the use of Mathematics specialist teachers in grades 6-8─ of 13 Canadian and 8 South African pre-service teachers that the paper reports. The data indicate how our pre-service teachers think about their future career and how they, even as students, take into consideration particular aspects that may benefit or hinder their teaching.

Introduction

Mathematics teaching and learning in K-12 schools are fiercely debated topics these days. Questions of what Mathematics should be taught and who should teach it has, historically, never been fully agreed upon by the various educational stakeholders. It seems, however, that this is the case now more than ever. The debate is especially prevalent on the matter of the Mathematics education of elementary (K-8) school children, where the notion of Mathematics specialist teachers (MSTs) is front and centre (Aubrey, 2006; Li, 2008; Schmidt, Blömeke, & Tatto, 2011; Switzer, 2010).

In the study informing this paper, the two authors/researchers (one located at a university in Canada and one at a university in South Africa) sought to study what perceptions individuals, involved in Mathematics teaching and learning, hold of the use of MSTs in Grades 6-8. In other words, to study from multiple perspectives the phenomenon of the MST and how various educational stakeholders perceive it. In the larger study, participants involved in Mathematics teaching and learning who were surveyed as to their perceptions (the five stakeholder groups) included school administrators, grades 6-8 classroom teachers, grades 6-8 students and their parents, as well as pre-service teachers enrolled in the two universities' teacher education programs. This paper and presentation focuses on one particular group of individuals - that of the pre-service teachers being educated to teach Mathematics at the middle years/intermediate level (grades 6-8).

Methodology

This is a qualitative study, nestled in the interpretive paradigm. It was executed on two different continents by two different researchers using two different groups of participants. The same questionnaire instrument was used, however, and all participants had the same goal in mind: to become middle years/intermediate level teachers when they graduated from university.13 Canadian and 8 South African Mathematics teacher education students (pre-service teachers)

constituted the sample for the study. The questionnaire was posted in an easily accessible spot on the internet or the institution's online learning management system, from where participants could access, complete and submit it. The questionnaire consisted of two main sections, namely a Part A on 'Current Attitudes and Practices' and a Part B entitled 'Mathematics Specialists'. This paper focuses on the responses from the participants regarding questions 3, 4 and 5 in Part B of the questionnaire. These questions address whether or not a participant would consider taking on the role of a MST in a school, as well as the benefits and possible shortcomings of MSTs. The data provided by these three questions was analysed by extracting and organizing the responses from each of the questions on the questionnaire answer sheets. The similarities and differences across responses could then easily be identified and discussed.

Results and discussion

The results will be discussed question by question, starting with question number 3. Out of 13 Canadian pre-service teacher respondents asked the question of whether they would consider taking on the role of a MST in a school, 6 responded yes, and 7 responded no. The 'yes' responses were similar in reporting that they enjoyed learning Mathematics and so would enjoy teaching it. One 'yes' respondent stated: "Yes, because I love math and I would love to inspire others to love it as well." The 'no' responses were a bit more diverse in terms of their reasoning, from "nope, don't feel comfortable with content" to "The new math program is horrendous. It makes teaching difficult and not enjoyable." In addition to explanations focusing on not feeling comfortable, confident, or enjoyment in teaching Mathematics, there were also 'no' responses highlighting positive feelings toward Mathematics but not wanting to specialize in teaching it because, according to one respondent, "I enjoy teaching other subjects too."

The 8 South African participants responded with 6 yes answers and only 2 no answers. Reasons for the 6 yes answers were quite similar to Canadian participants' answers and included loving Mathematics, enjoying a challenge, wanting to help learners understand the work better and supporting the Mathematics teachers. One student in particular noted that, "I want to motivate children to enjoy Mathematics as it is part of almost every component of life. Learners need someone they feel comfortable with to give advice and help when they are struggling." The two no answers came very much from a student's perspective as they mentioned that, "I do not have enough experience yet", and "Not straight away when I start teaching, as experience is essential. With time, however, I would like to become a mathematics specialist teacher." These two candidates were therefore hesitant to act as a specialist teacher right from the start, but thought that experience would better prepare them for the job. Experience was key to them.

Question 4 in Part B of the questionnaire considered the benefits of Mathematics specialist teachers. Responses from the Canadian and South African participants are summarised and colour-coded as follows:

	Canadian participants (N=13)	**South African participants (N=8)**
1	Experts offer a higher standard of teaching and empowers teachers to exercise skills they excel in.	You know the learners receive the best possible education.
2	More students would succeed in Mathematics, because they would have someone to turn to.	MSTs can help teachers teach Mathematics in a simple and easily understandable way.

