

Maths Anxiety Self-assessment as a Quality Assurance Measure

Link to publication record in USC Research Bank:

<http://research.usc.edu.au/vital/access/manager/Repository/usc:15845>

Document Version:

Published version

Citation for published version:

Dole, Shelley, Beswick, K (2002) Maths Anxiety Self-assessment as a Quality Assurance Measure. Mathematics Education in the South Pacific: Proceedings of the 25th annual conference of the Mathematics Education Research Group of Australasia, Auckland, New Zealand, 7-10 July 2002, pp.236-243.

Copyright Statement:

General Rights:

Copyright for the publications made accessible via the USC Research Bank is retained by the author(s) and / or the copyright owners and it is a condition of accessing these publications that users recognize and abide by the legal requirements associated with these rights.

Take down policy

The University of the Sunshine Coast has made every reasonable effort to ensure that USC Research Bank content complies with copyright legislation. If you believe that the public display of this file breaches copyright please contact research-repository@usc.edu.au providing details, and we will remove the work immediately and investigate your claim.

S6 The study of maths makes me feel anxious and fearful.

Student levels of agreement with each of the 6 statements across the 3 year levels, prior to commencement of Mathematics Curriculum Studies in Year 2 and at the completion of the program in Year 4 are presented in Table 1. For clarity and ease of analysis, scores that indicated students who 'agreed' with a particular statement (that is, they selected 4 or 5 on the rating scale) or 'disagreed' with a particular statement (that is, they selected 1 or 2 on the rating scale) were collapsed together to give a single score for agreement (rather than strongly agree or agree) and a single score for disagreement (rather than strongly disagree or disagree) for that statement. Results therefore reflect three categories of response (D for disagreement, N for neutral, A for agree) for each statement.

Table 1

Percentage of Preservice Students across 3 Year Levels Who Disagreed (D), were Neutral (N) or Agreed (A) with Particular Statements about Mathematics.

	Year 2			Year 3			Year 4		
	D	N	A	D	N	A	D	N	A
S1. Maths makes me feel uneasy and nervous									
pre	39	21	40	44	20	36	37	8	56
post	58	27	15	70	20	10	73	14	13
S2. I am interested and willing to use maths in everyday life.									
pre	22	28	50	28	27	45	18	34	48
post	17	22	61	21	13	66	18	13	69
S3. I find mathematics difficult and confusing									
pre	42	25	33	44	18	39	40	15	45
post	55	26	19	70	16	14	71	13	16
S4. I would like to further develop my mathematical skills and study this subject more.									
pre	39	25	36	29	24	48	21	14	65
post	17	19	64	11	15	74	10	15	76
S5. Maths is dull and boring.									
pre	35	25	40	52	20	28	46	21	32
post	68	20	12	87	6	7	88	9	3
S6. The study of maths makes me feel anxious and fearful.									
pre	39	26	35	39	18	42	43	16	50
post	58	28	14	69	21	10	73	15	13

From Table 1 it can be seen that the extent to which students agreed with particular statements relating to mathematics anxiety changed in a positive sense as they undertook each component of the Mathematics Curriculum program, and that this change was more pronounced at the end of Year 4. For example, for item S1 (Maths makes me feel uneasy and nervous), of the second year cohort, 40% of students indicated that they agreed with the statement prior to study of mathematics curriculum but at the end of the second year, 15% agreed, 27% were neutral, and 58% disagreed. Of the third year cohort, 36% indicated that they agreed with the statement prior to mathematics curriculum study, but after third year maths curriculum studies, 10% indicated that they now agreed, 20% were neutral and

70% indicated that they now disagreed with the statement. Of the fourth year students, 56% indicated that they agreed with the statement prior to mathematics curriculum study, but after completion of the three-half semester program, this changed to 13% agreement, 14% neutral and 73% disagreement. Item S6 (The study of maths makes me feel anxious and fearful) is similar to S1 (Maths makes me feel uneasy and nervous). Students' responses to this item are almost identical to those for item S1 across the three student cohorts.

