Technical Support Role for Project Oriented Design Based Learning in Engineering

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Structured Abstract

BACKGROUND
The School of Engineering within the Faculty of Science, Engineering and the Built Environment at Deakin University was funded to build a new Engineering building in 2012. The Centre for Advanced Design in Engineering Training (CADET). CADET will not only serve as a new engineering building but also act as the catalyst for a pedagogical change in the way that Engineering is delivered at Deakin University. As of 2016 all programs within the School of Engineering will be delivered via a Project Oriented Design Based Learning (PODBL) Methodology. This paper looks at the role that the technical staff will play in a PODBL environment and how to ensure they receive appropriate staff development when moving to a PODBL environment.

PURPOSE
It is well known that for a successful change in the learning and teaching methodology for any program is to ensure all stake holders are well informed and included in all changes to a program. An area often over looked is the preparation of technical staff as a part of that change process. Staff development in moving from traditional teaching methods to one such as PODBL focuses primarily on the development and preparation of the academic staff for the new environment. Technical staff are a critical factor in a successful outcome of any project/ problem/ design based learning environment and ensuring appropriate and specific staff development for such staff in essential.

DESIGN/METHOD
Some of the techniques used in academic staff development for PODBL can be used but in order to have active participation of technical staff in a PODBL curriculum there will need to be specific training suited for technical staff. The specific requirements will include training technical staff in what and how their role the educational environment will train. To this end the School of Engineering will not only have the technical staff attend training sessions along with the academic staff but will also investigate and run specific training sessions primarily designed to take advantage of their technical talents to guide and support students and their projects.

CONCLUSIONS
Technical support requirements in PODBL are significantly different to technical support requirements in traditional lecture-based learning and teaching. With rapid technological advances, technical staff are interested to practice new learning and teaching approaches to meet industry expected career requirements for future graduates.

KEYWORDS
Project oriented design based learning, technical support, student learning outcomes.

Introduction

Staff development in moving from traditional teaching methods to one such as Project Oriented Design Based Learning (PODBL) focuses primarily on the development and preparation of the academic staff for the new environment. Technical staff are a critical factor in a successful outcome of any project/ problem/ design based learning environment and ensuring appropriate and specific staff development for such staff is essential. This paper looks at the role that the technical staff will play in a PODBL environment and how to ensure they receive appropriate staff development when moving to a PODBL environment.

Design Based Learning Curriculum

Design based learning (DBL) is a self-directed approach in which students initiate creative learning using hands on solutions to meet the academic and industrial expectations of society. Yaron Dopplet (Doppelt, 2009) states that DBL is used to produce a curriculum that improves learning for all students in science education. Yaron Dopplet and Reynolds (Dopplet, 2008; Reynolds, Mehalik, Lovell, & Schunn, 2009) states that DBL is an effective process centred on problem solving structures which flow from problem-oriented project based education. By engaging students in design, DBL provides an opportunity to apply original and inventive ideas that aid in students' development and growth. The intention of engineering science education is to produce a curriculum that improves learning for all students. This can be achieved by using design based learning through the preparation and training of project based activities that support the learning of cooperative methods.

Students are encouraged to study subjects where they learn by building, creating and implementing products and prototypes. The objective is for students to integrate their knowledge in processes where problem solving is essential. Therefore, design based learning is used to enrich student involvement by integrating experience. DBL is a type of problem-based learning where problems are solved in teams. It is important to have a pedagogy style or approach, such as design based learning, which is similar to project based or problem based learning. Jonassen and Lehmann (Jonassen, 2000, 2010; Lehmann, 2008) intended that the purpose of design education is to enhance learning in order to teach students to become active participants to solve the design problems around them. Overall, design based learning supports encouraging evidence that this project/problem based learning increases students' science content knowledge and engagement. Working on the design challenge, enables students to transfer knowledge into another task, learn through collaboration, and develop students' positive attitudes towards engineering design education.

Project Oriented Design Based Learning Model

Project Oriented Design Based Learning (PODBL) is a teaching and learning approach (TLA) that is based on engineering design activities undertaken during a project. PODBL encourages independent learning and a deep approach to learning. It is also an approach that supports the development of information literacy and design thinking in the field of tertiary education – currently two of the key learning outcomes in engineering.

The PODBL approach is focused on innovation and creativity where students learn through design based activities but are driven or oriented by a project. The Project Oriented Design Based Learning approach (PODBL) is a design centred approach driven through projects to assist learning and teaching. PODBL allows students to demonstrate professional capabilities expected of graduating professional engineers. Industry expects graduate engineers to be educated with skills, knowledge and attitudes that have changed over time. Chandrasekaran, Alex Stojcevski and Guy Littlefair (S. Chandrasekaran, and Stojcevski, A., 2012; Guy Littlefair, 2012) intended that the purpose of the new learning and teaching model (PODBL) is not to change the engineering curriculum but to reform engineering learning and teaching through design centred curriculum.

