

# Training tutors for undergraduate courses in engineering: The importance of context

Lydia Kavanagh<sup>a</sup>, Tracey Papinczak<sup>a</sup>, and Liza O'Moore<sup>b</sup>

*EAIT Faculty, The University of Queensland<sup>a</sup>, School of Civil Engineering, The University of Queensland, <sup>b</sup>  
Corresponding Author Email: [l.kavanagh@uq.edu.au](mailto:l.kavanagh@uq.edu.au)*

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## **BACKGROUND**

Provision of sufficient effective tutors for students in undergraduate courses in engineering can be a difficult and time-consuming process. One solution is a program of high quality training made compulsory for all new tutors. Trained tutors yield statistically significant gains in learning for students compared to untrained tutors (Bloom, 1984; Chi et al., 2008; Slavin et al., 1989; VanLehn et al., 2007). Tutor training programs in Australia generally adopt a 'one size fits all' approach that fails to acknowledge or accommodate the enormous diversity of tutor roles and the importance of context; the role of context has previously been highlighted in reviews of professional development (PD) for academics (Steinert et al., 2006).

## **AIM**

Modifications to the university-wide generic tutor training program (Tutors@UQ) were undertaken to enhance attendance, role-relevance and contextualisation. This was expected to have flow-on effects to student engagement and retention and provide teaching skills relevant for engineering graduates.

## **APPROACH**

Modifications to the content of Tutors@UQ to highlight engineering-specific assessment, tutorial situations and case examples were made in consultation with EAIT academics. Greater emphasis on program components of most relevance to the majority of tutors was key. Engineering academics were responsible for facilitation of the program. Evaluation included quantitative measures of tutor satisfaction with the program and its elements, and qualitative comments regarding the training.

## **RESULTS**

Evaluation using the standard institutional instrument revealed improved tutor satisfaction with the overall program, with ratings (out of 5) increasing from 3.97 in 2011 to 4.28 in 2014. Comments highlighted that the introduction of specific engineering context was one of the best aspects of the training. More relevant context lead to increased engagement from academic facilitators, which lead, in turn, to greater buy-in from tutors. This evidence resulted in the modified program being endorsed at faculty level for future implementation.

## **CONCLUSIONS**

Just as high quality PD for engineering academics is best embedded in engineering-contexts (Papinczak et al., 2013), tutor training is improved when context is given paramount consideration. There is also a level of ownership by academic facilitators as the training program is owned and operated within the faculty. The program is therefore likely to be better able to improve tutoring practice within engineering courses.

## **KEYWORDS**

Professional development, Tutors

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## Introduction

The traditional Australian teaching model incorporates several hours of lectures with supplementary tutorial time each week. Practical application of theory is done in these smaller group (tutorial) settings where students have an opportunity to seek guidance and pose clarifying questions. Tutors are ideally placed to facilitate student learning and to identify students who need further assistance. Studies from France, Australia and the UK highlight the strong link between tutor support and improved student learning, and the importance of tutors to retention of students in tertiary education, particularly in the first year of their studies (Bevan-Smith et al., 2013; Goodlad, 1998).

Trained tutors yield statistically significant gains in learning for students compared to untrained tutors (Bloom, 1984; Chi et al., 2008; Slavi et al., 1989; VanLehn et al., 2007). Unfortunately, provision of sufficient trained tutors for students in large undergraduate courses (such as in engineering) can be a difficult process. With the number of first-year engineering students in this institution approaching 1200, large numbers of tutors are required and the number of new tutors requiring training at the beginning of first semester is around 180. One solution is a structured program of high quality contextualised training made compulsory for all new tutors and offered prior to the commencement of each semester; the importance of context has previously been highlighted in reviews of professional development for academics (Steinert et al., 2006).

However, tutor training programs in Australia generally adopt a 'one size fits all' approach which fails to acknowledge or accommodate the enormous diversity of tutor roles and the importance of context. While generic training will enable tutors to gain a better understanding of learning theories and principles, it is unable to embed these understandings in the context of an engineering classroom, where, for example, the assessment will be quite different to that in another discipline. Underhill (2010) reflects on the need for tutors to be trained in the "practices, attitudes and values of the disciplinary community" (p. 97).

In his seminal paper, Shulman (1986) describes the differing knowledge of teachers: content knowledge (CK), pedagogical knowledge (PK), and pedagogical content knowledge (PCK). Many tutor training programs rely on PK and focus on inclusive practices, active learning, reflective practice and student-centred learning. Knowing how to teach in one's discipline (PCK), although central to higher education, cannot readily be integrated into generic tutor training programs.

