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Factors impacting on students' beliefs and attitudes toward learning mathematics: Some findings from the Solomon Islands

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Abstract

Currently, the educational system in the Solomon Islands faces tremendous challenges, including how to develop student skills and interest in subjects such as mathematics. The attitudes and beliefs of Pacific and non-Pacific students can impact on their mathematics learning and performance. This paper focuses on the educational implications of this dimension. It reports on a small study of Solomon Islands high school (Year 12) students' beliefs and attitudes about their mathematics learning. This study found that factors associated with individual student's knowledge of the subject and their classroom experience, as well as the attitudes of their teachers and peers, had a negative and positive impact on what students knew and how they thought about their mathematics learning. It is suggested that mathematics teachers may need to review, reflect and re-examine their teaching practices, and to seek new approaches to improving the teaching and learning of mathematics so as to foster the development of students' positive mathematical beliefs. Some ideas for a way forward are suggested.

Keywords

Solomon Islands, beliefs, attitudes, mathematics learning, secondary school

Introduction

Students` beliefs and attitudes can shape their cognitive and affective domain in mathematics learning (Leder & Grootenboer, 2005; White, Way, Perry & Southwell, 2006). Assessing students` beliefs, attitudes and knowledge about their mathematical skills can yield in-depth information, as these affective domains can have both positive and negative impacts on the process of mathematics learning. Previous work in this area has analysed mathematical beliefs of secondary students. However, the gap in the literature is that these studies have not addressed likely factors that might impact on the beliefs and attitudes held by the students concerned (Tarmizi & Tarmizi, 2010; Whitin, 2007).

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(pp. 85-92)

The affective domain is one of the important dimensions of mathematics learning (Grootenboer, Lomas & Ingram, 2008; Kele & Sharma, 2014). A country's national curriculum documents should provide a good guide as to how, realistically, knowledge about beliefs and attitudes, and the possible barriers to learning they might create, are effectively enacted (Kele & Sharma, 2014). The mathematics curriculum document in the Solomon Islands is written to promote a positive affective domain (MEHRD, 2011; MEHRD, 2012), however, there is a minimal emphasis on how to direct the impact of this policy towards students' mathematics learning.

The following research questions underpinned this study:

1. What beliefs and attitudes do senior high school students have toward their mathematics learning?
2. What factors do students think have impacted on their beliefs and attitudes toward mathematics learning?

This paper reproduces data from a Master's degree research study conducted in 2014 which investigated the beliefs and attitudes of senior high school students in the Solomon Islands towards learning mathematics (Kele, 2014). The paper includes a review of the literature on factors that impact these affective domains and discusses data gathered from the second research question noted above.

Literature Review

Traditionally, a complex array of factors have impacted on students' beliefs and attitudes towards their mathematics learning, including individual students' own knowledge and experiences, and those of their teachers and peers. This means that students' beliefs about learning mathematics may have a substantial impact on their interest and motivation in mathematics (Kele & Sharma, 2014).

Students need to make sense of mathematics throughout their learning. Having little understanding of the concepts, language, content and processes used in this discipline area can affect students' ability to make sense of mathematics as a subject (Whitlin, 2007). The outcome can be a negative impact on their mathematical ability and confidence (Gafoor & Ashraf, 2012; Gunderson, Ramirez, Levine, & Beilock, 2012). Jourdian and Sharma (2016) claim that difficulties associated with mathematics are largely seen as coming from the cognitive demands of mathematics itself. However, deficits in students' understanding and use of mathematical language can lead them to view mathematics as a difficult subject (Devlin, 2000; Jourdian & Sharma, 2016).

Teachers are key players in influencing students in their learning in this subject area. Several studies have claimed that the most important factor influencing secondary school students' beliefs and attitudes toward mathematics learning is what the teacher does (Grootenboer, et al., 2008; Gunderson, et al., 2012; Marchis, 2011; Yaratan & Kasapoğlu, 2012). In particular, the willingness of students to participate in their mathematics learning has been found to relate to the competence of their teachers. The way teachers conduct themselves in class, their teaching methods and strategies and the conduciveness of the learning environment all count toward the development of students' learning. If teachers show positive attitudes toward mathematics then students will be more likely to develop positive attitudes towards their learning (Anthony & Walshaw, 2009; Devlin, 2000; Grootenboer, 2001). These studies conclude that teachers must take a bold stand to motivate students in the development of their mathematical understanding.