Project Oriented Design Based Learning is set to have a positive effect on student content knowledge and the development of skills such as collaboration, critical thinking, creativity, innovation, and problem solving, thus increasing their motivation and engagement. Chandrasekaran and Alex Stojcevski (Chandrasekaran S, 2013a, 2013b; S. Chandrasekaran, Stojcevski, Littlefair, & Joordens, 2013) says that it is a challenging task for academic staff to implement a PODBL approach and integrate technology into projects in meaningful ways.

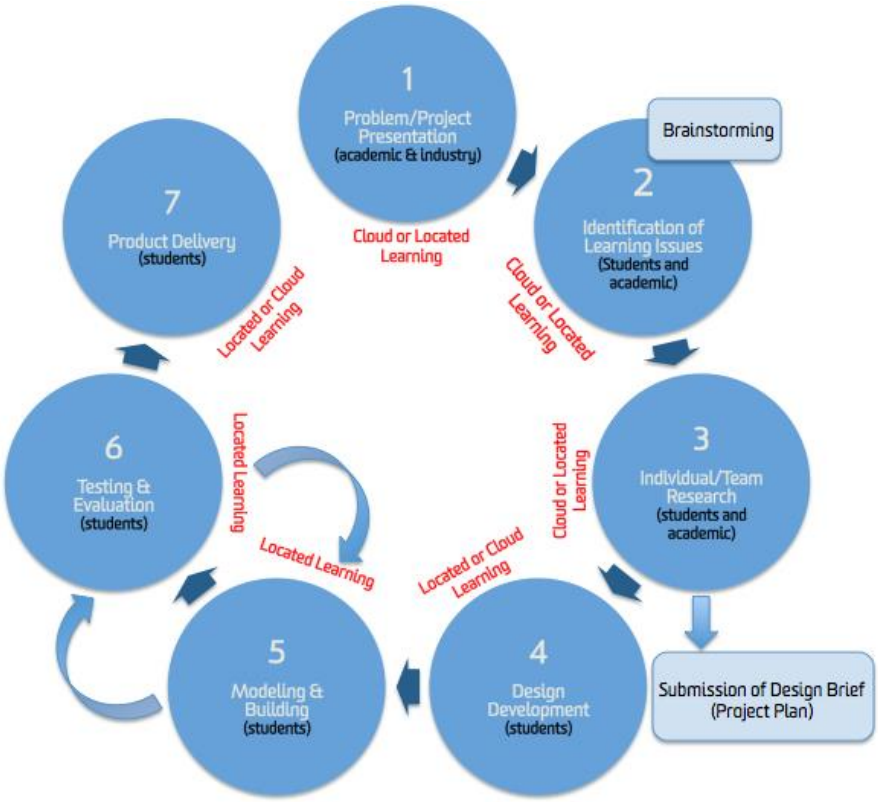

Figure 1: PODBL process

The PODBL cycle involves seven main steps. The steps are illustrated in Figure 1. Steps 1-4 and step 7 take place in a combination of both cloud and located learning, and Steps 5 and 6 are performed through located learning. There are many versions of project based learning as well as design based learning. This new learning and teaching model is a unique combination of the two. PODBL indicates that students learn through real engineering design activities while driven by a project that has a defined deliverable that is presented to them by industry partners or academic staff. In our version, participants work in PODBL teams of four to six members with a facilitator. The same group meets regularly throughout the trimester to work on a series of design activities. The learning and teaching delivery is a combination of cloud and located learning activities. Cloud learning enables students to evidence their achievement. Units contain integrated short, accessible, highly visual, media-rich, interactive learning experiences rebuilt for the mobile screen, with integrated learning resources created by Deakin and other worldly universities and premium providers. Cloud learning will require students to be generators of content, collaborators in solving real world problems, and evidence their achievements in professional and personal digital portfolios. With premium cloud learning experiences in place, students who come to campus will have the opportunity to engage with teaching staff and peers in opportunities for rich interpersonal interaction through large and small team activities.

Technical Engagement

The role of technical staff in a traditional Learning and teaching curriculum is to some degree limited to laboratory support, where technical staff will maintain the equipment used in laboratory sessions. A PODBL environment changes the role of technical staff from a purely support role to one where technical staff become a resource for the students learning needs. This change in role can be quite drastic for some staff and extensive staff development may be required to enable them to conform to the changing needs of the students and the curriculum. While this change can also be difficult for academic staff the PODBL staff development procedures and processes for the change are commonly focused on the changing roles and needs of academic staff. Technical staff are usually left to attend academic staff development sessions and attempt the garner what little information they can in order to adapt their skills to the new environment. Technical staff members skill sets such as OHS, Analytical thinking, Problem solving and hand on technical abilities are ideally suited to support a PODBL learning and teaching environment, however technical staff require training to adjust from being in a purely support oriented role to one of a resource and an educator.