As a measure of mathematics anxiety, the results show that approximately 40% of the students indicated that they did suffer mathematics anxiety (and 40% who would not rate themselves as maths anxious). Specifically, to items S1 (Maths makes me feel uneasy and nervous), S6 (The study of maths makes me feel anxious and fearful), S3 (I find mathematics difficult and confusing) and S4 (I would like to further develop my mathematical skills and study this subject more) the percentage of disagreement is similar across all year levels. The prevalence of mathematics anxiety is a cause for concern in terms of teacher education and numeracy development of children in schools, but the fact that this drops to around 10% after Mathematics Curriculum studies suggests the positive impact of the program. Interestingly, the fourth year students indicated the highest level of mathematics anxiety prior to studies in Mathematics Curriculum of all the year groups, with 56% and 50% agreement with the statements 'Maths makes me feel uneasy and nervous' and 'The study of maths makes me feel anxious and fearful' respectively. It is also interesting to note that a greater percentage of fourth year students indicated that they wanted to develop their mathematics skills and study mathematics further prior to undertaking their mathematics curriculum studies (65%) compared to the third year students (48%) and second year students (36%). It is extremely heartening that at each point of their studies in mathematics curriculum, the number of students indicating that they would like to continue in mathematics education increased (64% for second years, 74% for third years and 76% for fourth years).

One of the items upon which students indicated the biggest change was item S5 (Maths is dull and boring). Results across the three year levels are similar with approximately 20% of students neutral and 30-40% agreeing with the statement prior to Mathematics Curriculum Studies. After Mathematics Curriculum at each year level, a dramatic change is indicated with 12% of second year students, 7% of third year students, and just 3% of fourth year students agreeing with this statement. Such a positive rating for this item suggests great promise in terms of the teaching of mathematics in these students' future classrooms. Such results provide a tantalising image of lively, energetic, interesting mathematics lessons where students are actively engaged in exploring meaningful mathematics because the classroom teacher holds a strong belief that mathematics is not dull and boring.

The item for which least change is apparent is S2 (I am interested and willing to use mathematics in everyday life). Between 45-50% of students agreed with this statement prior to Mathematics Curriculum Studies. There is a progressive increase in agreement with this statement across the three year levels (61% for second years, 66% for third years and 69% for fourth years), but the number of students disagreeing with this statement is relatively static across the three year levels both before and after Mathematics Curriculum Studies (approximately 20%). The change was in the number of students selecting neutral to this statement, possibly indicating that prior to Curriculum Studies, students had not fully considered the extent to which they could or did use mathematics in their everyday lives. It could be argued that, with a focus on mathematics through their tertiary studies,

they became more aware of numeracy and the importance of numeracy for living and this may be one reason for the change of neutral opinion to a positive opinion.

Discussion

Unpacking mathematics anxiety in terms of personal feelings about the study of mathematics, perceptions of mathematics as a subject and personal impetus to use mathematics or pursue further study of mathematics provides a picture of this belief category of a large cohort of preservice teachers. From data gathered during this study, prior to Mathematics Curriculum Studies, approximately 50% of students felt uneasy and nervous about mathematics and were anxious and fearful about the study of mathematics; 35-45% found mathematics dull and boring, as well as difficult and confusing with only 50% willing to use mathematics in everyday life. Approximately 50% of the student population in this preservice course had beliefs about mathematics that would not have been helpful in the planning and teaching of mathematics to promote numeracy and achieve the goals of school mathematics. With students indicating positive change of opinions, the program appears to have influenced such change.

Interview data provides further evidence for the positive impact of the program. The following two responses of students dealing with maths anxiety describe the impact of the program upon their beliefs:

My beliefs about mathematics before probably weren't so good because I didn't have a very good high school experience with mathematics ...but this course has proven my beliefs to be completely wrong. I was a bit scared of doing mathematics in Education.

I just didn't have good experience at school with mathematics ...when I got to Uni and had to do maths, I was really nervous...but the course has changed my whole perspective and it has made me feel fantastic about teaching mathematics.

For one student, who was clearly not mathematics anxious, the following response shows a new perspective on mathematics, which appears to be a contrast of her own mathematics experiences:

...the course hasn't influenced my beliefs about mathematics itself...but obviously it has on how you'd go about teaching it...I think of mathematics more as problem solving and patterning rather than formula memorization.

So what aspects of the course impacted upon this change? The following two comments provide further insight that augment the previous statement in which mathematics was described as patterning and problem solving:

I've seen how mathematics can be more hands-on and more group work and more talking about it...before I had just text books and chalk and board so to speak.

