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The development and validation of a student evaluation instrument to identify highly accomplished mathematics teachers.

Stephen Earl Irving

A thesis submitted in partial fulfilment of
the requirements for the degree of
Doctor of Philosophy
The University of Auckland, 2004

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Abstract

This study describes the attributes of a highly accomplished mathematics teacher as reported by the students in their class, and also determines whether high school students can differentiate between highly accomplished mathematics teachers and others.

The 51-item instrument, Students Evaluating Accomplished Teaching – Mathematics, was developed to map the construct of highly accomplished teaching as articulated by the National Board for Professional Teaching Standards in their Adolescent and Young Adulthood Mathematics Standards. Two focus groups of New Zealand high school mathematics teachers reviewed these Standards, and found that there were more similarities than differences between the Standards and what they would expect of a highly accomplished teacher in New Zealand. Questionnaire items were drafted relating to each of 470 statements in the Standards. These items were trialled in New Zealand high schools, and analysed using factor analysis and item response theory, to select items that completely mapped the Standards. The questionnaire was then administered to 1611 students in the classes of thirty-two National Board Certified Teachers and twenty-six non-Board colleagues in 13 states of the USA.

Multivariate analysis of variance and discriminant function analysis were used to establish that students can record and report the difference between NBCTs and their non-Board certified colleagues, and describe what students believe are the attributes of a good teacher. Highly accomplished teachers build a relationship between their students and the mathematics curriculum, as well as with the language and processes of mathematics, by engaging their minds with challenging material and rich tasks. These results provide further validation of the NBPTS certification process, and indicate that students provide dependable evaluations of their teachers. The student evaluation questionnaire could be used with confidence in both the USA and New Zealand to identify highly accomplished mathematics teachers.

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This research was only possible through the involvement of a large cast of students, teachers and principals, who willingly gave their time and energy to make it possible. There were no direct, tangible benefits for them yet they were prepared to contribute their thoughts and concerns to further this project. To them I express my sincere thanks for their assistance, often at what seemed like the most difficult time in the annual cycle of school life.

It is the student voice that is at the heart of this research. Over 2500 students (1640 in the USA and 899 in New Zealand) participated in this research, often 'volunteered' by their teacher to act as unwitting reporters of their teacher's strengths and foibles. In this research, they have clearly indicated what they like about their teachers, and what they do not. The good news is that their best ratings help to dispel the myth that high school students can be "bought" by a charismatic teacher who ignores the real job of the teacher – to engage students with the curriculum, and challenge them to strive for the best. Thank you for helping to make this clear. High school students are not very familiar with this role in teacher evaluation, but they seemed to approach their role with due consideration. As always, working with these young people has strengthened my optimism about the future that will eventually be in their hands.

The 116 teachers have been the key people in this research, but their role has been greater than just providing access to their classes. Many teachers feel threatened at the thought of being judged by their students, and then to find out what their class thinks about them, but these teachers welcomed this opportunity and opened the doors that made this possible – the classroom doors, as well as the doors to their minds and hearts. In addition, they provided helpful input into the project. Without this receptiveness as well as the cooperation of their principals, this research would never have been possible.

Professor John Hattie has been an incredible tower of inspiration and strength. He has introduced me to the wonders of Item Response Theory and the National Board for Professional Teaching Standards, and shepherded me through the many ups and downs of postgraduate research. The lengthy gestation has been very trying, and his unfailing patience has been greatly appreciated. All the while, John has provided invaluable advice to keep this research pointing in the right direction. Dr Richard Hamilton has also provided wise counsel as this journey drew to a close. Dr Gavin Brown has helped to keep me on task over the past year while I have been working on Project asTTle. The teams in the Research Centre for Interventions in Teaching and Learning (RCITL), and Project asTTle at the University of Auckland have been very supportive and encouraging, providing a sounding board by listening attentively and responding appropriately.

The final word of thanks goes to my long-suffering family. They have had to live with the longer than expected time it has taken to bring this to fruition, and the time that has not been shared with them. In spite of this, they have continued to share their love, support and encouragement to see me through to completion. No doubt they will be as pleased as I now that this project can finally be "put to bed".

This has been an awesome journey, with many twists and turns - I am hugely indebted to all who have made this journey so fulfilling that it has come alive in my mind.

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