ASCILITE
SHAPING THE FUTURE OF TERTIARY EDUCATION
Show Me The Learning
Adelaide, Nov 27-30, 2016

Using a Video-Based Critique Process to Support Studio Pedagogies in Distance Education – A Tool and Pilot Study

William Billingsley
School of Science & Technology
University of New England

Bing Ngu
School of Education
University of New England

Huy Phan
School of Education
University of New England

Nicolas Gromik
School of Education
University of New England

Paul Kwan
School of Science & Technology
University of New England

Studio courses have become a key way in which professional skills, especially those involving collaboration and design, are taught in many fields, including computer science. Studios typically involve students working on a design problem, periodically presenting their work for critique, and critiquing the work of other students or groups. They support productive inquiry, as well as teamwork, communication, and reflection. However, although studios have become an important mode of instruction for on-campus students, they have not typically been offered for online or distance education students. In this paper we describe a studio critique process that is designed to work asynchronously, using short videos, and a tool that we have built to support it. We also describe qualitative observations from a pilot study, in which video-based critiques were used at a university whose students predominantly study online rather than on-campus.

Keywords: Online education, studio pedagogies, video-based assessment.

Studio Pedagogies

The design studio has grown to become a key teaching methodology in several fields (Levy, 1980; Schön, 1987; Kuhn, 2001; Long, 2012; Bull *et al.,* 2013). Though design studios have existed as a teaching mechanism for many centuries, most modern studio pedagogies stem from a historic understanding of practices in architecture education. In a typical architecture design studio, students are given realistic multi-faceted design problems, and a learning space that is shared with other students working on other design problems. Work in the studio is seen as cumulative, with frequent critiques during the course of a project through "pin ups", where work is pinned to the wall for the class collectively to critique, and desk critiques between the instructor and participants. By the 1980s, the design studio dominated architecture education (Dutton, 1987). Levy (1980) observed that the curriculum is centred around synthesis, through the studio as the environment in which all aspects of architectural skills can be learned and practiced together, and that the design goal motivates students to learn the material they need to know in order to complete the design. Schön (1983, 1987) described the studio as a means for developing reflective practitioners, who through a cycle of observing and refining practice, can address the "messy, confusing" problems that are of greatest human concern. He particularly linked the studio pedagogies to Dewey's theories of productive inquiry (1938). Studio pedagogies are also supported by theories of experiential learning (Kolb, 1984), and more recently, researchers have sought to refine the theories behind reflection (van Manen, 1995; Bleakley, 1999; Leitch & Day, 2000).

Computer science has been an enthusiastic adopter of studio pedagogies. Computing was quick to recognise the importance of collaborative design and reflective practice to the discipline (Brooks, 1987). There is widespread recognition that computing is a design discipline, as well as a science and engineering practice. Before deciding how to build it, software professionals must first decide what to build. For many software projects, this is known to be what Rittel termed a "wicked problem" (Rittel & Webber, 1973) – a question that is inherently ambiguous, cannot be solved analytically, and can only be understood by proposing solutions. This is a similar concept to Dewey's "problematic situations" (1938) that Schön drew on when analysing architecture studios. From the 1990s, computer science sought to adopt studio teaching (Tomayko, 1996; Docherty et al, 2001; Kuhn, 2001; Hazzan, 2002). As on-campus studio courses in computing proliferated, academics adapted the pedagogies to fit the needs of the field, and there are now many variations (Hundhausen et al, 2008; Hendrix et al, 2010; Carter & Hundhausen, 2011; Nurkkala & Brandle, 2011; Billingsley & Steel, 2013; Bull & Whittle, 2014; Reardon & Tangney, 2015). Australia has been at the forefront of this, and studio courses and collaboration are now embedded in many Australian universities' on-campus computing and design degrees.

The Need for Asynchronous Critiques

Studio collaboration is, however, difficult to achieve for distance education classes. At our university, most of our computer science students are studying by distance, and many would not be able to attend a synchronous virtual class at the same time as their peers. On-campus courses with large cohorts have also reported difficulty scheduling enough time in the class for every group to present its work for critique (Matthews, 2013). There is therefore a need for asynchronous techniques that can enable remote students to fully participate in studio teaching. Particularly, we need asynchronous techniques to support the studio critique process that binds the class together.