The University of Queensland (UQ) offers a generic tutor training program - Tutors@UQ - which is delivered across all faculties either by the Teaching and Learning Unit or by academics within the respective faculties or schools with input from the unit. The program commences with a day-long workshop (Session 1 and Session 2) which new tutors are required to attend prior to tutoring. Session 1 is focussed on the basics of learning, the importance of professionalism, and the components of a well-balanced tutorial. Session 2 deals with managing tutorials, marking and giving feedback, plagiarism and collusion, as well as gathering feedback about one's tutoring performance. There is a third session that is conducted by the schools in Week 6 of semester as follow-up to the initial training. As this short session is highly contextual, it is not discussed further in this paper.

Tutors@UQ is a robust and well thought out approach to training new tutors; however, after running the program for several years to train tutors for the Schools of Engineering, issues were beginning to arise. Some of the program was found to be inapplicable to tutoring in engineering (e.g., developing lesson plans or marking essays), whilst other areas, such as facilitating the development of engineering skills and competencies, were not addressed. This 'lack-of-fit' manifested itself through lack of tutor engagement and with academics having to facilitate special sessions for tutors to cover what should be basic engineering tutor skills. This ultimately resulted in the development of a context-specific program.

This paper details the program of ongoing modifications to the university-wide generic tutor training program (Tutors@UQ) and evaluates the impact of the contextualised training in terms of tutor attendance, engagement, role-relevance and learning. There are expected to be positive flow-on effects to undergraduate student engagement and retention but these are not addressed here. In particular, this paper addresses the following research questions:

1. Will contextualisation enhance tutor satisfaction with training?
2. Will contextualisation enhance tutor's perceptions of preparedness and confidence in their tutoring?
3. Will the contextualised program be more intellectually stimulating for tutors?

It is acknowledged that these questions focus only on tutor perceptions of their training and that a more complete evaluation would include other outcome measures, such as tutor-student interaction and tutor performance. This will be an area of ongoing research.

## **Developing a Contextualised Tutor Training Program**

For the past two years, a contextualised tutor training program, entitled EAIT@UQ, has been developed, implemented, evaluated and improved in the faculty of Engineering, Architecture and Information Technology (EAIT). It is based on Tutors@UQ with context-specific revisions and case studies and was developed with input from the Teaching and Learning Committee chairs from each of the schools within the Faculty along with teaching staff involved in tutor training. Greater emphasis on program components of most relevance to the majority of tutors underpinned content development.

In addition, and in line with the key principles for good practice outlined by Chickering and Gamson (1999), revisions to the training program emphasised positive faculty-tutor interaction and role-modelling, encouraged cooperation among students, involved active learning, communicated high expectations and respected diversity. The socialisation model described by Smith and Bath (2007), which specifies both socialisation into the role of tutor as well as socialisation into the culture of the discipline, was utilised.

Kolb's learning cycle model, as refined by Roberts (2006), was used as a framework for the contextualised program in order to focus on the level, duration, and intended outcomes of training. EAIT@UQ therefore starts with a reflection on participants' experiences as engineering students - a more concrete level that connects tutors with their own experience - and systematically progresses to more abstract levels of knowledge moving participants from consumers of content to facilitators of learning. After the initial reflection, participants are exposed to new information that is discussed so that it can be integrated with their existing knowledge. In addition contextualised practice is disseminated and refined in the workshop and this provides continuity in the learning process.

A further factor was the acknowledgement of the diversity of the tutor cohort within engineering: the roles of tutor may vary considerably from course to course, from 'junior tutor' to laboratory demonstrator to 'senior tutor', and a significant number have English as a second language and may have been schooled overseas. The program modifications were therefore also responsive to these factors.

The EAIT@UQ program (Table 1) has been through several iterations from July 2012 to July 2014 based on both academic and participant feedback:

- Revision 1 (Semester 2, 2012)
  - engineering cases and examples introduced; and
  - generic lesson-planning and critique replaced by observation of an engineering lesson plan.

- Revision 2 (Semester 1, 2013)
  - generic assessment activity replaced with a engineering assessment activity with rubric;
  - plagiarism and collusion material expanded and delivered by an Academic Integrity Officer (from engineering) in an engaging and humorous manner; and
  - an expert engineering tutor panel introduced to enhance student motivation and engagement.
- Revision 3 (Semester 2, 2013)
  - Session 2 timed to end before lunch, enabling students to attend school-specific Work Health and Safety (WHS) inductions in the afternoon; and
  - greater discussion of tutor and student diversity undertaken.
- Revision 4 (Semester 1, 2014)
  - a range of engineering assessment rubrics included;
  - ways of marking and moderating marking in large classes highlighted; and
  - specific tutorial challenges in engineering including fire alarms, lab safety, student conflict in group-work, cultural differences and lack of student engagement included as coping with difficult classroom situations has been identified as important to tutors in engineering disciplines (Bevan-Smith 2013).

