

# Online delivery of architecture and building design studios: a case study of Central Queensland University

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**Abstract:** Online delivery offers students flexibility to choose when, where, and with what pace they wish to learn. This mode of delivery, however, presents challenges specifically for design studio units, which depend largely on students' creative processes and facilitating social interactions with their teachers and fellow students. In practice, design is a collaborative process that engages a range of stakeholders from different disciplines, backgrounds, experiences, expertise, motivations, and interests and integrates their contributions through effective communication. This paper examines challenges, opportunities, and factors that influence students' experiences of online delivery of architecture and building design studio units. It was developed as part of the project funded by Centre for Learning and Teaching at Central Queensland University (CQU) that explores best practices in online delivery of design studios. We present a thematic analysis of students' comments from CQU Unit Evaluation Surveys of two units of Bachelor of Building Design that had emphasis on creative design tasks from 2012 to 2017. Students provided feedback on aspects of the units that they were most satisfied with as well as areas that need to be improved in future offerings of the units. The five main themes that were identified from students' comments had to do with: (1) assessment processes and practices; (2) teacher support and teaching strategies; (3) interactions, communication, and collaboration; (4) unit content and knowledge building; and (5) educational technologies and Computer Aided Design (CAD) software. The paper concludes with a set of pedagogical considerations for online delivery of design studio units.

**Keywords:** Design Studio; architecture; building design; online delivery.

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## **1. INTRODUCTION**

The field of design span from building, graphic, industrial, interior, and fashion design to newly developed areas of communication, interaction, and multimedia design. Regardless of the curriculum and pedagogical approaches adopted in different higher education design programs across the world, they share the common aim of preparing creative individuals who are capable of designing in their field with required theoretical knowledge and practical skills (Tovey, 2015). Williams et al. (2011, p. 66) view creativity as “a focus of design education and it is a stated learning outcome of the discipline.”

Shreeve (2015, p. 84) refers to signature pedagogies for design and describes them as “those ways of learning which help students to become designers; to think and act in ways which are deemed to be professional and appropriate.” These signature pedagogies of design include: the studio, projects and the brief, materiality as part of the pedagogy of ‘doing and making’, and the crit. In art and design education, the crit is a fundamental teaching methodology and “the most-widespread learning methods used by art and design educators” (Souleles, 2013, p. 250). The crit acts as a form of formative assessment and the purposes of it are to provide an opportunity for students to receive informal feedback on their works in progress or final design products (Blair, 2006) and to evaluate their abilities to articulate their works and the processes they went through to achieve it (McCarthy, 2011). It is, as Dannels (2005) states, “a central place where students learn what it means to be a professional in the design arena.” In this sense, crit also becomes a ground for facilitating and

developing skills in critical peer evaluation. In crit sessions of face-to-face design studios, design educators may provide feedback on a student's work while other students are present and can comment (Simpson, 2012). In these *Crit* sessions, "students are expected to communicate their design intent and enter into a discussion of their work with tutors, peers, and in some cases external stakeholders such as industry practitioners, clients, and community members" (Healy, 2016).

On the other hand, as Park (2011) notes, "the use of Virtual Learning Environment (VLE) in higher education has become an integral strategy for quality education." Among benefits of ICTs and online education delivery are: overcoming space- and time-related barriers of face-to-face learning; providing opportunities for students to learn at their own pace and with their preferred learning style and to become self-directed learner responsible for their own learning; and creating new modes of interactions which are flexible and personalised (Moore and Kearsley, 2011). When it comes to the field of design education, however, there is a knowledge gap about online learning, delivery, and evaluation, Park (2011) argues. As Broadfoot and Bennett (2003, p. 9) note, "with the recent explosive growth of the Internet as a tool for mass communication, the situation now exists for educational design studios to be offered online." The authors continue to suggest "the online or *virtual* studio as it is often termed ideally involves a 'community' rather than isolated, one-on-one communication" (Broadfoot and Bennett, 2003). An online design studio includes participants distributed across space and time with the design process and communication being computer mediated and computer supported (Maher *et al.*, 2000).

The current study is a response to this under-researched area, in particular, to the knowledge gap in relation to understanding online design studios or virtual design studios. The little research conducted in this area is often occupied with technology and dismisses the pedagogical issues and the student interaction dimension of online design studios (Broadfoot and Bennett, 2003). To better understand barriers and opportunities for online delivery of design studios, we started by looking at two case studies of design studio units that are delivered completely online at Central Queensland University. A thematic analysis of 136 students' comments on two open-ended questions of Unit Evaluation surveys from 2012 to 2017 provided insights into factors and issues that influence students' experiences and contribute to effective online delivery of design studio units.

