STUDENT PERCEPTIONS OF LEARNING OUTCOMES IN MATHEMATICS MAJORS

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Background

In recent years there has been an increasing focus on accountability within the higher education sector. This has led to requirements for institutions to (i) indicate learning outcomes for the programs they offer and (ii) provide evidence of student achievement in those learning outcomes. The endorsement of The Science Threshold Learning Outcomes (TLOs) (Yates, Jones and Kelder, 2011) by the Australian Council of Deans of Science indicates that they have been adopted by the community of science academics as appropriate for Bachelor of Science (and similar) degrees across Australia. One way to gain evidence of student achievement is through asking students their perceptions of their learning gains. A survey tool called the Science Students Skills Inventory (SSSI) is now firmly established as a mechanism to gain useful insight from students regarding the extent to which learning outcomes are achieved (Matthews & Hodgson, 2012; Varsavsky, Matthews, & Hodgson, 2013; Hodgson, Varsavsky, & Matthews, 2013; Mercer-Mapstone & Matthews, 2015).

The Science TLOs have been further distilled by sub-discipline (such as chemistry or mathematics) within science (Johnson & Jones, 2015). Thus there is a need for institutions to provide evidence of student achievement against sub-discipline learning outcomes. In this study the SSSI was modified to align with the TLOs for the sub-discipline of mathematics.

Aims

The purpose of this study was to investigate how undergraduate science students in mathematics majors perceive graduate learning outcomes specific to mathematics at four Australian universities. These were explored through differing demographic variables. The question guiding this study was:

How do perceptions of mathematics specific graduate learning outcomes differ by demographic groups such as gender, university attended, single/dual degree and their future plans?

The contribution of this study is to provide greater depth of understanding for curriculum development for mathematics-specific graduate learning outcomes. This is an area of research that is under-explored.

Design and methods

The learning outcomes addressed by the modified SSSI included disciplinary content knowledge, communication to experts and non-experts, writing skills, quantitative skills, teamwork skills and ethical thinking. The survey consisted of questions, which asked students to rate, on a four-point scale, each learning outcome across five indicators. These were the 'importance' of being taught in the program, the extent to which each outcome was 'included' and 'assessed' in the curriculum, the 'improvement' as a result of the degree program, and perceptions of 'confidence'. The demographic information sought from students included gender, tertiary institution, type of degree program (single or dual/joint/double) and plans students had for after graduation (employment, postgraduate studies – research or other, or no plans yet).

Results

The total sample of 144 responses to the survey across the four Australian universities involved in the study was analysed using descriptive statistics. Inferential statistics were used to discern differences in student perceptions across the demographic variables. Overall, students in the study reported low

perception levels regarding the inclusion, assessment, improvement and confidence of TLOs with the exception of content knowledge and quantitative skills. However, respondents indicated all TLOs were important with the exception of ethical thinking. Statistically significant results included many differences in the perceptions of males and females with males typically reporting higher perception levels. Students planning postgraduate studies in research reported higher levels of perceptions regarding TLOs.

Conclusions

Overall, the results suggest gaps in the mathematics curriculum around several of the TLOs. The findings also indicate that male students and/or those who are considering research studies are more likely to perceive alignment between the stated mathematics TLOs and the learning experiences provided in their mathematics major. The call to action for leveling the playing field between males and females in mathematics education appears to be just as pertinent in higher education as it is in primary and secondary school. Likewise the push to move science degrees to more directly meet the needs of those seeking non research paths through mechanisms such as Work Integrated Learning aligns with the results from the survey.

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