Students were provided with a Student Handbook which was completed as a record of key learnings in the sessions, as well as a Demonstrator Guide to use for future reference. Evaluation of the sessions was conducted by the teaching and learning unit using the standard institutional instrument (SECaT). Both quantitative data and qualitative data were collected by this instrument as it contains both Likert-scale and open-ended questions. Feedback was also obtained from the engineering academics facilitating the tutor training sessions.

All new tutors are required to complete EAIT@UQ; otherwise, they cannot be employed as a tutor. Therefore a second repeat workshop is offered each semester for the (small number of) tutors unable to attend on the allocated date. Training is delivered in the week before both semester 1 and 2 begin.

## Results

Table 2 presents SECaT results for each iteration of the EAIT@UQ program. The response rates for each survey exceed 70%.

As shown in Table 2, improved overall satisfaction with the EAIT@UQ program was evident, with ratings (out of 5) increasing from 3.97 in 2011 to 4.25 in 2014. The highest level of satisfaction (4.37) was shown for semester 2, 2013. In Semester 1 2014, due to increased numbers, the training was moved to a different teaching space which was not appropriate for the session as the audio was poor and the room had an L-shape layout meaning that many attendees could not see facilitators. This resulted in the drop in overall satisfaction for the program (4.37 to 4.25).

For comparison, UQ-wide data from all four faculties implementing Tutors@UQ were included where available. This data is inconclusive as in 2012, EAIT@UQ was rated 4.15 (/5) compared to a university rating of 4.07 whereas in 2013, EAIT@UQ achieved a mean rating of 4.15 (/5) compared to a pooled rating of 4.22 for the university.

**Table 2: EAIT@UQ evaluation (Likert rating: 5 = strongly agree, 1 = strongly disagree)**

Evaluation item	Tutors@UQ		EAIT@UQ		
	Sem 2, 2011 (N=72)	Sem 1, 2012 (N=105)	Sem 1, 2013 (N=125)	Sem 2, 2013 (N=85)	Sem 1, 2014 (N=126)
I had a clear understanding of program aims and goals	4.46	4.44	4.43	4.62	4.50
The program was intellectually stimulating	3.89	3.88	3.64	4.25	4.01
The program was well-structured	4.26	4.38	4.20	4.48	4.41
Learning materials assisted me	4.25	4.22	4.33	4.14	4.27
I learned a lot	3.96	4.17	4.20	4.28	4.20
I feel prepared for tutoring	4.04	4.11	4.10	4.27	4.25
I am confident in my tutoring	3.96	3.98	3.76	4.26	4.25
<i>Comparison of EAIT ratings with overall UQ ratings</i>					
EAIT overall satisfaction	3.97	4.15	3.99	4.37	4.25
University overall satisfaction	ND	4.07	4.12	4.33	4.32

What is not inconclusive is the robust improvement for several items on the survey, including 'intellectually stimulating', 'well-structured', 'learned a lot', 'feel prepared' and 'feel confident'. The first three of these items attest to the increased engagement of the attendees with the contextualised program and this was evident through simple observation. The last two items are those that should result in better learning gains for students as the literature attests that confident and prepared tutors better facilitate student learning.

This improvement through moving from a generic to contextual program was also noted in the tutor comments. For example, one attendee highlighted the importance of proposing solutions specific to issues likely to be faced by tutors within engineering tutorials:

*Getting to hear other people's concerns and realising you aren't the only one – and getting to hear solutions to these concerns that you yourself wouldn't have thought of.*

Another participant was impressed with the EAIT tutor panel that provided "excellent advice by experienced tutors". The facilitators were lauded for their dynamic and contextualised approach:

*Good engagement and interaction from the instructors –provided me with useful information and strategies for tutoring in engineering.*

Many comments centred on the benefits of having a variety of different facilitators, the interactive style and peer-peer interactions in the tutorials. While the interactive style and tutor-tutor interaction is a hallmark of the generic Tutors@UQ program, it was emphasised and further developed in EAIT@UQ.