## 2. CONTEXT AND BACKGROUNDS

The study focused on two units of Bachelor of Building Design, Unit A and Unit B, that are offered completely online at CQU. The Bachelor of Building Design (CU65) is a three-year full time course (or five-year part time) with an embedded Associate Degree of Building Design (CC01) award available after two years. The course produces building designers capable of providing the full scope of design solutions, documentation, and contract administration for residential, industrial, and commercial buildings. While each of the two units under study has a set of specific learning outcomes, students are expected to develop skills in creative design, presentation, and articulation of their design concepts and solutions.

Unit A aims to provide students with an understanding of environmentally appropriate design and planning solutions in domestic and low-rise commercial buildings. By completing the unit, students learn to: 1) apply design principles to domestic and low-rise commercial buildings; 2) study issues involved in the design of domestic and low-rise commercial buildings; 3) examine sustainable design principles and incorporate them in their designs to provide appropriate outcomes for the client and the built environment; and 4) practice skills and activities expected of a building designer.

In *Assessment 1*, students are required to choose one of the case study houses provided by the educator and evaluate the design in terms of its relationship to the site, elements of sustainable design; designers' vision and intentions; and ideas, inspirations and implications for future design. For *Assessment 2*, two floor plans of a house are given to students and they need to propose design solutions to improve the existing design in terms of access, circulation, safety, spatial relationships, lighting, sustainability, and aesthetics. In *Assessment 3*, students are provided with a client brief and site plan and asked to develop preliminary design ideas for a single residence for this site in accordance with the requirements of the local government planning scheme. For *Assessment 4*, students are provided with a site plan and project brief and need to develop preliminary design ideas for a mixed-use two-storey building.

Unit B aims to provide students with an understanding of environmentally appropriate design and planning solutions in multi-storey residential and high-rise commercial buildings. By completing the unit, students learn to: 1) apply design principles to multi-storey residential and high-rise commercial buildings; 2) explain design solutions within an environmental, social, and community context; 3) examine design and legislative issues for multi-storey residential and high-rise commercial buildings; and 4) discuss appropriate building fabrics, plant, equipment, and services.

The three assessment items focus on the design of a multi-storey mixed use commercial and residential building. In *Assessment 1*, students are required to: (1) examine Town Planning Scheme and National Construction Codes (NCC) requirements; and (2) develop project/design brief based on the client brief given to them. In *Assessment 2*, students are expected to: (1) develop preliminary design solutions and initial drawings for each floor level and the elevations on four sides; and (2) give a five minute presentation to display and discuss their preliminary design. In *Assessment 3*, students need to: (1) complete the design and final design drawings; (2) give a five minute presentation; and (3) comment on at least two other student presentations.

In both units, students are offered a number of online consultation/design critique sessions to present their designs and receive feedback from educators and fellow students. Since 2016, in Unit A, every student is also required to post his/her design in a discussion forum and all students are required to provide feedback on their fellow students' designs using De Bono's Six Thinking Hats (De Bono, 1985). Students receive marks for their engagement in the discussion forum.

### 3. METHOD

The Unit Evaluation survey at CQU provided students with the opportunity to provide anonymous feedback on their units of study each term. It is available through the Learning Management System (Moodle) from Week 9 and remains open until the Friday before certification of grades (7 – 8 weeks depending on the term). The survey includes: (1) seven Likert-type scale questions that require students to specify their level of satisfaction with aspects of the unit delivery and content; and (2) two open-ended questions that focus on positive aspects of the unit delivery as well as the areas for improvement in future offerings. This paper presents a thematic analysis of 136 responses to the two open-ended questions of Unit Evaluation surveys for Unit A and Unit B, two units of Bachelor of Building Design with a focus on creative design tasks, from 2012-2017. Approval to use the data was obtained from Human Ethics Committee of Central Queensland University.

### 4. FINDINGS

Students' comments highlighted aspects of the units that they found positive and were satisfied with as well as dimensions that they believed need improvement. These comments were coded under five themes and these themes were then listed according to the number of times they appeared in students' comments. Table 1 presents the five themes, a summary of topics and issues addressed under each theme, and the number of times they were referred (REF) by students.

