Article

A Blended Learning Approach to the Teaching of Professional Practice in Architecture

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Abstract: This paper reports on a number of blended learning activities conducted in two subjects of a Master of Architecture degree at a major Australian university. The subjects were related to "professional practice" and as such represent a little researched area of architectural curriculum. The research provides some insight into the student perceptions of learning opportunity and engagement associated with on-line delivery modes. Students from these two subjects were surveyed for their perceptions about the opportunity for learning afforded by the on-line components, and also for their perceived level of engagement. Responses to these perceptions of traditional and on-line modes of delivery are compared and analysed for significant differences. While students were generally positive in response to the learning experiences, analysis of the results shows that students found the traditional modes to assist in their learning significantly more than on-line modes. Students were neutral regarding the opportunity for engagement that on-line modes provided. Analysis of the students' gender, age and hours of paid work was also conducted to ascertain any relationship with attitudes to the flexibility of on-line delivery; no significant relationship was detected. This study has shown that students were generally resistant to on-line engagement opportunities and their ability to support learning.

1. Introduction

This paper presents the findings from a research study that investigated student reported perceptions of their learning and levels of engagement in two "professional practice" subjects undertaken by postgraduate architecture students in a large Australian university. The objective of the study was to explore the differences between the students perceptions of their learning through different modes of engagement; especially the differences between on-line (digital) and traditional (face-to-face) modes. In essence, are students learning through, and engaging with, on-line delivery differently (better or worse) from traditional modes of delivery? In particular, the study seeks to question if students found on-line delivery more or less engaging than traditional delivery, and if they found on-line delivery assisted them in their learning more than traditional delivery.

The paper presents an overview of the literature in the areas of transformative higher education, the history of architectural education, modes of delivery, and on-line learning. It then uses this understanding to categorise a number of modes of delivery and their media forms in order to better explore the specifics of the two subjects under investigation here. The methodology of the research is discussed; in which students were surveyed for their perceptions of engagement and learning. Statistical analysis of the survey results is presented and its significance tested. The paper concludes with a discussion of the findings.

2. Transforming Learning Environments in Higher Education

Access to technology and on-line learning is a key 21st century literacy. The emergences of popular social networking sites like Facebook and Twitter, and the introduction of wireless enabled mobile technologies have completely transformed the way we interact, communicate and access information. The potential to advance higher education through the use of information technology is radically transforming learning environments in higher education.

In "The Beginning of Something Big" President and CEO of EDUCAUSE Oblinger [1] argues that we are living in a post traditional world, where 98% of students own a digital device and, indeed, 38% cannot go more than 10 min without using one. She also discusses the impact of MOOCs (Massive Open On-line Courses) and "do it yourself" learning provided largely through social media, to the tertiary education sector. We need to shift our thinking from being in the Information Age, to being in the Connected Age; in education, people and connections are infinitely more valuable and powerful, than information alone [2].

Garrett and Davies [3] assert that the difficulty of collaboration and boundary crossing should be discussed in terms of learning to understand culture better. One way we can facilitate collaboration, is through active and connected learning; interacting with students in the classroom and on-line. Deslauriers *et al.* [4] demonstrate that a student's performance improves with attendance, engagement and learning. How then, can teachers effectively facilitate collaborative learning in a blended or virtual learning environment? Social media is a critical learning opportunity that extends beyond physical classroom environments, and into digital global networked communities. At the beginning of classes, many teachers are now telling students to turn *on* their mobile devices, and log into social media websites.

3. Learning Environments in Architectural Professional Practice

Architectural education is an area that has not responded quickly to opportunities afforded by new technologies. The practice-based nature of the architectural profession has encouraged an architectural education that has historically also been similarly practice-based; a form of apprenticeship. Despite architectural education having moved into the academy in the early twentieth century, it is still a requirement in most industrialised countries that in order to become a registered architect, the student or graduate must complete a period of employment supervised by a registered architect. This period is typically two years in which the student/graduate (the apprentice) is supervised by the architect (the master). Not only is this relationship remarkably similar to the relationship of over a hundred years ago, the environment in which this occurs, the studio, has also changed little in the past hundred years.