Grouping students for learning tasks is an essential organisational practice that can give opportunities for students to articulate thinking and understanding. Social-constructivists believe that learning takes place in social interactions (Jones, Jones, & Vermette, 2010). In this view students actively share ideas with their peers, thus promoting the development of mathematical knowledge (Lau, Sing, & Hwa 2009). Students communicating with teacher and peers about their mathematical ideas is 'considered a major component of classroom discourse and a vehicle for increasing student learning'. (Franke, Webb, Chan, Ing, Freud & Battey, 2009, p. 380). Actively communicating

mathematical ideas collaboratively does promote confident and positive beliefs to students (Boaler, 2009). This point can be seen in Young-Loveridge and Mill's (2010) study with primary students. These researchers found that students talking about mathematics in peer discussions promoted positive views about mathematics learning. In reality, however, not every student is willing to participate collaboratively in a group.

One of the major gaps in the literature related to this area of study is that, while many countries already investigate factors impacting on students' beliefs and attitudes toward mathematical learning, in the Solomon Islands there has been no study that has investigated this complex array of factors to date. This study sought to fill an aspect of this knowledge gap.

Method

Three methods of data generation were used in this study, including a written survey, semi-structured interviews and focus group interviews. Data from the focus group interviews were considered in this paper. A copy of the full study is available through the Te Kura Toi Tangata Faculty of Education, University of Waikato.

Participants

This research was conducted with Year 12 senior high school students in the Solomon Islands. Due to limited time, only two schools (one urban and one rural) were part of this study. A total of 107 students participated, and of this cohort 55 students (21 girls and 34 boys) were from the urban high school and 52 students (25 girls and 27 boys) were from the rural high school setting. The students were between 17 and 19 years old. One of the reasons for selecting Year 12 for the study was that Year 12 is the last level in the secondary school. The researcher could, therefore, explore secondary students' overall beliefs and attitudes about learning mathematics by engaging them in the study before they ventured into tertiary level education. Participants from both schools were coded to retain their identity. Of the 107 students eight students participated in the focus group interviews. Four male students were from the urban high school and four female students were from the rural high school. Male urban participants were coded as MSU1 – MSU34 while female rural participants were coded FSR1 – FSR25.

Data collection procedure

A focus group interview was completed with eight participants to investigate factors that the group thought had impacted on their beliefs and attitudes about their mathematics learning. To avoid shyness between genders, and so that rich data could be obtained, the four boys from the urban high school and the four girls from the rural high school were interviewed separately. Participants were selected on the basis of their confidence in communication during the time of the study and their willingness to participate. The focus group questionnaire included a variety of open-ended questions. This data was analysed using a simple thematic analysis, where recurring themes emerged from the responses that were given. These responses were then, identified and coded.

Results and Discussion

In this analysis, responses related to factors impacting on participants beliefs and attitudes toward their mathematics learning are included. Students' responses were organised according to a number of major theme 'factor' areas. The analysis of data revealed four key factors associated with the

individual student's knowledge and experiences – affective, cognitive, teacher attitude, skill and knowledge and peer support. Examples for all factor areas are presented below.

Affective factors

Of the eight students interviewed, four mentioned their personal interests and positive feelings towards learning mathematics. For example. FSR22's reflections about her experience in learning mathematics tasks were closely linked with feelings of interest and love for learning mathematics, as she mentions below:

> Learning activities, practical tasks in mathematics are very interesting for me and I am good at mathematics, and I will love to learn mathematics as long as I live.

For FSR20, her interest in learning resonates with her self-concept and belief that she is good at mathematics especially in the areas she finds easy, as she states:

> I felt interested in learning mathematics because I am good at several topics that are very easy for me to understand. For the hard topics that I came across in my learning, I feel like trying them …

In contract FSR7 describes the negative feelings she now associates with mathematics. She dislikes solving mathematics problems because they are very difficult.

> How to solve mathematics problems is something I am not good at. There are some that I did not like because they were difficult. It's the calculation part is the most hated one (FSR7).

FSR20 also shares her unease about this area of learning. She dislikes learning mathematics which she saw as wasting her time, for very little result.

> In working out solutions for mathematics problems, if you get one part wrong you will end up getting all sections wrong. That is one of the things I dislike about mathematics. It just like wasting my time doing it and I end up getting wrong answers (FSR20).