Table 1. Five themes emerged from thematic analysis of students' responses on open-ended questions of Unit Evaluation surveys of Unit A and Unit B

Themes	Description	No. of REF
<b>Assessment Items and Procedures</b>		<b>59</b>
	This theme included issues related to the importance of a clear description of assessment items, timely constructive feedback, and developing relevant assessment items that are aligned with the unit content and incorporate real life tasks and examples.	
<b>Teacher Support and Teaching Strategies</b>		<b>38</b>
	This theme addressed the importance of design educators' enthusiasm and engagement and availability of teacher support for students as well as the need to assist students learn to design through focusing on students' creativity.	
<b>Interactions, Communication, and Collaboration</b>		<b>36</b>
	This theme highlighted the importance of peer-to-peer interactions and feedback, environments for collaboration and discussion such as forums, live or interactive Critique sessions or Crit, recorded lectures or sessions, and issues around teamwork.	
<b>Unit Content and Knowledge Building</b>		<b>32</b>
	This theme included issues related to the availability and accessibility of resources.	
<b>Educational Technologies and CAD Software</b>		<b>32</b>
	This theme highlighted the need for students' and teachers' skills in working with technology, the challenge of working with technology and incidents when technology fails as well as issues with the unit Moodle page set up and navigation.	

#### 4.1 Assessment

The first theme that appeared 59 times in students' comments was 'assessment'. With regard to assessment, 17 students' comments addressed the importance of a clear description of assessment items. These comments highlighted the need for having an assessment description document that clearly address the assessment due date, required tasks, and expected submission products or outcomes. In relation to assessment description, four students' comments also included references to clearly defined assessment criteria or rubrics. In other words, students need to be clear about the required standards for the submission e.g. the number of words, contents, and the amount of details.

15 comments pointed to the importance of receiving constructive feedback from the teacher on a timely manner. The return timeframe for feedback on assessment items is particularly important when there are several assessment items in a design unit that build on each other to assist students in developing their final design solutions. In other words, it is necessary that students receive proper and detailed feedback on Assessment A, which focuses on developing the project brief and design concepts, well before Assessment B, which requires them to submit final design drawings, is due so that they have time to reflect, improve, and refine their design and not to repeat their mistakes.

Ten students highlighted the importance of incorporating real life tasks or examples into assessment items. Relevant and interesting assessment items were found to contribute to ten students' satisfaction with the unit. In this regard, two students' comments addressed an issue that may be worth further examining: alignment of assessment items and the unit content. These students suggested some assessment work should draw directly upon the prescribed texts and resources of a unit as a means of ensuring that they are read.

## 4.2 Teacher support and teaching strategies

The second most important theme having an impact on unit satisfaction and an area for improvement, identified from 38 students' comments, was teacher support. While a teacher's enthusiasm and availability to provide prompt responses to students when they need help was mentioned as a positive aspect of a unit, a teacher's lack of interest or time to guide students and engage in Questions & Answers or other online discussion forums was repeatedly stated as a factor which led to dissatisfaction with the unit delivery. Students' comments showed that they highly value the teacher's motivation and the enthusiasm put into the unit delivery.

[The lecturer] also provided a stress free, open platform where all students could feel comfortable in sharing design ideas. This was a truly rewarding experience where distant education lost the distance and brought the students all close.

The comments also highlighted the need for teachers to guide students in finding the relevant resources, if not prescribing every single useful text. A lack of response in a timely manner from the lecturer was repeatedly stated as an area that needs improvement in future offerings of the unit.

## 4.3 Interactions, communication, and collaboration

Another important theme that emerged from students' comments has to do with communication and social interactions. Students suggested they found peer-to-peer feedback valuable and beneficial to refining their design ideas and solutions and gaining inspiration:

... the feedback sessions offered to discuss our design projects with both the lecturer and fellow students was fantastic. They provided real opportunities to re-evaluate our ideas and thought process.

Where the lecturer created an environment for collaboration such as discussion or design critique forums and blogs, students appreciated the opportunity as an interesting and valuable learning experience. Students' comments under this theme also pointed to issues around teamwork and group assessment:

The group / speaking assessments need to be thought through more carefully ... and be spaced apart from the other larger assessments to allow groups to collaborate as we all have different schedules.

Other comments under this theme addressed the importance of live or interactive critique sessions or crit (8 REF) and the value of recorded lectures (3 REF).