The studio, or atelier, is still the dominant environment of architectural practice. It is also the dominant environment of architectural education. The term "studio" has come to refer to both a physical space in which architecture is practiced, and also a mode or style of educational engagement which includes the physical space, the types of activities and assessment, the authentic project-based tasks, and the teacher/student relationship. This studio is indeed what Schulman [5] has come to refer to as a "signature pedagogy"; a pedagogical practice that is ubiquitous in the discipline and associated somewhat uniquely with the profession.

While the studio may be the signature pedagogy, ubiquitous and dominant, it is not the only learning environment that is commonly used in architectural education. Some aspects of architectural education are typically dealt with in a more common lecture and tutorial mode of delivery. One such aspect is that of professional practice; those subjects within a program that seek to prepare the student for employment within the profession with all of its contractual, legal, financial, and ethical dimensions.

The studio, along with the other less unique modes of engagement, provides a program of study which accommodates three types of learning: learning *about* design (the development of knowledge), learning to design (the development of skills), and learning to become an architect (transformation as a person) [6,7]. This third type of learning, that of "becoming", is also noted by Shulman [5] (p. 52) who states that signature pedagogies have dimensions of thinking and acting with integrity as a professional. The professional practice subjects studied in this research attempt to build a bridge for students from academia into practice; and as such are the first formalised aspect of the student becoming an architect. This is an important type of learning, but since it does not normally occur within the signature pedagogy of the studio, relatively little attention has been given to researching the development of the pedagogy in these subjects dealing with professional practice.

Schulman also discusses three other dimensions of signature pedagogies: the explicit operational activities of teaching and learning, the set of assumptions about how best to teach the particular profession, and an implicit structure of beliefs and values. He refers to this third dimension as the "*hidden curriculum*" of the profession [5] (p. 55). This hidden curriculum has been well noted within architectural education [7,8], and is normally associated with an antiquated and outdated mode of engagement. "Design education, as undertaken in the schools of architecture, appears to be preparing students for models of practice that are no longer in full accord with the current professional context" [8] (p. 6). Worthington [9] (p. 27) notes that "there is still a significant gap between the vision of the architect's role, as characterised in schools of architecture and the reality of practice".

It is with these ideas and concerns in mind that this study was established in order to explore the pedagogy of the professional practice subjects, and to address some of these aspects of 'becoming' through the use of a more diverse range of learning environments in a blended mode of delivery.

4. Modes of Delivery

While it is certainly true that what students learn is inextricably embedded in how they learn [10] it is also certain that "media environments do not cause learning, cognitive processing by the learner causes learning" [11] (p. 137). The type of media that we use to convey information is important, but good learning environments are likely to use a range of media that respond to a range of student learning styles, align activities and tasks with intended learning outcomes, and optimise the pedagogical benefits of each type of media or mode of delivery. If the environments themselves do not cause the learning then "all teachers can do is to create an environment which is encouraging and supportive" so as to allow a student to construct their own understandings [12] (p. 1). Such a constructivist view of how learning occurs recognises the importance of the experience of the student, which in turn is reliant on the environment, and the modes of delivery, and how the student then cognitively organises such experiences [13] (p. 695).

This constructivist view is also aligned with a theory of situated learning in which the environment itself, and the modes of delivery, are a vital ingredient in the learning outcomes [14] (pp. 13–19). A number of researchers have explored this relationship between what is learned and how it is learned, and the relationship between how things are learned and the modes of delivery [10,15,16]. Constructive alignment of the student activity, what they actually do, is vitally important to the achievement of the learning outcomes [17,18]. When selecting a mode of delivery it is therefore important to consider the alignment of the media being used, the student activities, and the intended learning outcomes, in order to achieve constructive alignment that supports deep learning [12,19,20].

5. On-Line Learning

"New technologies of teaching via the Internet; Web-based information seeking; computer-mediated dialogue; collaborations and critiques in the design studio; powerful representations of complex and often unavailable examples of professional reasoning, judgment, and actionall create an opportunity for re-examining the fundamental signatures we have so long taken for granted" [5] (p. 59).