Cognitive factors

A factor related to students' own mathematical knowledge and understanding. and the nature of their understanding, was also found. Students mentioned their difficulties arose from their gaps in mathematical and procedural knowledge. Their difficulties included problems with understanding concepts, using mathematical language and remembering formulas to solve mathematical problems, as this excerpt from FSR22 shows:

> I sometimes faced difficulties in mathematics because I did not understand the mathematics language and the correct use of formulas and concepts of the particular topic.

MSU27 also expressed his lack of understanding of the languages used and procedures for solving mathematical problems.

> My problem of learning mathematics is not getting good a grasp of understanding languages used and procedures to solve mathematical problems. I see mathematics questions are linked to each other in some cases. So, when I get the first questions wrong, then the rest of the questions have the same result.

Students' strong mathematical knowledge and understanding seemed to promote increased positive attitudes towards mathematics. However, this finding suggests that some of the problems that

students face in mathematics may arise from personal experiences during subsequent mathematical encounters. All four students admitted their difficulties of lacking mathematical knowledge and understanding the mathematics language which were key issues they had been unable to overcome.

Factors associated with the teacher

Students also talked about how their teacher taught mathematics. Students' responses were subdivided into those that considered the impact of teachers' content–area knowledge and those who were more concerned about teachers' attitudes.

Teacher's attitude, skill and knowledge

Teachers' content knowledge and their ability to convey mathematical content to students was expressed by MSU5. In particular, individual teachers' lack of clarity in conveying mathematics content to students had caused a lot of confusion for the participant concerned, as below.

> I was really having a problem in understanding the concept if the teacher is not making the explanation clear and simple to me. Such as explaining the topic and breaking down formulas into simple ways that I can understand. If the teacher's explanation is poor it makes me confused, then learning and understanding that particular topic becomes a problem for me (MSU5).

Teaching instruction that involved teachers incorrectly providing feedback (answers) could also be a problem for students, as FSR7 mentions:

> Sometimes when she [teacher] came into class and gave corrections, her answers sometimes incorrect and this makes me confused on how to get the correct answer (FSR7).

Another student expressed his dissatisfaction over how a teacher managed mathematical assessments such as exercises, homework and problem-based activities by not providing solutions after marking them. The teacher, instead, moved straight to the next topic without taking a few moments to provide solutions. As MSU5 said:

> One part of teaching I see that was not satisfying for me was that the teacher did not give solutions to the problems as well as correcting the exercises or homework, etc. Instead, he gave other exercises and moved to the next topic without revising or correcting some maths exercises he left in the previous topic. This made me struggle to find the answers to the questions he provided. I need to see how and what steps to use to get the solution. When the teacher did that I felt frustrated and would want to know how to get the answer (MSU5).

Another aspect about the teacher mentioned during the focus group interviews was the teachers' negative attitudes. Students felt that learning mathematics was taught by a teacher who had an uncaring attitude. Two rural female students commented that their previous teacher was grumpy and often got mad at students, as FSR20 notes:

> Sometimes she taught with angry behaviours if we did not quickly grasp the concept when she made an explanation (FSR20).

A similar sentiment was expressed by FSR7 about her teacher's frustration if students were not answering questions correctly. She said that

> If we did not answer her questions correctly she would just get mad at us. That was her type of attitude. (FSR7)

Peer support

Unlike their views of their teachers, participants had a positive view of their peer group. When they were connected with their peers in communicating mathematical ideas, they were impacted positively. Getting support from a peer group was mentioned by all students. MSU24, for instance acknowledged his classmates for their continuous support and assistance for sharing their mathematical knowledge.

> I had to ask my classmates mates for help. It was good to have other pupils' ideas in my learning of mathematics. Because what others knew, for me, I did not have that type of idea. So I treasured seeking assistance from my classmates (MSU24)

MSU5 firmly believed that learning in a communal environment had a positive impact on his mathematics learning. He further emphasised that he learnt mathematics better from being in his small study group. He seemed to compare their ideas and try to integrate these new ideas into his existing knowledge.

> I learn mathematics better from my classmates and study group. Like I would compare their ideas on how they explain the concept for me. And I try to grasp those ideas (MSU5).

FSR22 shared her views that if the teacher was busy she would resort to asking her brilliant classmates for help. Moreover, she treasured her classmates for their willingness in helping her understand mathematics.

> I learn better from students. I have much confidence to seek help from students rather than teachers. Students who were good in mathematics are usually available and willing to help (FRS22).

