

# Engineering education quality enhancement: A case study at the School level in the University

Arun Patil, Central Queensland University, Mackay, Australia  
Chenicheri (Sid) Nair, University of Western Australia, Perth, Australia  
Jo Miller, Central Queensland University, Rockhampton, Australia  
Amanullah M Than Oo, Central Queensland University, Rockhampton, Australia  
Patrick Keleher, Central Queensland University, Rockhampton, Australia  
Fae Martin, Central Queensland University, Mackay, Australia

## Abstract

The Undergraduate Engineering Educational Quality Working Group (UEEQWG or EQG) was formed in 2010 within the School of Engineering and Built Environment at the Central Queensland University in order to provide a focal point for learning and teaching quality and its assurance in the Undergraduate Engineering Programs. Currently, there is minimal published evidence of similar and focussed approaches at other universities that do similar work within the sector. This paper outlines the activities conducted by the EQG since its inception and elaborates on key quality assurance approaches and recommendations provided by the working group to achieve the desired quality as well as efficacy of those recommendations/actions undertaken at the school level. The formation and activities of the Group are aligned with the recent AUQA recommendation which seeks emphasis on comprehensive approaches to Quality Policy and related documentation and improve staff understanding of and participation in the University's quality system (TEQSA, 2012).

*Key words:* Quality systems, quality enhancement, QA in engineering education, student feedback, closing the loop, Central Queensland University

This article has been peer-reviewed and accepted for publication in *SLEID*, an international journal of scholarship and research that supports emerging scholars and the development of evidence-based practice in education.

© Copyright of articles is retained by authors. As an open access journal, articles are free to use, with proper attribution, in educational and other non-commercial settings.  
ISSN 1832-2050

## Background

The quality assurance processes in higher education can be carried out at different levels, such as; internal (school/department, faculty or university), external (professional bodies), national (national agencies) and regional or international (international agencies). Finch (1994) has described the five important stages of development in the quality framework to improve the level of quality performance in any organisation, namely:

- Awareness: about the whole educational process or educational system.

- Measurement methods: implementation of adequate measurement methods of performances and outputs in education.
- Process focus: focusing on the educational process in which inputs are converted into performance and learning output.
- Alignment of objectives: aligning program or course objectives to the whole educational process.
- Customer orientation: focusing on students (or learners) as customers and facilitating learning throughout the process.

At institutional level, many QA tools or processes are implemented in higher education around the world, such as; Total Quality Management (TQM), International Quality Standards (ISO 9000 etc.) and Capability Model (Doherty, 1993; Kanji G. K. & Tambi, 1999; Chua, 2004; Soosaipillai et al., 2004).

The quality assurance at Central Queensland University is monitored through the process of planning, decision-making, implementing and reporting a quality cycle based on “Plan-Do-Check-Act”. The University safeguards the cycle of regular evaluation of its processes and activities, using both internal and external evaluations and reviews. External evaluations and reviews are used to benchmark the University’s standards (CQUniversity, 2012).

Within faculties and schools, Program Committees are responsible for the processes of planning, development, content, performance, analysis and review of programs to assure to the University that quality and compliance meets with academic standards within the Australian Higher Education Quality Assurance Framework and the Australian Qualifications Framework (AQF). These Program Committees are supported by a Program Reference Committees that advises on discipline, industry, government or community needs. These committees report through the Faculty Education Committee to ECAB. The University’s Academic Board accredits programs and receives program review reports. As part of enhancing Central Queensland University’s commitment to the quality of its learning and teaching, learning and teaching supporting structures are being realigned to bring together aspects of quality assurance and enhancement, curriculum design and academic staff development within Office of Learning and Teaching.

## **Development and rationale**

In 2010, an initiative of the School of Engineering and Build Environment at the Central Queensland University was the formation of Undergraduate Engineering Educational Quality Working Group (UEEQWG or EQG). The aim of EQG is to provide a focal point for learning and teaching quality and its assurance in the Undergraduate Engineering Programs. In addition it builds on the AUQA recommendation that says ...“Central Queensland University review and make more comprehensive its Quality Policy and related documentation and improve staff understanding of and participation in the University’s quality system.” (TEQSA, 2012).

The areas that the EQG has initiated, since its inception, are the areas of strategic importance to the university such as, student feedback and course evaluations. The School approach complements Central Queensland University processes of collecting and analysing student feedback on course curriculum design and delivery and lecturer delivery performance; feedback regarding individual

lecturers, course evaluations, course enhancements and graduate course experiences. The emphasis of this approach is to promote improvement of quality, not just to ensure quality is maintained but consequently, shifting the emphasis from quality assurance to quality enhancement (QAA, 2008). Most importantly to provide a formal interface between stakeholder groups (students, industry advisory groups, schools' reference groups, university administration, employers, etc.) and the Undergraduate Engineering, Physics and Mining Program Committee (Program Committee or PC) in order to enhance teaching and learning quality within the school.

