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# Integration of Cloud Based Learning in Project Oriented Design Based Learning

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**Abstract**

The School of Engineering at Deakin University has been practicing design based learning as one of its engineering learning principles for further development in the learning and teaching process. It has been exploring the student and industry perspectives in this regards and has embarked in the development of a new framework for a project oriented design based learning approach for the development of the engineering curriculum. Along with this change in the engineering curriculum Deakin University also has been going through a major change in the delivery of education. The policy shift has been initiated through Live the Future: Agenda 2020 which focusses on Cloud and Located Learning. This change in policy has had an impact on delivery framework for the project oriented design based learning model which has been incorporated through the use of lecture videos, a learning management system called Cloud Deakin and online tutorials through the eLive system.

*Keywords:* design based learning, cloud learning , project based learning

## 1. Introduction

### *1.1 Project oriented design based learning*

In learning and teaching, practicing design is one of the fundamental processes in engineering curriculum and all other engineering activities related to it. Deakin engineering uses design based learning as one of its engineering learning principles for further development in learning and teaching process. Design based learning (DBL) a self-directed approach in which students initiate learning by designing creative and innovative practical solutions to fulfill academic and industry expectations. It is an effective vehicle for learning centred on a deisgn problem solving structure adopted from a combination of problem and project based learning (Dopplet, 2009). Learning is an active process of investigation and creation based on learner's interest, experience and curiosity and it should result in expanded knowledge and skills. Learning through projects is considered as a way of interactive learning (S. Chandrasekaran and A. Stojcevski, 2012a). The perceptions of engineering students at Deakin University indicated that they believed that DBL was a useful learning and teaching approach, which would be helpful for their future career opportunities (S. Chandrasekaran and A. Stojcevski, 2012b; Dopplet 2009).

By aligning the ongoing study on student perspectives with the investigated industry views, a new framework for the newly proposed project oriented design based learning (PODBL) approach will be structured in our engineering curriculum by considering all factors affecting in the learning and teaching process (S. Chandrasekaran and A. Stojcevski, 2012c). From the ongoing research on project oriented design based learning, it is applicable for the School of engineering at Deakin University to motivate the students and also to teach engineering science in classrooms to get more practical experience that fulfill the industry needs (S. Chandrasekaran and A. Stojcevski, 2013b; Nelson 2004; Lehmann 2008).

The proposed approach PODBL is set have a positive effect on student content knowledge and the development of skills such as collaboration, critical thinking, and problem solving which increases student motivation and engagement. The aim of the research on PODBL approach is to develop and implement a framework for learning and teaching to solve design problems through accreditation inspired project oriented design based learning in engineering education. This research identifies the need to enhance important skills such as innovation and creativity through whole learning process that incorporates design based learning features.

The engineering teaching staff in Deakin University seems to have an adequate understanding of design based learning. This is encouraging to the School of Engineering who will enhance student learning and staff teaching process in a better way. By implementing PODBL approach in the curriculum, it helps to foster the student understanding and engagement in learning. It would be interesting task for academic staff to implement PODBL approach and integrate technology into projects in meaningful ways (S Chandrasekaran and A Stojcevski, 2013b). PODBL is bridging the gap exists between the students learning expectations and teachers teaching approach by aligning both students and staff perceptions about design focused education in their curriculum (S Chandrasekaran and A Stojcevski, 2013a; Godfrey 2009). As part of the PODBL research, the in-depth analyses of all Deakin engineering programs educational objectives, student outcomes, assessment methods and evaluation of various

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undergraduate program shows that design can be learned and taught through project oriented design based learning approach in a convalescent way which is inspired by Engineers Australia accreditation requirements.

Project oriented design based learning (PODBL) in engineering education is an overarching learning approach proposed in the School of Engineering at Deakin University. It is set to satisfy many requirements of the revised accreditation criteria in Australia and around the world, as well as industrial need for the next generation engineering graduates.

### *1.2 Cloud Based Learning*

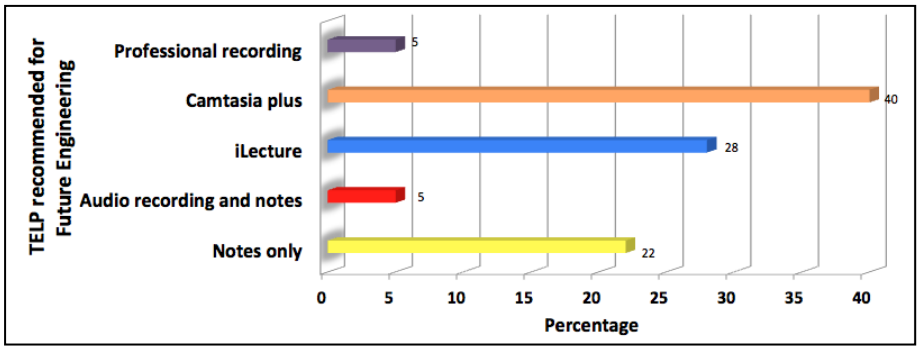


Figure 1. Technology enabled learning practices (TELP's) recommended in engineering

