

Workshop: Thinking Like an Engineer

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CONTEXT

Student's capacity for thinking critically and applying those skills to solving problems within an engineering context is crucial to their successful engagement with the profession. Facilitating a learning process that not only introduces students to the technical aspects of engineering but also to the development of skills of thinking critically, working in teams and effectively solving problems is, however, a complex task that is often difficult to structure and challenging to achieve. Working with first year Mechanical Engineering students in an integrated Design Graphics and Communication (DG&C) (Mech.Eng.1006) course, these challenges are often exacerbated by a tradition of prior school education in which students are socialised by didactic teaching methods and examination based learning as well as by the students own resistance to what they perceive as "learning English". Little or no previous exposure to the engineering profession also means that first year students frequently hold misconceptions about the role of professional engineers and therefore have difficulty in making connections between developing technical knowledge and the importance of being able to clearly articulate that knowledge and communicate with others.

To address these challenges an innovative approach to learning and teaching within the course has grown out of student led directions. This approach focuses on skills of problem solving, thinking critically, effective collaboration and teamwork, and effective communication within the engineering genre of both technical and non-technical information; skills all essential to becoming a world class engineer.

This Master Workshop will present an overview of an innovative and evolving approach to learning and teaching which has been co-created by successive members of this first year engineering course.

PURPOSE OR GOAL

The course itself has been developed to create a culture of knowledge sharing and reciprocal learning between students and tutors, tutors and lecturers, lecturers and students, students and students, and students and professional engineers.

The aim of this workshop is to;

- provide some brief theoretical, and historical background,
- demonstrate the approach used
- engage workshop participants in some democratic, active learning experiences which exemplify the approach.

APPROACH

Course Approach

What distinguishes this course from others is the role of the tutor educators and students in co-creating the learning and teaching approach. The approach includes peer lecturing, tutor led workshops, the involvement of former graduates, and a pilot course on tutoring the tutors.

Ideas generated by students themselves initiated the process of co-creation of curricula which has now developed into a multifaceted and richly layered interactive learning experience. The tutor educator group is comprised of a mix of undergraduate students (2nd, 3rd, 4th and 5th years) and one or two post graduate students.

Each year from the 1st year student cohort in communication, a number of 'stand-out' students are invited to continue on as tutors for the following year. This ensures the continued addition of fresh ideas and perspectives to the educator group, whilst still allowing the newer tutors to benefit from the more experienced tutors. At the same time the active role modelling of the tutors in the classroom enhances learning for the students.

Workshop Approach

This workshop presents perspectives of the tutor educator group on the educational approach and how it is continuing to be evolved. In particular the approach taken by the tutor educator group is one of Optimising Problem Solving.

Participants attending this session should be prepared to engage in some democratic, active learning experiences devised and led by members of the tutor educator group. Participants should also be prepared to contribute their own knowledge, experiences and ideas to the presenter's on-going learning as student engineers.

ACTUAL OR ANTICIPATED OUTCOMES

Participants in the master workshop will take away information on

- a) practical approaches and techniques for engaging students in developing their capacity for thinking critically and creatively, and for solving problems within engineering settings
- b) experiences in promoting students capacity to make connections between authentic engineering practices, teamwork and collaboration, and professional engineering management and communication
- c) a new framework, developed by student engineers, for optimising problem solving

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

In a first year Design Graphics and Communication course in Mechanical Engineering, learning essential to becoming a world class engineer has involved developing a systemic integrated approach in collaboration with the students themselves. The development of this approach is still evolving, however, through the building of a culture of active and reciprocal sharing of knowledge between students and educators the course provides the opportunity for students to engage more fully in developing skills required by the engineering industry. Importantly, this approach also mirrors world class engineering collaboration and professional practice.

KEYWORDS thinking critically, problem solving, team work, collaboration, co-created curriculum