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Contents

Engaging design students through a video-based tutorial system

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Abstract

This study explores the efficacy of a video-based tutorial system within second year design education. It reports on a pilot study conducted in semester one, 2010, using an existing academic platform, the second year design core course *Technology in Design*, in the School of Architecture, Landscape Architecture and Urban Design at the University of Adelaide. Over one semester, 118 design students, including 27 international students, and 11 Graduate Diploma students, were engaged in the course which utilised traditional face-to-face teaching mechanisms (including site visits, lectures and studios) integrated with some online components (including a robust course website and discussion boards). The learning was supplemented by an online video-based resource, *24/7 Bec*. Each video, ten in total, addressed a different design communication skill and was posted on a *Blackboard* learning management system (LMS). The evaluation process involved intermittent feedback from students throughout the semester, a post-semester survey, and project-specific reflections at the completion of the course. The 24/7 availability and the video-based format of the resource conformed to both the asynchronous learning characteristics of mature-age students and the 'anytime, anywhere' work attitude of Generation-Y students, while also negating common learning hurdles, such as language barriers, of international students. It proved highly beneficial to staff as it eliminated the need to reiterate 'basic skills' teaching within class time, allowing studio sessions to be better utilised engaged in face-to-face development of design projects. The project will expand in 2011 to include other courses and programs within the faculty.

Introduction

The acquisition of basic drawing skills is a fundamental communication tool for design students. For some students the learning and teaching of these core skills in their first year of tertiary study is sufficient to enable them to continue to develop and move to higher levels of study and communication within the discipline. For some students the core skills teaching augments existing skills and re-focuses this knowledge with a new discipline specific application. However there are some students for whom more preparation is needed before they achieve sufficient mastery to move on to higher levels of application. Further, an influx of new students, with little or no pre-exposure to the core skills, necessitates that further teaching be provided so that all students are able to engage in their study from a levelled playing field. Within the course additional teaching resources were not available to address this 'stop gap' teaching. What was needed was a way to supplement the core skill teaching, to improve student learning outcomes, without impinging upon the already stretched teaching resources.

This paper describes a pilot study that devised and delivered learning support for students via an online video-based resource. The diversity of the student 'user' cohort is described. The usage of the resource was voluntary and data from the users (and non-users) was collected. Quantitative and qualitative data was collected and is used to demonstrate student satisfaction and the impact upon student learning outcomes.

Literature Review

The majority of the student cohort involved in this research fits within the Generation-Y label, or as Prensky has branded them, the 'Digital Natives'. According to Prensky, Digital Natives have 'spent their entire lives surrounded by and using computers, video games, digital music players, video cams, cell phones, and all the other toys and tools of the digital age' (Prensky, 2001a, p. 1). He maintains that the digital culture and environment in which the Natives have grown up has changed the way they think: 'It is now clear that as a result of this ubiquitous environment and the sheer volume of their interaction with it, today's students think and process information fundamentally differently from their predecessors' (Prensky, 2001a, p. 1). As such the argument stands that the digital culture in which the Digital Natives have grown up has influenced their preferences and skills in a number of key areas related to education. Prensky (2007, p. 41) notes:

> Our students are clamouring for these [new] technologies to be used as part of their education, in part because they are things that the students have already mastered and use in their daily lives, and in part because they realise just how useful they can be.

Supporting literature also suggests Digital Natives prefer receiving information quickly; are adept at processing information rapidly; prefer multi-tasking and non-linear access to information; have a low tolerance for lectures; prefer active rather than passive learning, and rely heavily on communications technologies to access information and to carry out social and professional interactions.