On 28 June 2012 the Vice Chancellor of Deakin University launched the strategic plan called LIVE the future: Agenda 2020, which bought about a major shift in the delivery for education across all disciplines. The plan focusses on Cloud and Located learning which affects every aspect of the student learning experience including the way content is delivered, assessments and student interaction and engagement with staff. This policy is designed to help Deakin University move and drive in the digital frontier a change which is moving across the education sector(John Bourne et. Al 2005). Cloud and located learning is about two distinct learning environments the first being a seamless digital environment provided on the cloud and the second focusing on the located learning experience provided on campus and learning centers and in industry settings.

The cloud learning experience for the students takes place in a digital environment where students will be able to connect with teaching staff, mentors, and have the ability to create evidence of their achievements. The cloud learning experience looks to harness new technologies to provide highly visual, media rich, interactive learning experiences to Deakin university students at locations and times which suit them. To provide this experience requires the use of new delivery platforms with education resources which are media rich and engaging. This also requires an innovative strategy in assessment and assessment pieces which will be able to provide meaningful feedback to the students.

## 2. Cloud learning in engineering projects

As a part of the implementation of the new cloud and located learning strategy the School of Engineering was chosen in the sandpit as one of the early implementers of this new learning and teaching philosophy. To implement this change and to meet the requirements of this new policy the school of engineering has concentrated on four areas lecture videos, eLive tutorials, cloud Deakin and industry projects.

### *2.1. Lecture Videos*

The school of engineering uses a set of technology enabled learning practices (TELP) which included video recording of the lectures using video cameras and screen capture of the lecture slides using a software package Camtasia to deliver content to the on and off campus students. The staff in the school were encouraged to use either the screen capture software or video recording to record their lectures which provided the off campus student with an experience similar to the on campus students and in some cases blend the screen capture recordings with the video lectures. These lecture resources provide the student with an opportunity to revisit the lectures and go through the concepts discussed during the session.

A research survey was conducted to gauge the response of the students towards these offerings. The responses from the students indicated, they have found the use of audio recordings, the Camtasia recordings and video recordings helpful but when asked about which technology enabled learning practice they would recommend for the future engineering students, 40% indicated the use of a blend of screen capture and video recordings as shown in figure 1 (Joordens M, Chandran J and Stojcevski A, 2012).

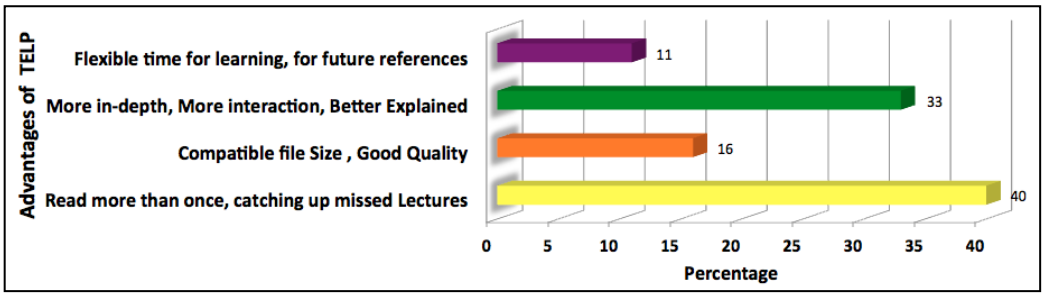


Figure 2. Student recommendations about TELP

In their recommendation for the lectures they 28 % stated it allowed them to catch up on a missed lecture and mentioned the experience being similar as attending the lecture as shown in figure 2.The download statistics for the video recording support this view; the video downloads range from 25% to 60 %. When asked to mention about the advantages of the system they indicated that there is more interaction through a technology enabled learning practice rather than the physical on site lecture, as illustrated in figure 3. This clearly shows that if technology was used to its fullest potential, interaction is certainly achievable. Another 40% indicated that the advantage of TELPs is that the lecture or learning activity can be viewed more than once and can be successfully used as a catch up exercise also shown in figure 3(Joordens Matthew, Chandran Jaideep and Stojcevski Alex, 2012).