Internet-based learning environments offer a number of advantages over traditional environments: access to resources, new tools and methods, easier interaction and communication, multi-modal presentations and learning, improved explorative learning, electronic communications, archiving and access, synchronous and asynchronous communications, extended collaborations times and locations, and a potential strengthening of social bonds [21–24]. These attributes of on-line environments enable students to construct their own understandings through a range of media, at their own pace, and in their own physical environments [13].

These new media environments do however require students to apply higher levels of personal motivation and autonomy through greater levels of student-led activity, and as such are not suited to all students for all types of activities [25,26]. There are limitations in both synchronous and asynchronous on-line activities and communications that make neither ideal for all situations. While on-line environments can provide "enormous enrichment to the methodology of teaching, learning and learning by doing" [27]

(p. 87) they cannot (within normal resource constraints) provide tactile experiences with intrinsic feedback as can be experienced in traditional physical environments such as laboratories and workshops [14,26].

It is thus reasonable to conclude that within currently available technological constraints, a blend of on-line (digital) and face-to-face (physical) environments is optimal. Such a marriage of delivery modes creates a blended learning environment where "exposure to ideas through several different media (modes) definitely improves understanding and assimilation" [26] (p. 13). While such blended learning environments have been trialled and researched in the mode of the signature pedagogy to create augmented design studios [22,25], such environments have not been researched to the same extent for professional practice content and learning. This study presents some initial research into this field. In particular this research seeks to review and analyse these blended learning environments for their capacity to assist in student learning and create engagement with the students.

6. Categorization of the Case

The research study presented here focusses on the pedagogical practices employed in the delivery of two Architectural Professional Practice subjects taught to Masters of Architecture students who are generally in their fifth and final year of study at a major Australian university. The subjects were titled Project Management (PM) and Contract Administration (CA). A diverse range of content delivery and assessment items were trialled in both on-line and traditional modes and at the end of the teaching period, participating students were surveyed on their learning experience and engagement. Before reporting on the survey findings we firstly present analysis of the subjects' content in order to categorise activities of traditional and on-line learning; and to categorise the media forms using the work of Diana Laurillard [14].

In Laurillard's framework for analysing educational media, there are five principle forms of media: *narrative, interactive, communicative, adaptive* and *productive* [14]. In accord with these principles, Laurillard also proposes typical methods or technologies that are appropriate for such media forms and the learning activities associated with the Media forms (Table 1). Firstly the pedagogical approaches offered to the Masters of Architecture students can be mapped to these media forms and technologies with a view to explicating the structure of these blended learning environments (Table 2). Laurillard's first and fourth media forms, the *narrative* and *adaptive* approaches, relate most strongly to a traditional non-Internet based approach of print-based and face-to-face content, lecture series and assessment which tests the apprehension of students such as exams. Alternatively the *interactive* media form is well suited to an on-line environment where students can more easily set their own agenda in an asynchronous learning environment. The remaining educational modes, *communicative* and *productive*, can generally be utilised in both on-line and off-line environments.

A variety of pedagogical approaches were employed in the teaching of Professional Practice to Master of Architectural students, spanning all five of Laurillard's modes for analysing educational media (Table 2). The *narrative* mode was evident in the delivery of lectures and also in the setting of exams. Live lectures were the predominant mode of delivery in the PM subject, while pre-recorded lectures made available on-line were mostly offered in the CA subject. An exam was included as assessment for the CA subject and it was scheduled for the end of the teaching period.

Table 1. Laurillard's [14] (p. 90; p. 191) framework for analysing educational media.

Media forms	Learning Activities	Affordances (Design Features)	Methods and Technologies
1. Narrative	Attending, apprehending	Clarify structure of argument, nature of evidence.	Print, lecture
2. Interactive	Investigating, exploring	Offer students the means to select or negotiate their own task goals.	Web, library
3. Communicative	Discussing, debating	Generate questions on topic goal that require students to use their experience at the interactive task level.	Tutorial, on-line discussion forum
4. Adaptive	Experimenting, practicing	Define the goals against which students can compare the intrinsic feedback to modify their next action.	Laboratory
5. Productive	Articulating, expressing, synthesising	Ask students to reflect on the comparison between theirs and the teacher's conceptions, and on goal-action-feedback-cycle.	Essay, product (design project), on-line blog

Table 2. Average (mean) student responses to "assisted me in learning" from the five point Likert scale.