3	Learners will learn more and have the opportunity to develop Mathematics skills.	A MST can assist Mathematics teachers in effective Mathematics teaching.
4	Teachers can use interesting learner groupings when teaching problem solving.	MSTs can assist colleagues and help train younger teachers. Good attitudes taught in the Mathematics class will be transferred to other classes.
5	Having a specialist with a deep understanding of and confidence in the subject is important.	The ability to use vast mathematical knowledge in problem solving; to guide other teachers in their presentation and assessment; learners who obtain better marks and are motivated to continue with Mathematics.
6	MSTs can focus all their attention on teaching Mathematics. It could take the pressure off those teachers who are afraid to teach Mathematics.	It creates a positive attitude among the learners towards Mathematics. An MST is someone learners can look up to. He can purposefully guide the learners.
7	An MST can teach with different strategies and have in depth knowledge of the subject.	The marks of the learners could improve which would improve the school's standing in the community.
8	An MST can introduce multiple ways of doing things in Mathematics, e.g. use technology. He may have a more sound understanding of mathematical principles and concepts.	No response
9	They create confidence, help with questions, create a network and a sense of community.	
10	Students who struggle or excel have someone to help them out.	
11	An MST can build on previous skills in his teaching.	
12	Teachers who are not strong in teaching Mathematics can go to the specialist for help and support.	
13	No response	

The majority of responses focused on the benefits in terms of teaching and learning. This means that the participants perceived the role and benefits of a Mathematics specialist teacher to be one in which learners benefit from their vast knowledge and understanding of the subject (*purple highlighted text*), and the teachers benefit from their guidance with respect to the successful teaching of the subject (*red and green*). Aspects such as the development of a positive attitude towards Mathematics and how the school in which the MST works could obtain better standing in the community because of its good results (*grey*), were also noted.

Question 5 of Part B of the questionnaire asked respondents to identify possible shortcomings of Mathematics specialist teachers. The views according to the Canadian and South African participants are summarised and colour-coded as follows:

	Canadian participants (N=13)	**South African participants (N=8)**
1	An MST would not have the relationship a classroom teacher has with the learners.	An MST might teach at a higher level than the learners can grasp and not realize it.
2	An MST coming in and out of the classroom for Mathematics lessons might cause inconsistency with classroom routines and procedures.	Overworking the specialist could end up in a situation where promises or dreams on the learners' side are not fulfilled.
3	The MST could use Mathematical terminology the learners do not understand. Learners could then struggle and not like Mathematics.	The specialist teacher may become too focused on assisting the teacher and neglect the learner. Perhaps too specialized and not focused on simplicity.
4	Grasping and understanding all the Mathematics concepts might initially be time consuming for a MST.	None
5	An MST who has always done well in Mathematics might not have sympathy or understanding for struggling learners. Having understood concepts in one way, MSTs may struggle explaining it another way.	All learners might want to attend the classes of the specialist teachers and other teachers might feel left out or inferior.
6	If the learners do not have access to the MST all the time, there might not be a strong relationship between the specialist and the learners.	Specialist teachers might not have knowledge of the types of learners in the grade, their circumstances at home, their learning styles or learning barriers. The specialist might not connect the Mathematics to the learners' living world and life experiences.
7	Too many different teachers for elementary school learners might impact negatively on the learners.	Mathematics specialist teachers who do not have the necessary time and resources to make an impact on the learners.
8	The MST might take over a teacher's class, be rude or not have enough time to help.	No response
9	Learners might be singled out in a negative way when they need extra help.	
10	Conflict between the MST and the learners might create a dislike for Mathematics.	
11	The development of dependency on the MST and consequent burnout.	
12	One is not enough, so it's pointless.	
13	None	

The key concern as identified by both participating groups was that the MST would teach and facilitate at too high a level, with the learners not being able to understand the content (*green highlighted text*). It is an observation that contradicts the purpose of an MST in some sense, as issues of improved instruction are exactly those which the MST is supposed to address. The second concern, also addressed by both participating groups, directly involved the learners and the extent to which the MST will be able to get to know the learners that he/she works with. The participants' concern was that if the MST only worked with the learners on an ad-hoc basis, no true relationship would form between the learners and the MST (*yellow*).

Other concerns raised in responses to this question included overworking or overburdening the MST (*turquoise*), the influence of an MST on a teacher's classroom routine if he/she comes and goes constantly (*grey*), and an MST who focuses on the teacher at the expense of the learners (*red*), amongst others.

Conclusion

The perceptions of pre-service teachers regarding the use of Mathematics specialist teachers in grades 6-8 classes clearly evoked mixed feelings. While there were many positive aspects mentioned, valid concerns were also raised. These concerns will have to be considered and handled on an individual basis by each school embarking on the use of MSTs. Furthermore, not all pre-service teachers were enthusiastic about becoming MSTs for various reasons. Reasons including the accompanying responsibility and need for experience explicit in the position will require careful thought and consideration in the education of grade 6-8 teachers, and especially Mathematics specialist teachers.

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