Discussion

From the data results noted above it can be seen that students' reflections on factors impacting on their experiences in learning mathematics were associated with both positive and negative feelings. Some shared sentiments that included enjoying, loving and liking mathematical subjects. Young-Loveridge and Mills (2010) in their survey of motivation towards learning mathematics also reported that students enjoyed mathematics when they had a good mathematical understanding of what they had learnt. However, this study also found that negative feelings were linked to negative attitudes towards learning mathematics for some students. Students' cognitive domain for lack of mathematical understanding of languages. content and procedures has been found to promote a decline in students' positive attitudes towards mathematics (Jourdain & Sharma, 2016; Kele & Sharma, 2014). As noted by Beyers (2011), students should not concentrate on their negative beliefs because they can influence not only their mathematical subject thinking and performance but also their attitudes and decisions about using mathematics in later years. Teachers' knowledge of mathematics and attitudes also played a significant role in students' mathematics attitudes. In this study. teachers own negative beliefs and attitudes were shown to produce a lack of clarity in their teaching. However, the study also found that students sharing their mathematics ideas in groups or with their peers could provide opportunities for students to engage in high-level cognitive activity (Anthony & Walshaw, 2007; Franke, et al., 2009).

Study Limitations

To address the shortcomings in this literature set. this study set out to explore high school students' beliefs and attitudes towards their mathematics learning in the Solomon Islands context. A number of limitations were encountered in the process of conducting this study. The researcher found that students were not always very comfortable having conversations with the researcher. Culturally, some students may not have felt confident talking with an adult in a private place. Thus, this study may not

have been able to get deeply enough into what the students were thinking about the issue. In addition, the national language in the Solomon Islands is Pijin. Even though the focus group questions were written in English and explained to students in Pijin, the questions may not have been well understood. Further, the study was working within a limited time frame, therefore only two schools were provided participants for the study. The study also focused on Year 12 students, hence represented students who already had been deemed successful in the Solomon Island context. What about the students who did not get this far? What did they make of their mathematical ability? The research could be extended to other schools and year levels to answer these questions and address these shortcomings. Finally, there is room for this study to link focus group interviews' findings to classroom observation and conversations with teachers. This could enable the researcher to gain insights into why students responded in particular ways, and what teachers themselves thought of what had been said. Although this was not possible in the present study because of time constraints, such research could throw further light on the issues raised here. Further research could also extend into an issue of language challenges in mathematics education in the Pacific islands, especially for students for whom English is not their first language.

Conclusion

The study found that students expressed factors based on personal affective domains and personal cognitive domains which impacted on their mathematics learning. The classroom teacher's teaching practices play a significant role iu impacting students' view of their mathematics learning and ability. Utilising peer support was found to be a significant mechanism that can assist the development of positive affective domain in mathematics learning. All factors can play a vital role in influencing beliefs and attitude in Mathematics Classrooms. However, the most important finding from this study is that actually listening to student perspectives in order to understand what does or does not work for them in terms of their mathematics learning, may be the ultimate key to successful mathematics teaching. Mathematics teachers may need to review, reflect, re-examine their teaching practices and to seek new approaches to improving teaching and learning in mathematics for the development of students' positive mathematical beliefs. It is hoped that the brief findings reported on in this article will help to generate more interest in research with respect to what students think about how their mathematics achievements have been affected by their beliefs and teacher attitudes in the Solomon Islands, and in other countries of Oceania. Teachers, teacher educators and researchers need to work together to find better ways to help all students develop positive dispositions in their learning in this critical subject area.

References

Anthony, G., & Walshaw, M. (2007). *Effective pedagogy in Mathematics/Pangarau: Best evidence synthesis iteration [BES]*. Wellington, New Zealand: Ministry of Education.

Anthony, G., & Walshaw, M. (2009). *Effective pedagogy in mathematics: International Academy of Education [IAE]*. Geneva, Switzerland: International Bureau of Education.

Beyers, J. (2011). Student disposition with respect to mathematics: What current literature says. In D. J. Brahier & W. R. Speer (Eds.), *Motivation and disposition: Pathway to learning mathematics* (pp. 69–79). Reston, VA: The National Council of Teachers of Mathematics.

Boaler, J. (2009). *What's math got to do with it? How parents and teachers can help children learn to love their least favorite subject*. Penguin: New York.