In a broad sense, many of Prensky's claims ring true. Technology has become an increasingly prevalent part of day to day life for the modern student. An exponential influx of mobile phones, mp3 players, personal computers and other assorted digital toys have shaped the lives of many students, however to label an entire generation as Digital Natives is a bold declaration indeed. Furthermore his analysis of lecturers in higher education as 'digital immigrants', foreigners in the digital lands of Generation-Y, unsurprisingly has attracted much scrutiny from academics within higher education circles (Doherty, 2005; Kennedy et al., 2008). In an extensive study conducted in 2006 with more than 2,000 incoming first-year Australian university students, Kennedy, found that while some students have embraced the technologies and tools of the 'net generation', it was by no means the universal student experience (Kennedy et al., 2008). The study showed a distinct lack of cohesion in the student population with regard to technology and a potential 'digital divide' between students within a cohort of a single year level. Moreover, it is increasingly recognised that while the majority of incoming university students possess a core set of technology based skills, there are students with a diverse range of skills across the student population (Caruso, 2005). As Lorenzo states (2006):

> Today's students are not just the traditional-age net generation, nor have they all had the benefit of state-of-the-art, ubiquitous technology. Higher education comprises a highly diverse and growing student body with a wide variety of information literacy capabilities.

At the same time a willingness to engage with the digital environment is not merely confined to Prensky's Digital Natives. Dutton, Dutton, and Perry (2002) suggest that older students have a preference for courses offered in 'distance' and 'blended' learning where they are 'more likely to be lifelong learning students... have job or childcare responsibilities, longer average commutes to campus and they are often more experienced with computers' (Dutton, Dutton, & Perry, 2002, p. 17 in Beer, Clark, & Jones, 2010, p. 77). This view is supported by Kelz (2009) who is concerned with student motivations to use e-learning strategies and blended learning where the 'organisational design allows students to study alongside work and family commitments' (p. 1).

Digital Learning Objects
A learning object (LO) is a grouping of instructional materials structured to meet a specified educational objective (Ruiz, Mintzer & Issenberg, 2006). Digital LOs, which can be stored electronically, allow a new approach to instructional activity, making design education more efficient, accessible and potentially more cost-effective. They are reusable and can incorporate text, graphics, animations, audio, and video content to support and enhance learning. A learning object can stand alone or be combined with additional objects to create larger forms of educational content meeting multiple educational objectives. Online digital LOs can be accessed by multiple users from multiple locations, and at any time. Integrating digital learning objects with traditional educational methods in a blended learning environment assists design educators in meeting the needs of the modern-day student (McCarthy, 2009a).

There is a lack of discipline specific literature regarding the use of video-based tutorials for supporting the teaching of basic skills to design students. Picolli, Ahmad, and Ives (2001) address the context of basic IT skills and propose a framework for evaluating the effectiveness of Virtual Learning Environments (VLE). The use of video is suggested but the application is limited to streaming of lecture recordings and video conferencing. Le, Joordens, Chrysostomou, and Grinnell (2010) look at digital LOs within the context of computer education. While they address basic skills-based courses the digital LOs are again limited to streaming of lecture recordings.

Within the context of English writing (as a second language), Miyazoe and Anderson (2010) look at digital LOs including wikis, blogs and forums. The digital LOs used were well-matched with the tasks the students needed to practice—namely reading and writing in English.

While there is much publication and interest in the use of online technologies to support, enhance and deliver learning and teaching (including video recording of lectures), there is almost no research regarding the specific use of videos to engage students and support them in their learning. Despite the lack of research, there are numerous examples of videos being used to teach basic skills. Butler (D. Butler, personal communication, September 24, 2010) utilised videos for demonstrating problem-solving processes through 'worked examples' in a first year mathematics course. YouTube abounds with mini-tutorials covering anything from the individual-with-a-passion 'how to curl your hair using rags' (YouTube, 2008), to multi-national companies 'Using the Casio fx-82ES calculator Full GCSE foundation tutorial with some higher material' (YouTube, 2011). Commercial enterprise and industry harness this platform to disseminate basic technical skills and support their patrons.

The following case study describes an approach that supports student learning through the provision of video-based resources to supplement face-to-face teaching. The study evaluates

student usage of the resource and the impact upon student learning. Recommendations for broad adoption of video-based basic skills support are provided.

