Submission Guide for AAEE 2015 Structured Abstract, followed by Full (draft) Paper template

Structured Abstract for Paper Submissions

Title:

Insert title text here:
Collabor8: (Re-)Engaging female secondary cohorts in STEM subjects

Background or Context:

Provide a brief description of the educational phenomenon or situation that motivated this paper. What have other people said in the past about this topic? What have other people already done? How has this work guided what you are doing (or not – if not why not)?

Insert text here: 250 words max

Demand for skilled professionals in science, technology, engineering and mathematics (STEM) is projected to increase significantly with 75% of the fastest growing occupations requiring STEM skills (Australian Industry Group, 2013). Yet, over the past 20 years, Australia has seen significant decline in the number of secondary students - particularly girls - electing to study science and advanced mathematics (Office of Chief Scientist, 2014).

A 2014 national STEM strategy from the Office of the Chief Scientist recommended support for `high levels of participation and success in STEM [education] for all Australians, including women, Indigenous students and students from disadvantaged and marginalised backgrounds'.

Recent research builds on previous work (e.g. Fine et al, 2010; Lyons et al, 2012; Sikora, 2012; Mills et al, 2010). Zecharia et al identify three key factors found to be influencing young women's participation in STEM subjects:

1. Relevance of STEM to sense of identity and future aspirations.
2. Perceived actual and relative ability in STEM subjects.
3. 'Science capital' - or experience of STEM, including formal and informal exposure to STEM subjects and careers through the curriculum, schooling, media, culture, family and personal connections' (Zecharia et al., 2014 p.9).

This paper introduces *Collabor8*, an engineering and IT outreach program for junior female students from high schools serving low socio-economic communities. *Collabor8* will test the relative importance of Zecharia et al's three key factors for participants' interest in STEM; intention to select STEM subjects in senior high school and tertiary study, and evaluate the chosen outreach model.

Purpose or Goal:

Whether writing about research, academic practice, or theory, what are you setting out to accomplish? What are the possible benefits to a variety of stakeholders, ranging from students to universities to industry.

Insert text here: 250 words max

The aim of *Collabor8* is to inquire into and address the decline in female enrolment in STEM subjects as young women move from junior to senior high school and potentially on to tertiary studies.

In 2015 the program will engage 400 female students in Year 8 and 9 in partner high schools. Each student will attend four separate *Collabor8* sessions in a 'multiple touch point' hands-on and problem-based learning approach to increasing engagement with

STEM study and related career aspirations, delivered by Women in Engineering and Information Technology Program team, and engineering and IT students with industry professionals.

The objectives are threefold:

1.To broaden the awareness of girls in targeted low socioeconomic high schools about engineering and information technology and increase their overall interest in studying STEM/engineering and IT beyond high school.

2.To evaluate the impact of the *Collabor8* program against intended outcomes; and,

3.To identify and investigate the following by a rigorous evaluation and research program:

- Factors that influence subject selection among the cohort,
- The differences in influencers of subject choice among the cohort,
- The number of 'touch points' needed to influence subject choice.
- Research findings will be shared with STEM teachers and outreach advocates in universities, the community, and industry, to inform approaches to working with girls in junior high school.

The program is funded through the Australian Government Department of Education's Higher Education Participation Programme (National Priorities Pool) and results of the evaluation and research will contribute to the Department's knowledge base.

Approach:
What did you actually do and why did you do it in that way?
Research papers should briefly describe research questions and methodological choices. Academic practice papers should describe the innovation as well as how it was implemented and evaluated. Theoretical papers should include the major theories used to analyse the phenomenon or situation and the questions that are driving the analysis.

Insert text here: 250 words max

Collabor8 extends a hands-on learning outreach model to girls in Years 8 and 9 from low socioeconomic backgrounds in a four 'touch point' program over the course of a school year and will found a community of practice for teachers seeking to improve their female students' engagement with STEM.

Participants attend two in-school visits, a full day on-campus and a full day tour of the workplace of an industry host. Each touch point is designed to stimulate interest in STEM; demystify the fields of engineering and IT; disrupt stereotypes that engineering and IT are careers for men but not for women; demonstrate how STEM concepts are applicable to real world problems; and engage students with the reported experience of female engineering and IT students and industry professionals.