Pedagogical Approach	Subjects	Media Forms	Mode	Averaged Response
1. Lectures	PM, CA	1. Narrative	Traditional	3.3
2. Exams	CA	1. Narrative	Traditional	3.4
3. Weekly blog posts	PM, CA	2. Interactive	Online	3.3
4. In-class discussion	PM, CA	3. Communicative	Traditional	3.5
5. On-line discussion	PM, CA	3. Communicative	On-line	2.6
6. Workshop activities	PM, CA	4. Adaptive	Traditional	3.5
7. Feasibility / post occupancy study	PM	5. Productive	Traditional	3.4
8. Architectural writing assignment	PM	5. Productive	Traditional	3.4
9. Video documentary assignment	CA	5. Productive	On-line	2.8
10. Practice manual assignment	CA	5. Productive	Traditional	3.4
Mean overall				3.3
Mean per media 1. Narrative		1. Narrative		3.4
Mean per media 2. Interactive		2. Interactive		3.3
Mean per media 3. Communicative		3. Communicative		3.0
Mean per media 4. Adaptive		4. Adaptive		3.5
Mean per media 5. Productive		5. Productive		3.3
Mean per on-line			On-line	2.9
Mean per traditional			Traditional	3.4

There were two instances of Laurillard's *interactive* approach in the teaching of professional practice to the Masters students. The first example is the delivery of video content of topical material produced both by QUT staff and by third parties such as TED talks, the on-line knowledge-base *Lynda* and commercial broadcasters such as the BBC. This material was offered to students as links embedded in webpages, giving them the option of watching all or parts of the videos at times most convenient to the

student, and review portions for revision and comprehension at will. It is this element which makes the video content interactive. If, on the other hand, it had been shown in a lecture format to all students at once, this would have been evidence of a *narrative* approach rather than *interactive* approach. The second way in which interactive teaching practices were adopted was though a series of weekly blog posts for both of the subjects. In these cases, instructional content was offered to students through an openly accessible blog-management system, WordPress, which automatically generated search-ability and index-ability, for students to more-easily negotiate their way through the information provided.

The *communicative* media form was adopted in the teaching of Professional Practice through the utilisation of in-class and on-line discussion. In the class-room setting, discussion was generated through the invitation of professionals or experts to sit on a panel in a lecture theatre during class time, to discuss their views and knowledge on a particular topic, with students encouraged to participate by asking the guest topical questions. Additionally, on-line discussion was encouraged in both subjects with the introduction of a discussion forum to the blog-posts in both subjects.

A series of workshop activities given to students in both subjects, highlight Laurillard's *adaptive* approach. In these instances, students either formed groups or worked individually on pre-set tasks. They were encouraged to experiment in these in-class activities, and to allow the lessons they learned to inform their next steps and ultimately, the subsequent pieces of assessment. For example, exercise in professional writing required students to imagine being an experienced architect faced with a particular conflict or dispute, and to then prepare a formal business letter to a client, addressing this.

While exams formed one part of the assessment for students, all other pieces of assessment were assignments which could be categorised at *productive* media forms. These included the production of a documentary video, as well as written work including an architectural feasibility or post occupancy study, a compilation of architectural writings and a practice manual.

7. Methodology

A cohort of 91 students at a major Australian university were surveyed at the end of the teaching semester using a paper-based questionnaire. The students were asked about two subjects in Professional Practice that they had completed in a postgraduate architecture degree. The students had the following characteristics (Table 3).

Table 3. Characteristics of student sample.

Characteristic	Percentage
Male	56
Female	44
Age: 20–24	58
Age: 25–30	36
Age: 31+	7
Hours in paid work: 0–8	25
Hours in paid work: 9–16	19
Hours in paid work: 17–24	29
Hours in paid work: 25–32	12
Hours in paid work: 33+	15

The survey consisted of a number of questions about the characteristics of the students/participants themselves (Table 3) and eleven questions that asked students about their learning and engagement with the subjects. The students were asked to rate, on a five-point Likert scale, ten different modes of delivery for their effectiveness in assisting them to learn. For example "*on-line blogging assisted me in learning in this subject*". Students were also asked to rate on a five point scale against the question "*on-line delivery helped me to feel engaged with this subject*". The five points of the scale ranged through "strongly disagree", "disagree", "neutral", "agree", and "strongly agree". An opportunity to comment was also included at the end of the survey so students could expand on some of their responses more fully. By assigning the numerical values from one to five against the responses from "strongly disagree" to "strongly agree" numeric averages of the response for the cohort were calculated. Averages were also calculated for the five different media forms, and overall for on-line and traditional models of delivery (Table 2).