Method

Technology in Design is a core second year course within the Bachelor of Design Studies (BDesSt) program and is also a core course for students within the Graduate Diploma of Design Studies (Grad Dip). In 2010 there were 118 students enrolled in *Technology in Design*; 107 students enrolled in the BDesSt program, and 11 enrolled in the Grad Dip program. The emphasis is upon the knowledge, skills and context within which architectural practice takes place. As well as developing skills in architectural design, students develop skills in the communication of design through graphics, including hand-drawing (drafting) and physical model making. BDesSt students are first introduced to these skills in first year core and elective courses.

Technology in Design provides an opportunity for BDesSt students to apply these graphic communication skills in a new context. The Grad Dip students are also expected to communicate their designs using these graphic techniques, however many have not yet acquired the core skills that the BDesSt students developed in first year. Design students need to quickly gather new communication and representation skills—in drawing, modelling, rendering and also speaking about design. As Delage and Marda note, 'architecture has two levels of expression: verbal/conceptual and visual/representational' (1995, p.65). Students need to learn how to talk about and justify their designs in a coherent way, as well as to represent their concepts through drawings and models.

For many of the Grad Dip students there are fundamental gaps in their knowledge and skills which inhibit their development to deeper levels of learning—application, analysis, synthesis and evaluation (Bloom, 1956). In anticipation of their first assessment task, 9 of the 11 Grad Dip students contacted the course coordinator concerned about their lack of graphic communication skills and how they would manage any, if not all of the assignments in the course. Within the current course structure there was neither the time nor the resources for additional teaching of such skills and therefore an alternate method for facilitating this student learning was required. If a student does not know how to use the required equipment, they cannot produce drawings which a) communicate their design work; and b) are consistent with the graphic language of the discipline. Facilitating the development of these communication skills enables students to progress to deeper levels of understanding and engagement with their learning, and as such, produce stronger results.

The course coordinator was required to meet the needs of this diverse cohort of students within *Technology in Design*, including local undergraduate, international undergraduate, and mature-age graduate diploma students, all with varying levels of information literacy capabilities. To cater to such a cohort, a series of instructional videos was conceived, developed and made available to all students through the course website in a series entitled *24/7 Bec*. The course website was accessible to all students 24/7 throughout the semester and, further, throughout a student's entire enrolment period at the university.

Each video, ten in total, addressed a different fundamental design communication skill, and ranged in length from 1-15 minutes, focussing on the following aspects:
- Drawing equipment and use
- Understanding scale within drawings
- Manual drafting skills
- Model making skills – Site / Context Models
- Design Process – Concept / Sketch / Developed (Final) Design Stages

By limiting the length of the videos, the information was conveyed in comprehensible 'chunks', enough for the attention span of Prensky's Digital Natives 'to get the gist and be sure it makes sense' (2001b, p. 4).

The inclusion of a video commentary is an opportunity to demonstrate the process of the skill—communicating not only *what* to do, but *how* and *why*. This is one approach that addresses Prensky's challenge 'to figure out inventive ways to *include* reflection and critical thinking in the learning' (2001b, p. 5).

The 24/7 availability of the resource conforms with the 'anytime, anywhere' work attitude of Generation-Y students, as Kennedy et al. note:

> While we recognize that ICT [Information and Communications Technology] use is by no means synonymous with engagement, the unique communicative capabilities of the technology as well as its increasingly ubiquitous 'anywhere-anytime' qualities offer much to those seeking ways to optimise student engagement in the 21st century (2008, p. 41).

The resource also meets the needs of the graduate diploma students through promoting higher order thinking by harnessing some of the motivational aspects of the adult learner identified by Lieb (1991), specifically by clarifying 'external expectations', providing a pathway for 'personal advancement' and fostering 'cognitive interest'. This 'fit' with the characteristics of the non-traditional and mature learner is reaffirmed by Dutton, Dutton, and Perry (2002) and Kelz (2009). Within the series each video demonstrates a practical skill overlayed with a commentary of *what*, *how* and *why* the approach is relevant and necessary within the discipline. As summarised in Table 1, the *24/7 Bec* series caters to several characteristics of the adult learner.