## 4.4 Content or knowledge building

32 students' comments referred to the importance of the unit content and knowledge building in supporting their learning and achievement of learning outcomes. In relation to this theme, five comments explicitly expressed students' frustration over difficulty in locating and accessing relevant resources. The well-thought and informative unit content developed in weekly topics was stated as among the best aspects of the unit delivery. Students appeared to value a balance between the content relating to building codes and regulations as well as the content on spatial design theories and principles:

The material was a pleasure to work through; a nice balance of the regulatory framework and creativity.

[An area of improvement is] perhaps some more theoretical content about key design features of famous design styles to expand architectural jargon and knowledge base.

Finally, students' comments addressed the importance of making a study guide, which outlines the topics of the unit content along with recommended or prescribed texts, available early in the beginning of the term. This is mainly important in offering students flexibility in the pace they wish to learn.

#### 4.5 Educational technologies and CAD software

Technologies used to support online teaching and learning was another theme that emerged from students' comments. Students addressed the need to be supported in developing skills in working with technology. In addition to ensuring that students have the required skills to make use of technologies, teachers need to know how to work with technology. Comments pointed to students' frustration over the limits of technologies or when technology fails.

17 References were also made to the need to assist students in developing skills to use CAD software:

Many students struggled to create technical drawings due to not having either access to software or knowledge of software. My feeling is this course needs a prerequisite of CAD design so as students can focus on the content rather than struggling to keep up due to deficiencies in technical know how.

Currently, in the first term of being enrolled in a built environment course in CQU and in a unit that focuses on built environment communication skills, students are introduced to available CAD software and resources that might help them learn working with these software. No unit is offered within Bachelor of Building that solely focuses on teaching students CAD software. While some students start Unit A with CAD software skills and drafting experiences, others may struggle to build skills in drawing with CAD software as they are completing their design assessment items. As one student noted:

I am lucky to have access to and experience using CAD for preparation of Assessment Item submissions. I wonder if, and assume not, all students have any drafting experience before reaching this portion of the program. Perhaps in the early stages of the program (at CU63 level) a semester of drafting skills and introductory CAD would benefit those without drafting skills.

## 5. DISCUSSION

Our analysis of 136 students' comments about factors which influenced their experiences in the Unit Evaluation surveys of two Bachelor of Building Design units that are offered completely online identified five main themes: assessment items and procedures; teacher support and teaching strategies; interactions, communication, and collaboration; unit content and knowledge building; and educational technologies and CAD software. Our review of literature on components of traditional design studios and online delivery of design education also pointed to two challenges specific to the field of architecture and building design: learning by doing and making; and learning through "reflection-in-action" (Schon, 1984; Schön, 1987). Table 2 outlines a number of lessons learned from our study that design educators may consider.

Assessment was found to be what concerned students the most with 43% of their comments (n=59) addressing an issue or aspect related to design assessment items and the procedures design educators adopted to provide formative and ongoing feedback and mark students' assessment submissions. Drawing upon students' comments, two areas where design educators have impacts on students' experiences of online design studios are: setting up design assessment items; and providing formative feedback and summative evaluation of the design assessment submissions. As students are completing the assessment items e.g. development of design concepts, initial floor plans, and final design drawings, the role of the design educator in providing formative feedback has to do with facilitating design critique sessions or crit.

In running online design studio units where the physical space of a studio and face-to-face interactions are missing, design educators face two key challenges: (1) facilitating learning by doing and making for students; and (2) supporting students to become reflective practitioners and develop skills in critical peer evaluation. In traditional design studios, students not only learn to design by drawing and making models to explore their own design ideas and solutions but also are able to observe other students and even their educators doing these. Crit sessions in face-to-face design studio units are also where students practise reflection in action and critical peer evaluation skills by presenting and articulating their design in progress, receiving feedback from their peers and educators, and providing feedback on other students' design solutions. In online design studio units, live and recorded sessions i.e. online design critique discussion forums are the main available platforms to accommodate learning by doing and making and reflection in action.