The program works with younger students to stimulate interest in STEM before girls opt out of subjects that prepare them for tertiary STEM study and careers in STEM related fields (nationally, students are given their first opportunity to independently select elective subjects during Year 8). Maths and science are compulsory until Year 10, however a student's enjoyment of the subject in junior years is a predictor of their choosing it in senior years (Ainley, 2010).

Collabor8 includes rigorous evaluation and a research component to identify factors that influence participants' interest in post-school engineering and IT study and careers as well as subject selection behaviour.

Discussion:
Summarise the key outcomes of your activity (actual or those you anticipate will be in the full paper draft).

Insert text here: 250 words max

The *Collabor8* Program began in early 2015 and has, to date, engaged around 385 students from seven low socioeconomic high schools in NSW in the first three touch points. We have found a high level of engagement with the program by the Year 8 and 9 students and teachers following a strong response to the initial invitation.

The first meeting of the '*Collabor8*: Teaching STEM to female students' community of practice was led by a *Collabor8* teacher, and was well subscribed by STEM educators from a diversity of schools.

We have constructive formative feedback from teachers and students for *Collabor8* hands-on learning activities to be more explicitly linked to the Year 8 and 9 mathematics and science curricula.

We hope to find that there is an increased awareness among the cohort of the social relevance of the fields of engineering and information technology and that they are potential and viable career paths for themselves. We hope to see an increased proportion of the Year 8 cohort selecting STEM subjects for Year 9 - by comparison with the Year 9 cohort not exposed to *Collabor8* during their Year 8 year.

We also hope to have a substantial body of knowledge about the basis for subject selection by girls in Years 8 and 9 that can contribute to best practice guidelines for STEM engagement that increases aspiration for STEM study and career paths.

Recommendations/Implications/Conclusions
Given these outcomes, describe what the implications are for the future conduct of engineering education for relevant stakeholders. You might also discuss what further questions arose as a result of an activity.

Insert text here: 250 words max

There is increased attention being paid to engaging with young people, especially girls and women, about the link between the study of STEM subjects in high school and tertiary pathways into new and expanding fields of employment.

The long-term project of attracting women to the 'non-traditional' fields of engineering and IT is being renewed in universities with the benefit of research in engineering education previewed by King 2008, including pathways into the curriculum by Godfrey & King 2011, and gender inclusive curriculum of Mills, Ayre and Gill 2010. The wider context of this project features the workplace reporting requirements to improve women's retention, of the Workplace Gender Equality Act 2012, and analysis of the slowness of change in the gender profile of engineering following decades of advocacy, by Mills et al 2014.

The subject of this paper is a nationally funded project inquiring into the influences on subject choice by junior high school girls, to better inform communications about both the links between STEM enabling subjects and tertiary studies, and the working life and leadership that graduates in these fields can step up to. The content and breadth of experiences of studies and careers in STEM are not readily accessible, and tend to be beset by gender stereotypes. This is an opportunity to promote inclusive practices and student-centred learning in education and to model the flexible and collaborative environments that are the goal of reforms to better attract and retain women in STEM fields and leverage diversity.

Authors: (please add the corresponding author first)

Prefix	First name	Surname	Email	Affiliation
Ms	Bronwyn	Holland	Bronwyn.Holland@uts.edu.au	University of Technology Sydney
Ms	Melissa	Ronca	Melissa.Ronca@uts.edu.au	University of Technology Sydney

Topic:	Select (X)
RESEARCH PAPERS:	
The appropriate use of the correct technology	
Student Centered Learning	X
Learning spaces; physical, virtual and remote	
Other (refer to Themes page on website)	
PRACTICE PAPERS:	
The appropriate use of the correct technology	
Student Centered Learning	
Learning spaces; physical, virtual and remote	
Other (refer to Themes page on website)	
THEORETICAL PAPERS:	
The appropriate use of the correct technology	
Student Centered Learning	
Learning spaces; physical, virtual and remote	
Other (refer to Themes page on website)	