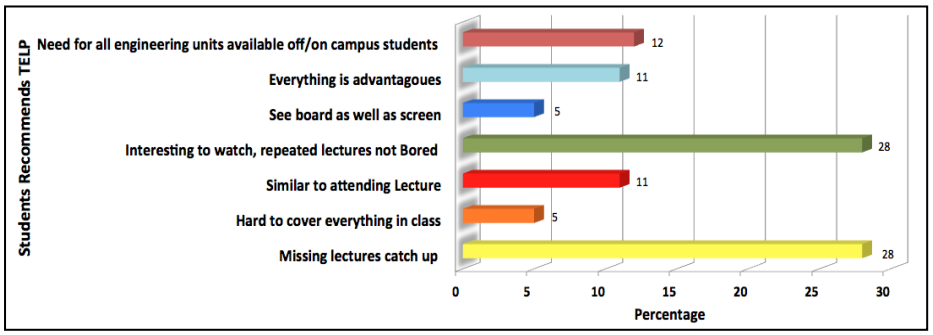


Figure 3. Advantages of TELP

### *2.2 Cloud Deakin*

Cloud Deakin is the learning content management system for Deakin University and it is the portal which provide the students with the opportunity to interact with the staff and their peers. It is Deakin's cloud learning environment and hosts the content like the lecture notes, assignment details and the lecture videos. The cloud environment is setup to allow students and staff to interact on various topics and also students to interact within themselves. Staff members are able to provide feedback to the students and are also able to set various assessment tasks which allows for greater flexibility to the students to attempt these tasks and also allows them to maintain a record of their progress. Cloud Deakin provides the platform for students to discuss their design projects, interact with staff and peers, collect and maintain evidence on the projects.

### *2.3 eLive Tutorials*

ElluminateLive! (eLive) is a technology resource which facilitates communication and collaboration between staff and students. It allows the staff and students to talk over the internet and also via an online chat room. It allows for students and staff to have online meetings and facilitates learning and training. Tutorials in the classroom setting allow for students to interact with the staff revisit the concepts discussed during the lectures; this scenario is replicated using eLive in a virtual setting. It presents off campus students to interact and collaborate with the staff and their peers in a safe and secure environment. Staff members can share audio and visual materials with the participants and can also invite guest speakers like experts from the industry. The flexibility of the online environment allows for the meeting to set up without the boundaries of time and space. The initiative from the school has been well received by the off campus students and also by the on campus students who use this as an extra opportunity to collaborate with the staff and their peers.

Project oriented design based learning approach focusses on this interactivity between the staff and students and among themselves and this resource provides them opportunity to interact in various setting in which members from the industry can also be invited to share their ideas and views. This resource also allows the school to provide the enhanced interaction between student and staff as mentioned in the cloud learning policy

### *2.4 Industry Projects*

Cloud and located learning is about two distinct learning environments the first being a seamless digital environment provided on the cloud and the second is the located learning experience provided on campus and learning centers and in industry settings. Industry project allow for an enriched located learning experience which is coupled with students working on a design based project which allows them to hone their design skills and meet the learning outcome specified by the project oriented design based learning approach.

## 3. Integration of Cloud Learning and PODBL

The newly proposed approach, project-oriented design based learning (PODBL) is applicable to motivate the students and also to teach engineering science in classrooms to get more practical experience that fulfil the industry needs. Project-oriented design based learning is set to have a positive effect on student content knowledge and the development of skills such as innovation and creativity which increases their motivation and engagement. It is an interesting research work to develop a framework and implement a PODBL approach in meaningful ways.

### *3.1 The PODBL cycle*

Project-Oriented Design Based Learning (PODBL) is a teaching and learning approach (TLA) that is based on engineering design activities while driven by a project. We have proposed to use PODBL at Deakin Engineering to encourage 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 - two of the key learning outcomes in engineering these days.

There are many versions of project based learning as well as design based learning. Deakin's engineering approach 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 will contain integrated short, accessible, highly visual, media-rich, interactive learning experiences rebuilt for the mobile screen, and integrating 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.

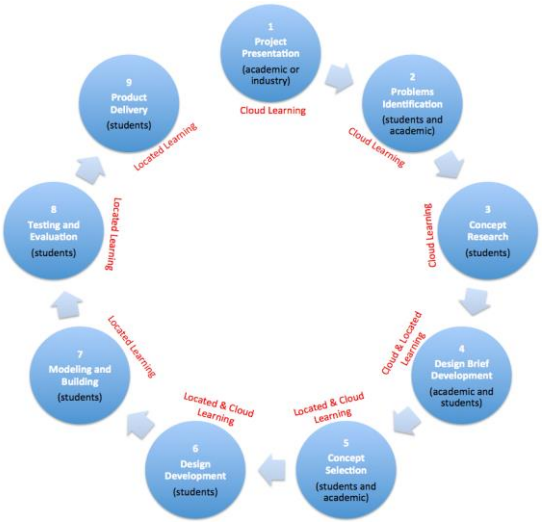


Figure 4. The PODBL learning process

The PODBL cycle involves nine main steps. The steps are illustrated in figure 4 above and described below. Steps 1-3 take place in the cloud, step 4-6 are a combination of both cloud and located learning, and steps 7-9 are performed through located learning.