I've always enjoyed maths, but when I was going through school I can't remember doing the hands-on stuff

The term 'hands-on' was frequently used by students in all interviews indicating that the tutorial structure was a contributing factor to anxiety change.

Conclusion

The necessarily brief analysis of data from this study has provided a picture of a sizable proportion of pre-service teachers suffering mathematics anxiety entering preservice primary education degree courses. Analysis of survey data has indicated that Mathematics

Curriculum Studies programs at tertiary level can positively impact upon anxiety levels, and that this appears to be more positive as students continue with their studies. This preliminary analysis reinforces the need for mathematics curriculum programs in teacher education and emphasises the need for hands-on activities for students in tutorial modes. Given that the survey returned such positive results when the program delivery was via mass lecture and one weekly tutorial, the impact of such a course, for example, delivered in an electronic mode is questioned. Experimentation in other modes of delivery would be an avenue for further research. Further analysis of interview data will assist in unpacking specific aspects of the program for large cohorts of students in a tertiary program operating with limited time and resources. Such analysis will serve to provide a clearer blueprint of necessary components of a tertiary program that positively impacts future-teachers' beliefs about mathematics. What this study has provided is a self-assessment instrument for mapping change in beliefs and attitudes to mathematics, as well as a measure of quality assurance of a particular program within a degree course.

References

- Australian Association of Mathematics Teachers Inc. (1997). Numeracy = everyone's business. Report of the Numeracy Education Strategy Development Conference. Adelaide: AAMT.
- Australian Education Council. (1990). *A national statement on mathematics for Australian Schools*. Carlton, Vic.: Curriculum Corporation.
- Baroody, A. J. (1987). *Children's mathematical thinking*. New York: Teachers College Press, Columbia University.
- Beswick, K., & Dole S. (2001). Dispelling the myths: Influencing the beliefs of preservice primary teachers. In J. Bobis, B. Perry, & M. Mitchelmore (Eds.), *Numeracy and beyond* (Proceedings of the 24th annual conference of the Mathematics Education Research Group of Australasia, Sydney, pp. 90-97). Sydney: MERGA.
- Bush, W. S. (1991). Factors related to changes in elementary students' mathematics anxiety. *Focus on Learning Problems in Mathematics*, 13(2), 33-43.
- Department of Education, Training and Youth Affairs (2000). *Numeracy, a priority for all: Challenges for Australian schools*. Canberra: JS McMillan Printing Group.
- Frank, M. L. (1990). What myths about mathematics are held and conveyed by teachers? *Arithmetic Teacher*, 37 (5), 21-23.
- Malone, J. A. (1995). Determining preservice teachers' beliefs about their role in teaching mathematics. In A. Richards (Ed.), *FLAIR: Forging links and Integrating Resources* (Proceedings of the 15th biennial conference of the Australian Association of Mathematics Teachers, pp. 264-269). Darwin: AAMT.
- Mayers, C. (1994). Mathematics and mathematics teaching: changes in pre-service student-teachers' beliefs and attitudes. In G. Bell, B. Wright, N. Leeson, & J. Geake (Eds.), *Challenges in mathematics education: constraints on construction* (Proceedings of the 17th annual conference of the Mathematics Education Group of Australasia, pp. 419-428). Southern Cross University: MERGA
- McLeod, D. B. (1992). Research on affect in mathematics education: a reconceptualisation. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 575-596). New York: Macmillan Publishing Company.
- Schuck, S., & Foley, G. (1998). Challenging beliefs about mathematics learning and teaching using an electronic learning community. In C. Kanen, M. Goos, & E. Warren (Eds.), *Teaching mathematics in new times* Vol. 2, pp. 508-515). Gold coast, Australia: MERGA
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, February, 15(2), 4-14.
- Stuart, C., & Thurlow, D. (2000). Making it their own: Preservice teachers' experiences, beliefs and classroom practices. *Journal of Teacher Education*, 51(2), 113-140.
- Sullivan, P. (1989). Factors inhibiting change: A case-study of a beginning primary teacher. *Mathematics Educational Journal*, 1(2), 1-6.
- Tobias, S. & Weissbrod, C. (1980). Anxiety and mathematics: An update. *Harvard Educational Review*, 50, 63-70.
- Wood, E. (1988). Math anxiety and elementary teachers: what does the research tell us? *For the Learning of Mathematics*, 8(1), 8-13.