

## STEM and girls education

### School Based Research Project 2015 Interim Report Wenona School

#### Project overview

The *STEM and girls education* project investigates possible solutions to improve educational outcomes for girls in STEM (Science, Technology, Engineering and Mathematics) in Australia and overseas.

The purpose of Wenona's research is to assess the impact of curricular and co-curricular STEM programs on girls' interest, engagement, participation and attainment in STEM education. The ultimate aim of the project is to positively support the transition of girls into post-secondary school options of study and employment in STEM-related fields. Practitioner-researchers are focusing on student, teacher and parent mindsets with regard to the development of girls' self-concept and self-efficacy — key elements in girls' continued engagement in STEM. Additional impact measures include tracking girls' academic decision-making with respect to STEM subjects from Stage 6 study through to post-HSC engagement.

#### The research team

The project is being led by Dr Nicole Archard, Dean of Academic Studies. The team is being supported by The Deakin University STEM Research Group (comprised of Professor Russell Tytler, Associate Professor Peter Hubber, and Dr Gay Williams). As part of Wenona School's data collection model, it is also participating in the Australian Science Enrolment Project, which is being conducted by John Kennedy (University of New England).

#### Project design

A mixed methods approach is being undertaken for this project, structured around four main areas of focus:

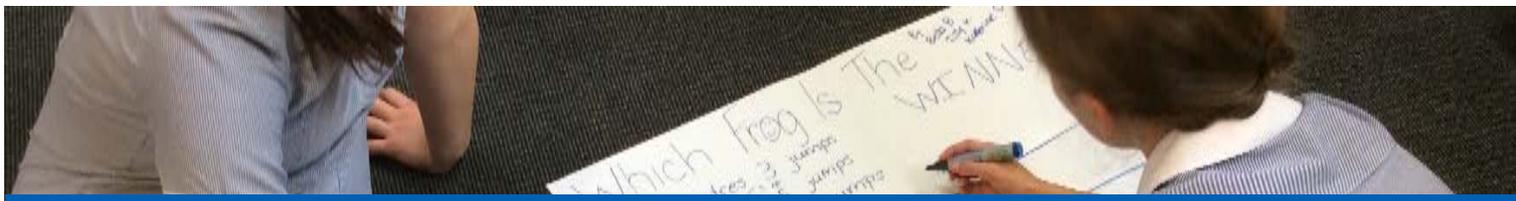
1. A comprehensive literature review
2. A quantitative review of student trends in subject selection, retention and achievement in STEM subjects
3. Deployment of various STEM curricular and co-curricular programs/interventions
4. Investigation of program/intervention impacts on girls' mindsets through a longitudinal attitude survey (for Years 7–12 over a five year period), observations using cutting edge video-capture technology, and student achievement and academic decision-making data collection and analysis.

A wide variety of curricular and co-curricular programs/interventions are being run over the course of the research project, providing multiple entry points for girls' interests in STEM:

- Co-curricular: Car Restoration Club, Space Science Club, Maker Club, Solar Mini Sprint (Cars and Boats), Robo Cup

Curricular: Engineering Studies (Preliminary: 2015, HSC: 2016), Computer Coding and Programming (Mandatory Technology – Year 8: 2016), Design Thinking Program (7–10: ongoing), Junior School Engineering Day (2015), Junior School Science Day (2016).

The Deakin University STEM Research Group is also supporting the project through two specific channels: a pedagogical intervention in maths and science in Years 5–8, working with teachers to develop teaching programs and assessments using



an inquiry approach, and the development of a STEM elective course for Stage 5 students which includes work placement (available in 2016).

Although this study is being supported by AISNSW for two years, the project is ongoing and will collect data from the current design for five years.

### Progress to date

Work continues on the project's literature review, and the quantitative review of student trends data — this aspect of the research will continue throughout the duration of the project.

Of significant note in 2015 was the establishment of a research relationship with the Deakin University STEM Research Group—a highly reputed team of researchers with expertise in inquiry and problem solving pedagogies in STEM. The Group began its work with Wenona maths and science teachers to explore pedagogical approaches that build and support girls STEM engagement. Five workshops were run during the second half of 2015 to support teachers in implementing these pedagogies within their classroom contexts. The STEM Research Group's involvement in the project also includes assistance with data collection by way of the innovative use of video capture technology—Go-Pro cameras are used to film both teacher performance and student engagement in the classroom for later teacher and researcher reflection. This observation method provides valuable opportunities for professional learning for teachers as they are able to examine their practices for efficacy in building student engagement.

The Wenona research team has also begun attitudinal survey data collection. This data collection is part of a wider national survey on science participation rates in Australian schools. It is a comprehensive study, capturing trends in engagement across all subjects in order to account for a variety of causal and correlational factors that may contribute to STEM engagement. The survey focuses on attitudes towards STEM subjects such as enjoyment, ability, difficulty, intentions, relevance, and usefulness — both specific and career-related.

The Wenona research team are able to extract data particular to their own research project, whilst contributing to a wider research agenda. The survey captures data over a five year period, presenting an opportunity to engage in a long-term examination of potential impacts of school programs.

2015 also saw the introduction of many of the curricular and co-curricular programs being run at Wenona, including the official launch of the Year 11 Engineering Studies course by the NSW Chief Scientist and Engineer Professor Mary O'Keefe. Student teams and individuals from the school also participated in national and state STEM-focused competitions, taking out top places in chemistry, engineering and robotics.

### Where to next?

The research team will continue with much of this work throughout 2016. Particular focus will be on the work of the STEM Research Group and teachers in the development of teaching programs and pedagogical improvements, and the analysis of preliminary data.



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