The key objectives of the EQG are:

- To create and facilitate strategic approaches for the improvement of the quality of learning and teaching in the Undergraduate Engineering Program.
  - In this context, working with key University strategic learning and teaching goals, such as student feedback
- To monitor key indicators of learning and teaching quality
  - that is, working with the Program Committee to agree on key indicators to monitor throughout the year
- To summarise feedback from stakeholder groups and make recommendations to the Program Committee for their review and adoption
- To create an end-of-year Quality Report which summarizes those quality-related issues which arose during the year, actions taken by the Program Committee to meet those issues, and the efficacy of those actions

## **Structure and function**

The EQG's role is to provide a summary of the findings/recommendations to the Program Committee for discussion, endorsement and further action. The Program Committee has Engineering Quality Group as a standing item on its agenda.

The EQG members are:

- Head of Program
- Discipline Leaders of Electrical, Civil, and Mechanical
- Foundation Studies Coordinator
- Distance/ Flex Studies Coordinator
- Industry Liaison Officer/Co-Operative Director
- An external member from other university who is internationally recognised QA expert.

The group is chaired by the member of the Program Committee who currently advises that group on quality issues. The EQG creates and facilitates strategic approaches for the improvement of the quality of learning and teaching in the Undergraduate Engineering Program and works with key University strategic learning and teaching goals, such as student feedback.

The Group conducts regular meetings and work on the set targets as planned and devised.

## **Plans/activities**

In the first two years of its operation, EQG worked on student feedback and course evaluation and enhancement data. This is further described as below.

As a priority and on the suggestion by program committee, the Group decided to work on student feedback. The School of Engineering and Build Environment organises regular student forums to obtain student feedback for the undergraduate programs. This is planned and conducted with the help of Engineering Undergraduate Society (EUS). The feedback collected in these forums was collated and compiled by the program committee which is utilized by the EQG for the further action.

The Group studied the report of students' feedback which comprised of elements of issues on various aspects of learning/teaching and assessment, as well as systems and administration. Each and every element of feedback was then categorised based on its urgency of action and members of the Group discussed the causes in detail. Based on this, a comprehensive list of recommendations was devised, drafted and finalised which is then submitted to the Program Committee for further action.

The document submitted to the Program Committee in response to students' feedback included a list of 20 recommendations which were categorised on the basis of urgency of actions. For example, the first category, "Need Urgent Attention", had 7 key recommendations which required urgent attention and actions by the School. The feedback elements and recommendations were related to all aspects of student learning, such as; course contents, delivery, assessments, access to learning materials, etc.

The Group further suggested Program Committee that these recommendations need to transformed or informed back to students with proposed actions or actions taken so that the important concept of "closing the loop" would be followed.

## **Working with course evaluations and enhancements**

In the second phase of operation, and on Program Committee's suggestion, the EQG worked on the course evaluation and enhancement data within the school. The data from course evaluation for Term 1 (T1) and Term 2 (T2) was studied, filtered and compiled. Finally, the relevant data for 46 courses in Term 1 and 54 courses in Term 2 was compiled and analysed. The Office of Learning and Teaching of the University provided mechanism and support to retrieve and filter the evaluation data from several courses within the School. The following criteria were used to filter the information:

- Only courses with student enrolment 5 or more have been considered for analysis and recommendations.
- The courses from undergraduate programs are only taken into account.

- The courses from internal/full-time as well as distance students enrolments were considered

In addition, the course enhancement data from university Nexus system is also utilised in conjunction with the course evaluation data for further analysis. The University has recently moved to the new electronic format for its Course Profiles (e-Course Profiles), using Nexus to replace previous system of Teaching Data Repository (TDR). The course coordinators input relevant information into their courses through the Annual Course Enhancement Reports using Nexus. This information includes course enrolment, student performance, feedback and recommendations and good practice/s utilised in learning/teaching and assessment. The group retrieved data and information from the course enhancement reports and used the compiled information in conjunction with the course evaluations for the selected courses.

The group, in a recent Program Committee Meeting, then submitted a compiled recommendation report to the Program Committee. The report consists of 13 recommendations at different levels of category as elaborated below.

### ***Level 1: Big picture (School level in comparison with other schools and faculty)***

The courses in this category are identified as “need urgent attention” due to the overall response rates and satisfaction below the set target, which is a major concern and there is a need to help these areas improved. Since University is aiming for higher target for the forthcoming academic years, there is a strong need to develop strategies across the school to achieve better outcomes.

### ***Level 2: Concerns and need urgent attention***

The Group identified 23 courses (in both terms) with less response rate and low satisfaction target and marked them as “the courses at risks”. These courses need urgent attention. It has been suggested that individual academic/course coordinator needs to study the reports and to develop strategies accordingly. The response rates within the School must be increased and this can be possible using various strategies.

### ***Level 3: Need improvements***

In the data analysis, 61 courses identified as the courses need improvements due to either less response rate or low satisfaction target. In order to improve this, the Group has suggested key strategies and one of the suggestions is the courses with low satisfaction target must look into the detailed qualitative feedback and analyse them accordingly. The feedback can be used for further improvements. The Group has also included compiled qualitative feedback data to the Program Committee.