Table 1: Responding to adult learner characteristics

Adult Learner Characteristic [as outlined by Lieb (1991)]	How the *24/7 Bec* series responded to the Adult Learner
Autonomous / Self-direction	• Asynchronous availability—students participate at a time convenient to them. (The data shows that students accessed the resources at all hours of the day, and all days of the week.) • Non-compulsory—students actively select whether or not they participate
Foundation of Life Experience	• Where possible it relates aspects of the skill to similar 'common' skills (non-discipline specific) from which students can develop
Goal-oriented	• Students know what longer term goal they want to attain (namely better graphic communication skills). This resource facilitates a move towards that goal.
Relevancy-oriented	• The relationship of the skill to the discipline and practice is explicitly stated – (*why*)
Practical	• How to practice the skill within the discipline is explicitly stated – (*what* and *how*)

The videos were recorded on a *Mino* 'Flip Video' digital recording device prior to the commencement of the semester. In each video the course coordinator demonstrated a specific skill (or aspect of a skill) while the camera was focused on her hands and the work being done and/or tool(s) being used. Concurrently the coordinator narrated the activity to clarify a) what was involved in the task—'what to do'; b) how to (physically) achieve the more subtle aspects of the skill—'how to do it'; and c) why it is relevant / useful—'why do it'. The videos were deliberately contained to a short timeframe (less than fifteen minutes) for two reasons. Firstly, students were able to access the resource from a range of internet connections and there was a need to minimise file size, thus minimising download times. Secondly, a concise timeframe would whet the appetite and ensure strong student engagement. Topics which required longer than the fifteen-minute timeframe were broken down into several smaller 'aspects', each with its own video to ensure that the skill was addressed comprehensively.

The *24/7 Bec* series was accessible through the *Blackboard* LMS and student access of the resource was monitored through the Statistics Tracking function. There were limitations to the monitoring as the tracking captures data for the number and date of 'hits' per student, but it could not capture data for how long a student was engaged with the material. Furthermore, the data does not distinguish between a single hit, which might represent a single view, or a download of the file, which might be viewed independently at another time. The evaluation process involved a post-semester questionnaire, intermittent feedback from students throughout the semester and project-specific reflections at the completion of the course.

Results

Caruso (2006, p. 3), contends that the 'most fundamental measure of student experience... is the degree to which students use the systems' (p. 3). Students cannot engage with something that they are not using.

The data obtained from the post-semester questionnaire outlines the student usage of the video-based tutorial system within each cohort. The *24/7 Bec* series was accessed heavily by students from both the Grad Dip and BDesSt cohorts, over the length of the entire course. The series was accessed more by the Grad Dips with an average of 82% compared to 67% of the BDesSt cohort utilising the resource at least once during the semester.

Table 2: Student types within the cohort and percentage of students accessing the online video-based tutorial system

Student Type	Number of Students	Number of students using the resource	Percentage of students using the resource
Grad Dip	11	9	82%
BDesSt	107	72	67%
Total	118	81	69%

A higher proportion of Grad Dip students than BDesSt students returned to the resource for multiple viewings (an average of 55% compared to 39%), as outlined in Table 3. It is also noteworthy that the students who were accessing the resource were not simply the 'struggling' students. Rather, some of the strongest performers within the entire student cohort were amongst the highest 'multiple-view' users.

Table 3: Percentage of students accessing the online video-based tutorial system on multiple occasions

Student Type	Number of Students	Minimum of one view	Multiple views	Percentage of students with multiple views
Grad Dip	11	9	6	55%
BDesSt	107	72	42	39%
Total	118	81	48	41%

Over the semester the 10 videos were accessed 1448 times by the cohort, with an average of 12.3 views per student. The Grad Dip students averaged 15.8 views each and the BDesSt averaged 11.9 views each, as outlined in Table 4.