## Discussion

The development and implementation of a contextualised tutor-training program, EAIT@UQ, has been successful with respect to the original aims: increased tutor attendance, engagement, role-relevance and learning. This is evident through the endorsement of the EAIT Faculty Teaching and Learning Committee who unanimously agreed that the modified program should be used for all future tutor training.

The contextualised training sought to engender discipline specific skills and pedagogical content knowledge in association with the development of generic tutoring skills. Significant gains in tutor satisfaction and engagement (Research Question 1) with the program and

many of its elements were evidenced from evaluations of the program using the standard institutional instrument.

In addition, it was satisfying to note the increase in tutors' self-rated feelings of preparedness for, and confidence in, their tutoring - thus answering Research Question 2. This equates with the aim of any tutor training program – to better prepare and support new tutors for the role. With engaging facilitators, drawn from EAIT faculty, providing real-life examples of practice within engineering tutorials, it is likely a more supportive environment could be fostered. Concrete examples of tutorial management and solutions for dealing with workplace health and safety challenges may also instil greater self-assurance among tutors. Tutors felt the program was more intellectually stimulating and well structured, which likely resulted from inclusion of scenarios and examples from engineering tutorials. These data support Research Question 3.

The greatest overall satisfaction with EAIT@UQ was shown for Semester 2 2013; this might be attributable to the combination of an excellent teaching space (designed for group-work) and a smaller number of participants who could be accommodated comfortably in that space. Larger numbers of tutors need to be trained in first semester, requiring venues less conducive to group discussion and interaction with the facilitators. This is supported by the lower ratings shown for semester 1 2013 for which the room was highly unsuitable. The impact of room layout and size and participant numbers on effective facilitation and subsequently tutor satisfaction has ramifications for the scalability of tutor training programs such as these. It is highly probable that two sessions will be run in future.

Several limitations are evident in the research. It was impossible to control for extraneous variables, making it difficult to attribute all positive findings to the modifications to tutor training (De Vos et.al, 2010). In addition, Herzog and Bowman (2011) note that self-ratings of satisfaction with educational programs are likely to be influenced by the 'halo effect', leading to the potential for bias. It is also not possible to determine the extent to which the training program enhances student learning due the presence of multiple confounders. Academics within EAIT faculty were asked if they had observed a change in tutor ability and/or student learning with the introduction of the contextualised program but they found it too difficult to attribute any changes to the program alone. This data was therefore not presented in this paper.

Future research could focus on evaluation of the impact of the EAIT@UQ program on student-tutor interaction, tutor performance and student achievement but this is likely to take significant resources to complete.

## **Conclusion and Recommendations**

Just as high quality professional development for engineering academics is best embedded in engineering-contexts (Papinczak et al., 2013), tutor training is improved when context is given paramount consideration. There is also a level of ownership by academic facilitators and senior management when the training program is owned and operated within the faculty that adds credence to the program. EAIT@UQ is therefore likely to be better able to improve tutoring skills within engineering practicals and tutorials.

One element not present in EAIT@UQ is a 'classroom visit' and mentorship system as described by Underhill and McDonald (2010). Visits from lecturers to tutorials creates an opportunity for dialogue on how to improve tutors' facilitation of tutorials and this ongoing mentorship of individual tutors is a key component of tutor development. This is one way that the program could be improved.