Analysis was conducted on the responses to the "*assisted me in learning*" questions using a *t*-test to compare differences in averages (means) between on-line and traditional modes of delivery. This was conducted to compare modes within media forms, as well as to test the responses overall. The *t*-test for overall responses to on-line and traditional modes returned a significant result.

d.f. = 272
t value = 5.95
This is significant at $p = 0.01$

Analysis between modes within the *communicative* media also produced a significant result.

d.f. = 90
t value = 8.62
This is significant at $p = 0.01$

Analysis between modes within the *productive* media also produced a significant result.

d.f. = 90
t value = 4.14
This is significant at $p = 0.01$

All three tests show that students had a district and significant preference for traditional modes of delivery with regards to how these activities assisted them in their learning. Further analysis using a *t*-test was also conducted to see if there was any significant difference between male and female responses, and also for younger and older students. In both cases the t value was very low showing no significance, even at $p = 0.1$ value.

Analysis was also conducted against the number of hours in paid work and the responses to on-line modes "*assisted me in learning*". A simple linear correlation was conducted which resulted in no significant correlation between hours worked and positive response to on-line deliver.

$r = 0.048$
$n = 91$
$p = 0.651$

Analysis was also conducted for the question "*on-line delivery helped me to feel engaged with this subject*". The average score for this question was 2.5 on the five point Likert scale (Table 4). The results also showed no correlation against hours in paid work. Further analysis using a t-test was also conducted for this question to see if there was any significant difference between male and female responses, and also for younger and older student. In both cases the t value was very low showing no significance, even at $p = 0.1$ value.

Table 4. Average (mean) student response to the question: "*The on-line delivery components helped me feel engaged in this subject*" from a five point Likert scale.

Gender	Mean Rating
Male	2.4
Female	2.6
Age in Years	
20–24	2.2
25–30	3.0
31–40	2.5
Hours Working	
0–8 H	2.7
9–16 H	2.2
17–24 H	2.3
25–32 H	2.6
33+ H	2.4
ALL	**2.5**

8. Findings

Overall, students were generally positive about the assistance afforded to them throughout the ten pedagogical approaches, with a mean rating of 3.3. However, analysis of the mode of teaching reveals that traditional approaches were perceived by the students to be more likely to assist them in their learning than on-line approaches. The mean response for on-line modes was 2.9, while for traditional approaches it was 3.4. As noted above this difference is significant, as is the difference within the *communicative* and *productive* media. Of the on-line initiatives, on-line discussion was rated as the least successful approach, at only 2.6, while a video assignment rated 2.8 and weekly blog posts 3.3. From the perspective of learning assistance, student sentiment can best be summarised by this student, "I personal(ly) find live lectures easier to learn from than on-line content only".

Interestingly there was no significant difference between scores (averages) for any of the media forms when considering just traditional or just on-line delivery. This supports a view that it is the mode of delivery that students are concerned with, not a preference for one media over another that is presenting here in this research as a preference for delivery mode.

In response to the following statement: "*The on-line delivery components helped me feel engaged in this subject*", student sentiment was quite negative in assessing the engagement opportunities of the on-line components of the subjects, with an average rating of only 2.5 (half-way between neutral and disagree). In fact, 53 percent of the student cohort disagreed with the statement to some extent, with only

a 20 percent positive response. Indicative student comments include: "I need regular face to face tutorials and tutor contact to feel engagement in the subject and to stay productive", and "I think on-line content should be used to double supplementary info. Core info face to face delivery is better."

As noted above, *t*-test and correlation analysis found no significant differences or relationships amongst gender, age or hours worked; none of these resulted in increased or decreased perceptions of engagement.

