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Mathematical Backgrounds of Preservice Teachers

Project Title	Mathematical Backgrounds of Preservice Teachers in Rural Australia: A Regional Comparative Study
Project Team	Dr Stephen Tobias (SiMERR Queensland), Diane Itter (La Trobe University – Bendigo)
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Description

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This study investigated the nature and depth of pre-service teachers' mathematical competencies, attitudes and beliefs of students entering teacher education courses in rural and remote areas. The study was simultaneously duplicated at two regional universities - James Cook University (JCU) (Townsville) and at La Trobe University (LTU) (Bendigo) - both of which draw many students from rural and isolated parts of Australia. The study will provide insights into the backgrounds of preservice teachers in their first year of tertiary study. The comparative nature of the study will allow researchers from JCU and LTU to compare data and identify similarities among nearly 400 first year students mainly from rural backgrounds. As many rural students return to the rural areas (the bush) after graduation, this project will potentially be an important instrument for guiding change in teaching practice. A larger longitudinal study is envisaged between the two universities with the same cohort near the end of their course and again in their initial years of teaching.

The SiMERR National Survey found that many students from rural and isolated schools are disadvantaged in comparison to their counterparts from metropolitan areas. Educationally it has been recognised that students from rural and regional schools have not been achieving to the same levels in science and mathematics as their capital city peers (SiMERR, 2006). Difficulties in retaining teachers, high turn-over rates, issues of support, resources and professional development were widely reported along with the lack of appropriately qualified staff especially in curriculum areas such as mathematics. Recruitment difficulties in non-metropolitan areas were of particular concern in the context of the tendency for lower levels of participation and achievement in mathematics among rural and regional students (Victorian Parliament, 2006, p.206). Although, it was found that there are many positive, quality of life, aspects to rural living, the lack of role models and vision was consistently regarded as outstanding. Rural students have fewer images from which to draw in envisaging what they might become (Alloway, Gilbert, Gilbert and Muspratt, 2004).

The Australian Council of Deans of Science report (ACDS, 2006) found some worrying trends in mathematics education, such as one in twelve of all mathematics teachers studied no mathematics at university and one in five of all mathematics teachers studied no mathematics beyond first year. Clearly there are concerns about recruiting and retaining suitably qualified mathematics teachers especially in rural and remote areas, and particularly it seems in Queensland schools (Queensland Board of Teacher Registration, 2005). These problems can only worsen in the short to medium term because fewer students are studying mathematics at school at advanced levels (ACDS, 2006, p.iv; Victorian Parliament, 2006, p.204). The shortage of available mathematics teachers was seen as a growing problem, predicted to increase as experienced teachers retire.

The project involved the first year students engaging in several surveys that included Attitudes to Teaching and Learning Mathematics questionnaire, a Critical Moments Survey of students' feelings about mathematics while they were school students, and a Competency Test (comprised of 40 short answer and multiple choice items designed to assess understanding of procedures and concepts). The Test was set at the Year 8 level with the questions derived from the standard national tests used across Australian schools.

Participants

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Year 1 preservice primary students at JCU (Townsville) and LTU (Bendigo) – 318 female and 79 male.

Findings

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The cross campus comparison of results:

- According to age group survey reveals that preservice teachers attending university within two years of Year 12

studies (about 2/3 of cohort), tended to out-perform their mature age counterparts;
- Indicated that as expected, the variable highest level of mathematics studied prior to attending university had the most impact on competency test results;
- Indicated that many preservice teachers experienced difficulties with questions related to operations involving fractions and decimal fractions, division with two digit divisors, recalling and applying the order of operations convention, and applying formulae;
- Indicated that most students had a positive experience in mathematics at primary school, while this trend was reversed in secondary school; and
- Indicated students' experiences while at school affected their attitudes and willingness to engage in learning mathematics. The teacher's attitude to teaching was seen as the most important influence. Their ability to "explain" and "work with students" was the most significant aspect.

The findings of this study were consistent with similar studies in this field. The results indicated that many preservice teachers had difficulties with questions related to operations involving fractions and decimal fractions, division and two digit divisors, recalling and applying the order of operations convention and applying formulae. This can be partially explained by the large number of preservice teachers who have studied the minimal mathematical requirement (Year 12 mathematics) in order to gain entry to their teaching degree and the number of mature aged students who took mathematics classes many years ago. Therefore, it is unwise to assume that preservice teachers have sufficient mathematical content knowledge to teach mathematics meaningfully.

The findings provided solid evidence for understanding rural students backgrounds in mathematics prior to beginning teacher education courses. This evidence is useful on the local level for curriculum design and implementation and also on a broader scale to inform other teacher educators and authorities as to the extent of the background understandings and attitudes and beliefs that many pre-service teachers' possess. The challenge for mathematics teacher educators is to recognize and positively influence students' orientations while engaging students in learning mathematics in light of how we might teach the subject. In order to achieve this, student's attitudes and backgrounds require sensitive attention and continued support throughout their tertiary studies as they develop their understandings prior to graduation.

Outcomes

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Peer reviewed article

- Tobias, S. and Itter, D., (2007) Mathematical backgrounds of preservice teachers in rural Australia: A regional comparative study, published by AARE in 2007.

Conference presentation

- Tobias, S. and Itter, D., (2007) Mathematical Backgrounds of Preservice Teachers in Rural Australia: A regional comparative study. Proceedings of the annual conference of the Australian Association for Research in Education, Notre Dame, Perth, WA.

Impact

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Knowledge of an inadequate conceptual understanding of preservice teacher in complex mathematical concepts, and the relationships which exist between and amongst them, is essential conceptual understanding that is required of teachers. Therefore, teacher educators are currently faced with the challenge of addressing conceptual misunderstandings and deficits in knowledge base.

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