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**ENGAGING LEARNERS EFFECTIVELY IN THE SCIENCES:  
THE PATHWAY FROM SECONDARY TO UNIVERSITY EDUCATION**

A thesis presented in partial fulfilment of the requirements for the degree of

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in

Science

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# Abstract

Considerable evidence exists of a world-wide trend of declining student numbers in school and university sciences. Much of the research evidence relating to student engagement in the Sciences has focused on school students, with very little focusing on university students, and even less on the transition and engagement of students from school to university science. This research seeks to understand how university students become or remain engaged in science during their transition from school to university.

Data were collected using a mixed-methods design that included a questionnaire and focus groups. Participants consisted of first-year university students from the College of Science, alongside their lecturers and paper coordinators; plus secondary school students studying one or more sciences, alongside their teachers.

Analysis of questionnaire data revealed five 'teacher efficacy' scales (Lecturer Qualities, Relevant Contexts, Scientific Method, Self-Directed Learning, and Maximising Technology) that correlated with three 'student engagement' scales (Commitment to Performance, Learning with Excitement, and Discovering Meaning). Thematic analysis of qualitative data supported these relationships between teacher efficacy and student engagement. Student engagement was most strongly influenced by lecturers' qualities, along with the ability to place scientific knowledge into contexts that were relevant to the student. However, lecturers' and teachers' perceptions of their teaching qualities were significantly greater than those of their students and, conversely, students' perceptions of their own engagement were significantly greater than those of their teachers/lecturers.

The findings provide clear evidence that more widespread use of best practice pedagogies and provision of relevant contexts would promote student engagement in the Sciences at both secondary and tertiary education levels. In arriving at this conclusion, the present study explores some key questions:

- Student engagement is not lost in transition; but are students engaged at all?
- Teachers influence student engagement; but are teachers reaching their potential?
- Teaching needs to be more engaging; but what does that involve?
- Undergraduates want to become scientists, but must they wait until postgraduate studies?

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Approval to conduct the study was granted by the Massey University Human Ethics Committee: Southern B 09/12.

# Publications

There have been several publications arising from this thesis. The primary publication was the Final Report, which was published by Ako Aotearoa in June 2011:

Parkinson, T., Hughes, H., Gardner, D., Suddaby, G., Gilling, M., & MacIntyre, B. (2011). *Engaging learners effectively in science, technology and engineering: The pathway from secondary to university education*. Wellington, New Zealand: Ako Aotearoa.

In addition, several conference papers have been presented:

MacIntyre, B., Gardner, D., Gilling, M., Hughes, H., Parkinson, T., Rosemergy, B., & Suddaby, G. (2010). *Engaging secondary school learners effectively in science: Voices of students and teachers*. In S. Dolinšek, T. Lyons (Eds.), XIV IOSTE 2010 Socio-cultural and Human Values in Science and Technology Education Conference Proceedings (pp. 715-724). Ljubljana, Slovenia: Institute for Innovation and Development of University of Ljubljana.

MacIntyre, B., Parkinson, T., Gardner, D., Suddaby, G., & Hughes, H. (2010). *Transition and engagement in the sciences: From school to university*. Paper presented at STEM in Education, Brisbane, Australia.

Parkinson, T., MacIntyre, B., Hughes, H., Gardner, D., Gilling, M., & Suddaby, G. (2010). *Engagement in the sciences: The pathway from secondary to tertiary learning*. Paper presented at Careers and Transition Education Conference, Auckland, New Zealand.

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