9. Conclusions

Generally the students within this study held reasonably negative attitudes towards both the capacity for engagement and learning opportunities from the on-line delivery methods in the blended learning environments. Certainly, traditional methods were favoured more than those conducted remotely by computer. There is however, enough variation in student responses to suggest that reasons behind this poor attitude to on-line learning may be many and complex; and could also relate to the particular nature of existing architectural pedagogical practice.

One finding of this research was the comparative popularity of the workshop environment for learning opportunities in Architectural Professional Practice. Within the student survey, we did not specifically delve into an exploration of the reasons behind this attitude, however one possible source of popularity is the familiarity that the studio setting (the signature pedagogy) offers architecture students, given that their core course subjects, architectural design, generally revolves around the studio environment each semester. Other potential explanations for its relative success include the direct and immediate connectivity it affords students in relationships with their peers and with their tutors; and the direct access offered by the tutors themselves, who generally are employed only for the duration of the class so interactions in on-line discussions can sometimes be limited. Unfortunately the open/written answers in the survey do not shed any light on this issue.

One of the reasons behind overall negativity in student attitudes towards on-line learning opportunities can be attributed to the aspect of engagement; with mean ratings in this area amongst the lowest of all aspects surveyed. It is important, at this stage to qualify that the students in this research were assessing only the on-line approaches offered to them within the context of the Professional Practice subjects, not on-line practices in general. It is always possible that the approaches taken in these newly developed subjects could be improved upon in later iterations and subsequent surveys could potentially show an improvement in these areas of learning and engagement.

One rationale for poor perceptions of on-line engagement opportunities may ironically be related to an apparent reason to actually advocate for on-line content: that of the time-poor student. It was found that students tended to work at least 20 h per week in paid employment on top of their studies (which in many cases was a full-time load of approximately 40 h per week). To this end, there were some students who appreciated the ability to fit the university work around their other priorities, which on-line delivery can offer. One obviously time-poor student states that, "on-line lectures helped in balancing study and fulltime work and having access to that much information helped", while another student states: "We need more face-to-face focused education. Self-directed learning can only motivate us and keep us on track for so long." It is however surprising that there was no correlation between hours worked and a positive response to on-line delivery.

Despite some resistance and negativity from students to the introduction of blended learning environments into their course, the benefits are clear, and still remain. On-line delivery offers convenience and flexibility for students to access information in a format consistent with ubiquitous technologies, to which they can easily relate. Students have the potential to access their course information anywhere, and at any time. This is a clear advantage for busy students who are juggling work commitments, family responsibilities, and study requirements.

Regardless of whether delivery is face-to-face, blended or on-line, good pedagogy facilitates an environment for students to interact in. Interactive learning is necessary for students to effectively develop both cognitive and physical skills, and gain important knowledge [28]. However, time and space differences that are enabled by the technology, result in more challenging facilitation and encouragement of online interaction, than in face-to-face learning contexts [29]. When appropriately facilitated, on-line delivery can actively support students to learn in a more sophisticated connected and collaborative mode. It can provide students with unique opportunities to interact with their tutors and peers in a less intimidating environment, allowing them sufficient time to understand the content, and then formulate their ideas and responses before contributing. It is clear from this study though that simple provision of on-line media in a blended learning environment is not enough, and that in itself this does not provide "support for learning" nor student "engagement".

The optimum blend of on-line and off-line modes of student learning is yet to be determined, certainly within the Architectural context. With further experimentation and refinement, especially in the area of facilitated interaction, on-line teaching practices should result in enhanced active and connected learning opportunities, however current evidence suggests that the perfect blend is not likely to do away with traditional approaches altogether. This research study has explored the differences between the students perceptions of their learning through different modes of engagement; especially the differences between on-line (digital) and traditional (face-to-face) modes. It has shown that student perceptions of opportunity for learning and engagement through on-line modes of delivery, in the context of architectural professional practice, are low and that traditional modes are currently still perceived as providing better assistance for learning and better engagement.

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Author Contributions

Murray Lane and Lindy Osborne conceived the experiments and data collection. Murray Lane and Lindy Osborne established the study environment and performed the experiments. Philip Crowther developed the analytical tools. Murray Lane and Philip Crowther analysed the data. Murray Lane, Lindy Osborne and Philip Crowther wrote the paper.

Conflicts of Interest

The authors declare no conflict of interest.

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