Table 4: Average number of views per student, across the ten tutorials

Student Type	Total views	Views per student
Grad Dip	174	15.8
BDesSt	1274	11.9
Total	1448	12.3

While the data demonstrates that the *24/7 Bec* series was accessed by students, of greater interest is how *useful* students found it. The post-semester questionnaire yielded a response rate of 81% and revealed the students' attitudes towards both their own fledgling representation and communication skills, and the perceived effectiveness of the video-based tutorial resource. A large number of students, from both the BDesSt and Grad Dip programs, indicated that they were concerned with their core skills in manual drawing, model making and digital drawing, prior to the commencement of the course, as shown in Table 5. Ninety two per cent of students indicated that they found the resource useful, particularly for 'future reference' and because they covered 'skills that are critical for professionals.' Eighty seven per cent stated that the resource assisted the development of their core representation skills, while 86% asserted they were now more confident with their graphic communication skills, as one student noted:

> I am keeping this drawing I did in Week 1 for the rest of my life. It is so bad. But I won't show it to anyone. I can't believe what I can do now—it [the work] is so different. It looks real.

The resource also assisted international students, some of whom struggled to keep up during classes due to language barriers:

> *24/7 Bec* was an additional help towards our study. I liked the way it communicated to the students. Students with language problems found it very useful.

Students also praised the 24/7 availability of the resource: 'we know it is there even if we get stuck in the middle of the night'; and the practicality of the content: 'it is practical and it is stuff I didn't know I didn't know...and I still wouldn't know where to go to find it out. It isn't anywhere else.' A large number of students indicated that the resource was so important to their studies that they wanted more videos within both this course and other courses within the curriculum, specifically related to topics such as drafting, poster layout and design, and 3D modelling and rendering.

Table 5: Post semester survey questions, mean responses and broad agreement percentages

Post-semester Questionnaire Response rate = 81%	Mean Likert Scale Response (1-7) 1 = strongly disagree 7 = strongly agree	Broad Agreement Percentage
'I found the *24/7 Bec* resource useful.'	5.9	92%
'The *24/7 Bec* resource assisted the development of my core skills in graphic communication.'	5.6	87%
'At the completion of the semester, I am now more confident in my graphic communication skills.'	5.5	86%
'At the beginning of this course I was concerned that my core skills in digital drawing were not adequate.'	4.9	68%
'At the beginning of this course I was concerned that my core skills in manual drawing were not adequate.'	4.8	71%
'At the beginning of this course I was concerned that my core skills in physical model making were not adequate.'	4.6	63%

Conclusion

Within design education, this style of 'skills support' is useful for all students, the Generation-Y Digital Natives, students from non-English speaking backgrounds and all adult learners, as it is accessible anytime, anywhere and has general transferable application irrespective of the design project they might be engaged in. The resource is available for students to revisit and revise whenever necessary to support the learning of the 'basic skill'. It is also useful to staff as it eliminates the need to reiterate 'basic skills' teaching, and precious studio time can be better utilised engaged in face-to-face development of design projects—something which cannot be effectively replicated in an asynchronous online forum. The online resource *24/7 Bec* has clearly impacted positively on student learning within this course and promoted higher order learning by facilitating the development of fundamental skills in graphic communication. Once these core skills are acquired students are able to move forward with the ability to express and develop concepts in the required professional approach. As the digital resource now exists it can be made available to students in other courses within the school. Extension of the project has included the embedding of new blended video-enhanced tutorial systems in other courses and programs at both undergraduate and postgraduate levels, while national and international collaboration are also currently being explored.

Recommendations

From the experience of the pilot study we make two key recommendations for broader adoption of video-based basic skill support:

- Contain the length of each 'help' video to a 15-minute maximum. This may mean breaking down a larger task into several shorter ones. When what is sought is 'quick help' the short video is not perceived as an onerous task and is palatable to a shorter attention span.
- Verbalise the thought processes that occur whilst engaged in the skill demonstration. The articulation of these thought processes in parallel with the modelled behaviour identifies and communicates an 'entry point' not merely of *what* to do but *how* and *why* it needs to be done.

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