Table 2. Five themes emerged from thematic analysis of students' responses on open-ended questions of Unit Evaluation surveys of Unit A and Unit B

Issues	Lessons Learned
<b>Assessment Items and Procedures</b>	Design educators may need to closely examine the following aspects related to assessment: <ul style="list-style-type: none"> <li>- Assessment tasks that incorporate real life applications and examples;</li> <li>- Alignment of the unit content and assessment items so the unit content assists students in completing assessment tasks;</li> <li>- Clear description of assessment tasks and marking criteria; and</li> <li>- Provision of timely constructive feedback.</li> </ul>
<b>Teacher Support and Teaching strategies</b>	Design educators may need to incorporate the following approaches and strategies into their teaching practices: <ul style="list-style-type: none"> <li>- A caring and engaged attitude towards student learning e.g. responding to students' inquiries in a timely manner;</li> <li>- A live session where an educator shows them how he/she may approach the design tasks; and</li> <li>- Facilitating learning by 'doing and making' through designing appropriate assessment items.</li> </ul>
<b>Interaction, Communication, and Collaboration</b>	Design educators may particularly focus on asynchronous communication and interaction in online design studios and create a design critique asynchronous online discussion forum where students can post their design for feedback from peers. It is necessary to offer students at least one interactive or live session where students' designs are presented and discussed. These platforms can support learning through reflection in action and critical peer evaluation. <p>In a design critique asynchronous online discussion forum, the design educators need to:</p> <ul style="list-style-type: none"> <li>- Establish codes of offering constructive feedback to create a safe and encouraging environment for students to engage</li> <li>- Participate in the critique forum by responding to students' posted designs, comments, or feedback; and</li> <li>- Offer incentives/rewards for students' participation in the critique forum.</li> </ul>
<b>Content or Knowledge Building</b>	For design educators, the following aspects are important to consider in relation to the unit content: <ul style="list-style-type: none"> <li>- A Study Guide (as a single file which can be downloaded by students) that outlines a summary of each of the weekly topics of the unit and prescribed texts;</li> <li>- A right balance in the unit content between the content on building codes and regulations as well as the content on creative design theories and principles; and</li> <li>- Accessible prescribed texts and resources, preferably through the institution library.</li> </ul>

Design educators play a key role in setting up these interactive platforms. Park (2008a) suggests the teacher needs to be an active participant and moderator and modify learning content and community to suit students' needs. This requires design educators to visit the online learning environment regularly, respond to questions, provide timely feedback and relevant information (Alderman and Fletcher, 2005), and monitor students' activities and behaviours in order to determine their needs and provide timely support (Hallas, 2005). In addition to making use of various communication tools, the design teachers need to provide support and monitor students' interactions and communications i.e. regulations or codes of communication and instructions required for students to build up a productive learning community (Park, 2011). Demonstration of relevant techniques and skills by the design teacher or practitioner forms part of the problem- and project-based learning in order to "assist students individually or in groups through repetitive instructions and applied skills" which may "accompany regular communication, both formal and informal, to improve the effectiveness of skills and knowledge acquisition" (Park, 2011, p. 178). As Ostwald and Williams (2008, p. 146-147) state, a common feature of the studio is promoting enculturation where students are given the opportunity "to observe and mimic the social and cultural values and behaviours of appropriate professional role models." Similarly Broadfoot and Bennett (2003, p. 11) state,

It is through demonstration of, and reflection upon their own knowing in action that the master conveys this tacit knowledge to the student. Through speaking and demonstrating (e.g. drawing) in tandem, the teacher demonstrates how to explore and act. The process can be described as a dialogue of reciprocal reflection in action between coach and student.

From the four signature pedagogies for design proposed by Shreeve (2015), online design studios might only build on three ways of learning: the project and the brief; materiality of doing and making; and the crit. The studio as a physical space is almost non-existent in the online design studio. The online design educator then need to facilitate and maximise student learning using these pedagogies. The first step is clearly defining the project and the brief and structure design assessment items. Such assessment items may then include requiring students to submit design concepts and models as they develop their design solutions to engage them in the materiality of the design through 'doing and making'. Finally, it is essential to set up the crit and engage students in it. In doing so, a range of platforms may be used in online unit delivery mode including design critique forums and online live crit sessions.

Interactions or dialogues are important attributes of a design studio: a place where dialogues are facilitated between students and educators, the emerging design, materials, among students, and the societal context to which the design is addressed (Wojtowicz, 1995; Brandt *et al.*, 2013). The challenge for the online design studios then remains as how to transfer this effectively in the online environment. If the flexibility in relation to the time and the place of learning is why many students choose to study online, it is of paramount importance to explore strategies to engage students in online design studios through asynchronous communication and collaboration platforms as opposed to synchronous or real-time communication and interaction modes.

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