Until now, there have been limited attempts to support asynchronous critiques in studio courses. These include two approaches that ask for text critiques of in-person or video presentations (Billingsley & Steel, 2014; Matthews, 2013). Though both were designed with online teaching in mind, they were implemented in on-campus courses only. The situation of a student in a large on-campus cohort, who meets many students but cannot engage with all students, is significantly different to that of a distance education student, who does not physically meet any other student in the course. With online learners, the MOOC provider NovoEd (Ronaghi *et al*, 2015) uses asynchronous critique-style feedback in some courses, but again only using text critiques, and outside of formal higher education. Saghafi *et al* (2012) experimented using text methods such as Wikis and Facebook comments for critiques in a virtual studio, but found that some students felt isolated using this method.

Asynchronous Critiques via Video

We are exploring the merits of students critiquing each other's work asynchronously via video, to enhance studio collaboration amongst distance education learners. This will allow students to present critiques more richly, for instance, including demonstrations of an issue, presenting sketches of an alternate solution, or enabling deixis by pointing at aspects of the design under critique.

Our project is not simply undertaken out of research interest, but also out of functional necessity. Our university has a computer science degree, where part of our professional accreditation depends on the teaching of collaborative, design, teamwork, and communication skills. We have chosen to do this through the incorporation of design studio units within the degree, and as the majority of our students are online rather than on-campus, we have a particular need to establish studio pedagogies that work online.

However, as studio pedagogies are not specific to computer science, having been inspired by architecture education, we are also interested in exploring the student experience of using asynchronous video for critiques outside the computer science studio units.

A Tool for Managing Video-Based Critiques: Assessory

We have developed an open source tool, Assessory[1], for managing a three-stage critique process:

1. Students (or groups) record and upload a video presentation of their design work. This is normally fewer than seven minutes in length, and may involve talking through design sketches.
2. Each student in the class is randomly allocated a number of videos to critique (normally three). For each video, they record a short critique video in reply, usually of less than three minutes in length.
3. The students (or groups) who recorded the original video presentations are then invited to watch the critiques of their work, and rate the critiques against a short form (normally, whether they were constructive, helpful, specific, and actionable)

This process is adapted from an earlier critique process for on-campus courses, that used in-person presentations and text-based critiques (Billingsley & Steel, 2014). Each step of the critique process is set up as a separate configurable task, so that other courses can use altered or shortened versions of the process.

In the initial version, as we test the concept, the video files themselves are uploaded to YouTube. This delegates the format conversion to a well-established existing service, and most students' devices (for example their mobile phones) already contain functionality for sharing a video to YouTube. In future versions, we will expand this to support different video upload services, including university-hosted ones. As shown in Figure 1, the student then pastes the video link into our tool, Assessory, which manages which students are allocated to critique or respond to which videos. As YouTube videos can be set to be "unlisted" (viewable only by users who have the link), Assessory can show the video to the students allocated to critique it, without the video being discoverable by the general public.

In stage 2, the videos selected for critique are the currently least-critiqued videos that have been received. This is an adaptation we had to make to the on-campus process. On campus, students would critique a selection of live presentations in a scheduled class. As students needed to know which presentations they particularly needed to pay attention for, the presentations to critique were pre-allocated by an algorithm in advance of the class. For the online process however, videos are submitted by students at unknown times, and there is no guarantee that all the videos will have been uploaded before the due date. The videos to critique therefore have to be allocated dynamically, so that an on-time critic is not delayed by a late presenter. By using a "least critiqued" rather than random algorithm, late uploaders can expect to receive some critiques although the pool of available critics will be smaller as some will already have completed their allocation.