## References

- Bevan-Smith, B., Keogh, J. & D'Arcy, B. (2013). Developing the support needs for casual academic staff at the frontline, In F. Beaton & A. Gilbert (Eds). *Developing effective part-time teachers in higher education*. New York: Routledge.
- Bloom, B. (1984). The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational Researcher*, 13, 4–16.
- Chi, M., Roy, M. & Hausmann, R. (2008). Observing tutorial dialogues collaboratively: Insights about human tutoring effectiveness from vicarious learning. *Cognitive Science*, 32(2), 301–341.
- Chickering, A. & Gamson, Z. (1999). Development and adaptations of the seven principles for good practice in undergraduate education. *New Directions for Teaching & Learning*, 80, 75-81.
- deVos, A., Strydom, H., Fouche, C. & Delport, C. (2005). *Research at grass roots* (3<sup>rd</sup> edition). Pretoria: Van Schaik.
- Felder, R. & Brent, R. (2004). *The ABC's of engineering education: Abet, Bloom's taxonomy, cooperative learning and so on*. Proceedings of the 2004 American Society for Engineering Education Annual Conference.
- Goodlad, S. (Ed). (1998). *Students as tutors and mentors*. London: Kogan-Page.
- Herzog, S. & Bowman, N. (2011). *Validity and limitations of college student self-report data*. San Francisco: Wiley Inc.
- Papinczak, T., Kavanagh, L., O'Moore, L., Reidsema, C., & Crosthwaite, C. (2013). *Do as I say, not as I do: Professional development of academics lacks contextualisation and sensitivity to discipline*. Paper presented to the AAEE Conference, Melbourne, Australia.
- Roberts, T. (2006). A philosophical examination of experiential learning theory. *Journal of Agricultural Education*, 47(1); 17-29.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Slavin, R., Karweit, N., & Madden, N. (1989). *Effective programs for students at risk*. Boston: Allyn and Bacon.
- Smith, C. & Bath, D. (2007). Evaluation of a university-wide strategy for providing staff development for tutors: Effectiveness, relevance and local impact. *Mentoring and Tutoring: Partnerships in Learning*, 12 (1), 107-1222.
- Steinert, Y., Mann, K., Centeno, A., Dolmans, D., Spencer, J., Gelula, M. and Prideaux, D. (2006). *A Systematic Review of Faculty Development Initiatives Designed to Improve Teaching Effectiveness in Medical Education: BEME Guide*.
- Underhill, J. & McDonald, J. (2010). Collaborative tutor development: Enabling a transformative paradigm in a South African university. *Mentoring and Tutoring: Partnerships in Learning*, 18(2), 91-106.
- VanLehn, K., Graesser, A., Jackson, G., Jordan, P., Olney, A., & Rosé, C. (2007). When are tutorial dialogues more effective than reading? *Cognitive Science*, 31, 3–62.

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**Table 1: Contextualisation of the UQ generic tutor training program**

Sub-section	Tutors@UQ		EAIT@UQ		Rational for modification	
	Didactic	Activity	Didactic	Activity		
Session 1	Introduction	About the generic program	-	About EAIT program; role & importance of tutors.	-	The importance of a good tutor to student learning and satisfaction is reinforced.
	UQ expectations of tutors	Importance of tutors, teaching cycle, code of conduct, contracts and duty statements	1. Reflection on personal experiences 2. Tutoring concerns	No change	No change	
	How do we learn?	How we learn, principles of learning	3. How we get better 4. What have we learned 5. Influencing learning	No change	3 and 4 unchanged 5. EAIT examples & differing tutor roles	Varied tutor roles need to be taken into consideration within the training program and contextualised examples used
	How do we tutor for learning?	Student diversity, inclusive teaching, inclusive pedagogies	6. Who are your students? 7. Case studies: inclusivity and student diversity (4)	No change except for inclusion of material on tutor diversity	6. Unchanged 7. Case studies: inclusivity & diversity	EAIT tutors are a diverse cohort; reported issues with cross-cultural communication between tutors lead to this addition
	How do we design tutorials for learning?	4x principles of learning in tutorials, aligning/ balancing tutorial activities, tutorial plans	8. Critiquing tutorial plans 9. Your first tutorial	4x brief principles of learning in tutorials, aligning/ balancing activities, managing tutorial time	8. Your first tutorial – EAIT-specific and general tips	Lesson-plan design/ critiquing activity replaced with discussion of time management and tutorial elements – lesson plans are provided for tutors.
	Summary	Recap of main principles; Answering questions		Unchanged		
Session 2	Introduction	About generic session 2	-	About EAIT session 2	-	
	Managing tutorials for learning?	Managing tutorials, student charter and misconduct	1. Case studies - managing tutorials	Managing tutorials, student charter and misconduct, misconduct in EAIT faculty	Common scenarios: how to manage them, student misconduct	Common scenarios faced by EAIT tutors – such as fire alarms and disagreements in group work, are addressed
	How will you know your students are learning?	Ways of knowing if students are learning, helping learning, marking/ feedback, moderation, plagiarism	2. Knowing 3. Helping learning 4. F/back 5. Marking 6. Providing f/back 7. Using f/back 8. Marking issues 9. Plagiarism	Ways of knowing if students are learning, improving learning, marking/ feedback, moderation, academic integrity	2, 3, 4, 6 Unchanged 5, 7, 8. Omitted 9. Plagiarism (highly interactive, EAIT-specific)	Generic activities were replaced with EAIT practices.
	Tutor evaluation	SETutor – tutor evaluation	-	SETutor – what, why and how; suggestion box	-	Tutors shown & encouraged to use methods to obtain regular student feedback
	Session wrap-up	Where to from here? Reflection on session 2	-	Where to from here? Reflection on session	10. WHS – import, labs, online induction	
	Tutor Panel	N/A		Discussion and answering questions from the floor	Useful tips/ advice 'from the field'	