Devlin, K. (2000). *The maths gene: Why everyone has it, but most people don't use it.* London: Phoenix. (Chapter 1: A mind for mathematics; pp. 5 – 17).

Franke, M. L., Webb, N. M., Chan, A. G., Ing, M., Freud. D., & Battey, D. (2009). Teacher questioning to elicit students' mathematical thinking in elementary school classrooms. *Journal of Teacher Education*, *4*(60), 380-392. doi: 10.1177/0022487109339906.

Gafoor, K. A., & Ashraf, P. M. (2012). Contextual influences on sources of academic self-efficacy: A validation with secondary school students of Kerala. *Asia Pacific Education Review*, *13*(4), 607–616. doi:10.1007/s12564-012-9223-z.

Grootenboer, P. (2001). How students remember their mathematics teachers. *Australian Mathematics Teacher*, *57* (4), 14 – 16.

Grootenboer, P., Lomas, G., & Ingram, N. (2008). The affective domain and mathematics education. In H. Forgasz, A. (Tasos) Barkatsas, A. Bishop, B. Clarke, S. Feast, T. Seah, & P. Sullivan (Eds.), *Research in mathematics education in Australasia 2004-2007* (pp. 255–269). Rotterdam: Sense Publishers.

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2012). The role of parents and teachers in the development of gender-related math attitudes. *Sex Roles*, *66*(3-4), 153–166. doi:10.1007/s11199-011-9996-2.

Jones, K., Jones, J. L., & Vermette, P. J. (2010). The constructivist mathematics classroom. *Mathematics Teaching*, *219*, 33–25. Retrieved from http://search.proquest.com.ezproxy.waikato.ac.nz/docview/879423475.

Jourdian, L., & Sharma, S. (2016). Language challenges in mathematics education: A literature review. *Waikato Journal of Education*, *21* (2), 43-56. doi: 10.15663/wje.v21i2.269.

Kele, A (2014). *An investigation of beliefs and attitudes of high school students in the Solomon Islands towards learning mathematics* (Masters thesis), The University of Waikato, Hamilton, New Zealand. Retrieved from http://researchcommons.waikato.ac.nz/handle/10289/8708.

Kele, A., & Sharma, S. (2014). Students' beliefs about learning mathematics: some findings from the Solomon Islands. *Teacher and Curriculum*, *14* (1), 33 – 44.

Lau, P. N. K., Sing, P., & Hwa, T. Y. (2009). Constructing mathematics in an interactive classroom. *Educational Studies in Mathematics*, *72*, 307–324.

Leder, G., & Grootenboer, P. (2005). Affect and mathematics education. *Mathematics Education Research Journal*, *17*(2), 1–8.

Marchis, I. (2011). Factors that influence secondary school students' attitude to mathematics. *Procedia Social and Behavioral Sciences 29*(0), 786–793. doi:10.1016/j.sbspro.2011.11.306.

MEHRD. (2011). *Solomon Islands government national curriculum statement*. Honiara, Solomon Islands: MEHRD

MEHRD. (2012). *Solomon Islands government: Annual Report 2011*. Honiara, Solomon Islands: MEHRD

Tarmizi, R. A., & Tarmizi, M. A. A. (2010). Analysis of mathematical beliefs of Malaysian secondary school students. *Procedia Social and Behavioral Sciences*, *2*(2), 4702–4706. doi:10.1016/j.sbspro.2010.03.753.

Whitin, P. E. (2007). The mathematics survey: A tool for assessing attitudes and dispositions. *Teaching Children Mathematics*, *13*(8), 426-432.

White, A., Way, J., Perry, B., & Southwell, B. (2006). Mathematical attitudes, beliefs and achievement in primary pre-service mathematics teacher education. Mathematics Teacher Education *and Development*, *7*, 35–52.

Yaratan, H., & Kasapoğlu. L. (2012). Eighth-grade students' attitude, anxiety, and achievement pertaining to mathematics lessons. *Procedia Social and Behavioral Sciences*, *46*, 162–171. doi:10.1016/j.sbspro.2012.05.087.

Young-Loveridge, J. & Mills. J. (2010). "Without maths we wouldn't be alive": Children's motivation towards learning mathematics in the primary years. In B. Maj, E. Swoboda, & K. Tatsis (Eds.), *Motivation via Natural Differentiation in Mathematics* (pp. 80-90). Poland: Wydawnictwo Uniwersytetu Rzeszowskiego.