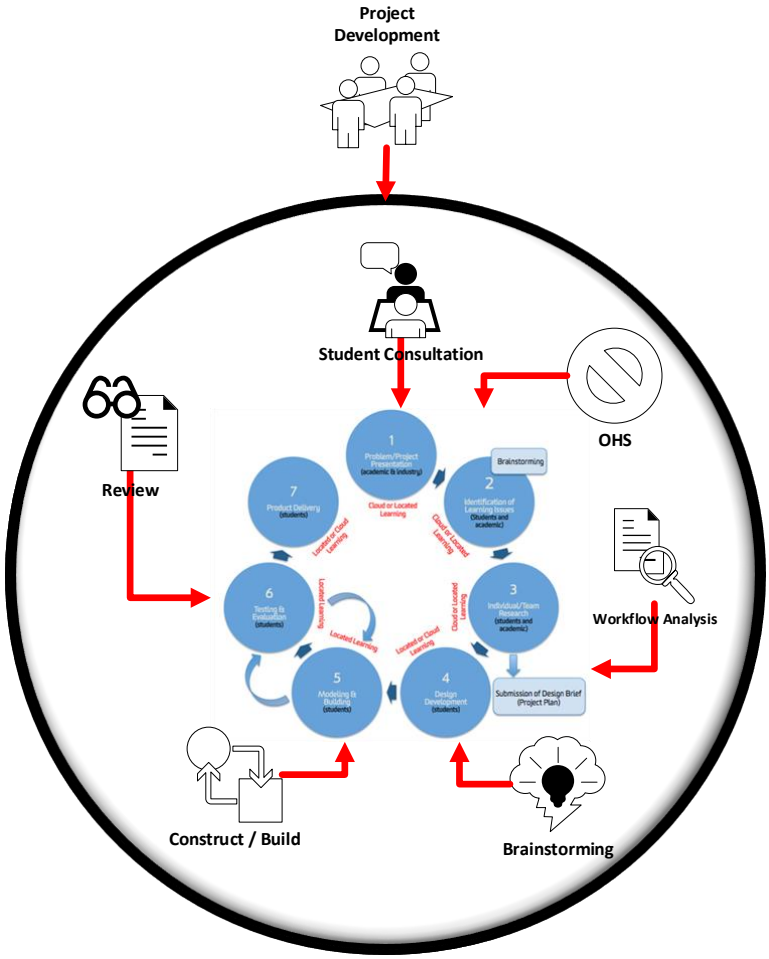

Figure 2 Technical involvement in a PODBL process

Technical staff are required to interact with both academic staff and students much more closely than traditionally. The technical involvement is needed from the onset as a technical advisor on project development committees. This ensures that the project development team are able to make use of specific expertise of the technical staff as well as ensuring that the facilities and equipment are able to support any project that is given to student teams. Once the students are given or choose their projects, the technical staff are required to be available for:

- Consultations
- Occupational Health & Safety
- Workflow analysis
- Brainstorming sessions
- Construction and building of deliverables
- Status review

The role of a technical staff member in a PODBL environment can be best seen in figure 2 above.

Occupational Health & Safety

Occupational Health & Safety is critical to any Engineering curriculum. In most higher education institutions it is the technical staff that ensure that all facilities, laboratories, staff and students conform to OH&S standards. It is the technical staff that not only maintain the equipment and laboratories but also ensure that students are trained and work in a safe and secure manner. Technical staff run laboratory inductions and safety workshops to ensure students comply with the safety standards expected not only by the university but also by their future employers.

Staff Development

While attending staff development sessions for academics can be useful to technical staff, however a targeted approach to training technical staff for a PODBL learning and teaching environment would enable technical staff to have a much more informed and valuable contribution to student education. Targeted staff development for technical staff would include training in order to better understand the PODBL process as well as how to interact with students, unit guidelines and learning outcomes. The targeted staff development will take the form of both half day and full day workshops run by internal and external instructors with experience in running programs in a problem / project based learning environments.

Workshop topics may include:

- The PODBL process (Figure 1)
- Unit guides and learning outcomes
- Project development
- Student guidance
- Resourcing

Technical staff members traditionally have a tendency to get a job completed successfully and move the students on. This however is the complete opposite to what is required of them in a PODBL environment where the students need to be guided to their own solutions. Therefore technical staff will need to be more familiar with each units learning outcomes in order to better guide students to their own solutions to problems.

Conclusion

Deakin University is already moving away from the traditional lecture based environment and now with the school of engineering adopting the newly developed PODBL methodology, it is vital staff members are trained to ensure a successful outcome. To this end the school of engineering has adopted a training schedule that encompasses all staff involved in the learning and teaching process to ensure students receive the best possible education at the highest standard.

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