### ***Level 4: Positives -very good***

During analysis it was also found that 24 courses have done very good in terms of both higher response rate as well as higher satisfaction target. It may be wise idea to utilise the best practices from these courses for the courses which are struggling. Therefore the Group recommended that these courses (and related staff) must be reciprocated by the leaders and their efforts must be acknowledged and considered. The compiled reports also include “Best Aspects” (from CE Reports) as well as

“Good Practice” (from Course Enhancement Reports) which reflect what different and effective strategies course coordinators are implementing in these courses to obtain better results. This information can be very useful for other courses which are struggling to perform. Based on these reports a “Good Practice Database” for the school can be generated and developed which can be updated regularly and disseminated to all academics.

## **Discussion and conclusion**

Engineering education needs to enhance not only the quality of learning outcomes, but also the full learning experience in order to address issues of attractiveness and retention in engineering education (Edström, 2012). The integration of student feedback, from various resources, into the quality assurance process of academic programmes is very common for professional courses such as engineering. Student feedback can be used to assess the current quality of courses, but also to guide the improvement of engineering classroom and laboratory practices and facilities as well as the overall quality of the engineering education environment. Student feedback, if heeded can enhance institutional prestige in the competitive global educational marketplace (Nair and Patil 2009). Our understanding of the role of student feedback and course performances is a part of a quality improvement process. The key aspect in collecting student feedback and course evaluation data is what is done with it? Student feedback surveys are not merely measurement tools but are dynamic instruments that need to be used in combination with an institutional quality improvement/enhancement process.

The EQG is exactly aiming in the right direction of quality enhancement for the School of Engineering and Build Environment. Currently, there are minimal references or evidences of similar approaches from other universities. However, anecdotal evidence shows handful of Australian universities utilising holistic approaches at the faculty level. The advantage of the CQU approach is that it is a focussed approach looking primarily at the undergraduate engineering education within the School. An outcome of this approach is the greater engagement of staff in interacting with undergraduate learning and teaching issues. One of the key drivers of the EQG activities is fostering the engagement of all staff in the quality enhancement process ensuring the “closing the loop” aspect in quality circle which was important issue raised by the AUQA (TEQSA) audit report (TEQSA, 2012). Hence, the formation and the activities of the EQG at the School of Engineering and Build Environment of CQUniversity is a first of its kind within the sector. The Group aligned quality enhancement activities with the School’s priorities to improve learning/teaching and assessment, student satisfaction and systems development. In the initial phases, the Group worked on student feedback, course evaluations and enhancement.

The success of any quality initiative rests with staff that are willing to engage with the issues at hand. This model presented in the paper demonstrates that a more focused approach results in a more sustainable engagement and change. The effectiveness of this approach will be closely watched by the Faculty and the university and the sector as exemplars of quality approaches are critical for effective change.

## References

- Chua, C. (2004). Perception of Quality in Higher Education. In R. Carmichael (Ed.), *Australian Universities Quality Forum*, (pp. 181-186). Adelaide, Australia: Australian Universities Quality Agency (AUQA).
- CQUniversity. (2012). Retrieved August 25, 2012, from <http://www.cqu.edu.au/>
- Doherty, G. (1993). Towards Total Quality Management in Higher Education: A Case Study of the University of Wolverhampton. *Higher Education*, 25, 321-339.
- Edström, K. (2012). Student feedback in engineering: a discipline-specific overview and background. In C. Nair, A. Patil & P. Mertova (Eds.), *Enhancing Learning and Teaching Through Student Feedback in Engineering*. Cambridge, UK: Woodhead Publishing.
- Finch, J. (1994). Quality and its Measurement: A Business Perspective. In D. Green (Ed.), *What is Quality in Higher Education?* (pp. 63-80). Buckingham, UK: Oxford University Press: Society for Research into Higher Education.
- Kanji, G. K., & Tambi, A.M. (1999). Total Quality Management in UK higher education institutions. *Total Quality Management*, 10, 129–153.
- Nair, C. S., & Patil, A. (2009). Enhancing the quality of the engineering student experience. In A. Patil & P. Gray (Eds.), *Engineering Education Quality Assurance: A Global Perspective*. New York, USA: Springer LLC.
- Quality Assurance Agency (QAA). (2008). Retrieved August 22, 2012, from [www.qaa.ac.uk](http://www.qaa.ac.uk)
- Soosaipillai, M., Monstad, M.E., & Grahl-Madsen, M. (2004). Total Quality Management in higher education institutions: How to not only teach it, but live up to it. In Z. Pudlowski & N. Grunwald (Eds.), *8th Baltic Regional Seminar on Engineering Education*. Kaunas, Lithuania, pp. 51-54.
- The Tertiary Education Quality and Standards Agency (TEQSA). (2012). *Report of an Audit of Central Queensland University*. Retrieved August 30, 2012, from [http://www.teqsa.gov.au/sites/default/files/auditreport\\_cqu\\_2011.pdf](http://www.teqsa.gov.au/sites/default/files/auditreport_cqu_2011.pdf)