*Step 1: Project Presentation*

The project is presented to the team of students by the industry client (if project is industry based) or by the academic facilitator if the team if the project is university based. The project outline, which is usually open-ended, is about half in length. It is recommended that one member of the student's team reads the project outline aloud to the group without comment at this stage.

*Step 2: Problems Identification*

This step is all about brainstorming the project. The student team could ask the following questions:

What do we know about this problem outlined in the project brief?
What do we need to find out about the problem?
What are the significant issues (teaching, learning, technical, social, economic and political)?
What do we need to learn?
What are the priorities? What is most important to learn?

The rules of brainstorming are that no evaluative comment is allowed at this stage. The aim is simply to get as many issues on the board or the cloud as possible so that they can be prioritised, spilt/clumped, and researched in the next step. One person in the group needs to be identified to act as scribe and write issues as they are raised.

*Step 3: Concept Research*

The first activity that needs to take place as part of this step is to identify, discuss, and assign the learning issues to each and every member of the team. Once this is done, each student in the team undertakes research into the assigned learning issue. Some of the questions that may arise could be:

What are the essential learning issues (for everyone to follow up)?
What are the specific learning issues (for individuals to follow up)?
What resources are available?
Who will look up what (and report back to the team)?
What are the overlapping issues?

Each member of the team needs to understand what all members of the team have agreed to research and what them as individuals must contribute to the team. As students locate resources that are directly relevant to the learning issues, the other members of their PODBL team need to be advised by posting a message in the appropriate discussion forum on the cloud.

This message must include enough information to allow others to locate the resource (for books and journals, bibliographic details; for Web resources, the URL or Web address); a brief summary of the content of the resource - cutting and pasting the abstract of a paper is often useful; and a comment on why they believe the resource is relevant to the learning issue. In some cases, a digital copy of the document itself may be attached but this should be done without breaching the copyright law and for this reason, it is not recommended to attach copies of scanned chapters of books.

As these resources accumulate and members of the team use the online discussion tool to comment on and ask questions about the resources. Online discussion is an assessed task, with marks allocated on the basis of the quality and quantity of contributions by each participant.

*Step 4: 'Design Brief' Development*

The 'design brief' is the key project planning document that specifies what the project has to achieve, by what means, and within what timeframe. During this step, the team of students uses the concept research ideas and findings to develop the 'design brief'.

*Step 5: Concept Selection*

By evaluating the research findings performed in step 3, during this step the team decides and selects the most appropriate concept to be used in order to develop their final design.

*Step 6: Design Development*

During this step the student team uses the selected concept in step 6 to finalise and develop their final design. This could include new ideas and additional features on top of the selected design.

The development of the design brief, the selection of the concept and the development of the final design form in step 4 to 6 form key components of the assessment pieces and the student portfolio which evidences their achievement; this portfolio is maintained digitally on the cloud which allows students to share evidence of their achievements with prospective employers and also reflect on their achievements. This allows us to provide the students with assessment tasks linked to real world situations and an opportunity to receive meaningful feedback a key principle of cloud learning.

*Step 7: Modelling and Building*

During this step the student team models and/or builds their design. Depending on the engineering stream this could be done using hardware equipment, modelling software, and laboratory equipment.

*Step 8: Testing and Evaluating*

Once the design has been modelled and/or built, the team tests it and evaluates it against the set requirements and specifications. Laboratory equipment or industry tools could be used to do this.

*Step 9: Product Delivery*

The last step in the PODBL cycle is product delivery. This is when the student team presents their final product to the academic and/or industry member(s). The final product can be in the form of a hardware, software, presentation, report, and other deliverables as set and agreed on by the team and the facilitator at the start of the project. The final product is assessed based on an agreed rubric.

## 4. Conclution

Project-oriented design based learning (PODBL) is a model designed to motivate students and teach engineering in a way that is student-centered and project driven. The cloud and located leaning experience is a convergence of experience provided on the cloud in a seamless digital environment with assessments linked with tasks performed by student in their chosen professions and opportunities to interact with staff and peers through located learning. The PODBL model integrates cloud and located learning, which allows students to learn through design activities on the cloud and in the interactive classroom. 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 which increases their motivation and engagement.

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