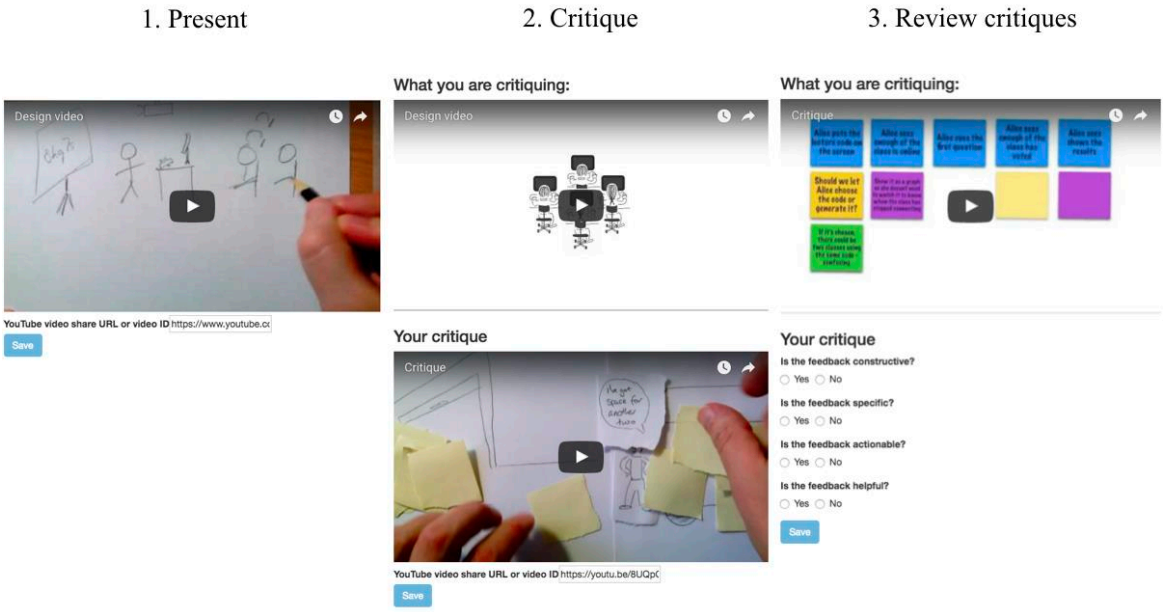

Figure 1: Assessory supports a three-stage critique process. First, students present their work via video. Then they produce videos critiquing the work of others. Then they review critiques of their work. For privacy reasons, the videos in the above illustration have been replaced.

[1] Project homepage http://assessory.org with source-code available from https://github.com/assessory/assessory.

A Small Pilot Study

In a pilot study in early 2016, we ran critique tasks in one unit in computer science and two units in education, taught by members of the research team. The task in each unit was designed by the unit coordinator, rather than deploying a standard task. We regarded this adaptation process as an important part of the pilot. In practice, teachers can be expected to tailor pedagogies to their classes, so we wanted to be able to reflect on the changes that different members of the team would make for their own classes. The results of our study are qualitative, and with only three teaching units, each with relatively small cohorts, we do not claim our results to be representative of broader education. Rather, they give us insights into the issues that can arise depending on the context of the class, and the variation in how students go about producing their videos and critiques.

Table 1: Pilot Study Unit summary

Unit	Topic	Presentations	Critiques	Other
A	Interaction design	14 videos	39 videos	11 demo videos
B	Learning theory	Lecturer-provided videos	15 videos, 4 audio	
C	Mathematics pedagogy	12 videos	25 text	

In Unit A, taught by the tool's author, the three-stage critique process was used, with students uploading the videos to YouTube and pasting the link into Assessory to manage the critique process as described above. This was an interaction design unit, in which eighteen students worked individually to develop smartphone apps. The three-stage critique process was used to ask students to critique each other's design work mid-way through the term, with an additional video demonstration of the student's finished product included at the end of term.

Each of the education units used an altered version of the process. Neither education coordinator wanted to use YouTube for submissions, instead preferring students to upload either to the university's Learning Management System (LMS), or to a special upload form if the video was larger than the LMS would accept. Videos were then manually reformatted and moved as necessary by the research team, rather than using our open source tool. In unit B, the coordinator preferred students not to see each other's work, and so tasked students with recording critiques for initial videos he provided (only using step 2 of the process). In Unit C, students did critique each other's work, and steps 1 and 2 were used.

Video strategies

When we proposed using video for critiques, one of our initial motivations was to enable deixis – being able to point at something on paper and say "this". In practice, especially in Unit A, we have found that there is a very large variety to the strategies students use to present not just their designs but also their critiques. Among the design videos, there were animations, recorded digital presentations, recorded on-paper presentations (using coloured notes instead of slides), screen-recordings panning through documents, and recordings of talking though paper design sketches and mock ups. In the critique videos, one student put images of design sketches onto a phone so they could swipe through them (recorded from another phone); another student screen-recorded the playback of the design video so they could scrub through the video and give a running commentary at key moments; yet another student sketched a key interface from the design video and used tangible items (coloured disks) to represent controls so they could illustrate an alternative design they wanted to suggest.

In unit B, some students expressed concern about physically appearing in a video. 4 students chose to upload audio critiques instead of video, and one initially uploaded text. These concerns were less prominent in unit C (though some confusion around the assignment instructions led to the critique stage being submitted as text) and did not occur at all in unit A. None of the units required students to physically appear in the video, but for Units A and C, the task design already made it more natural to place the work being described on-camera, rather than the student's face.

A secondary aspect is that we had speculated that the need to produce video could itself be a deterrent against students outsourcing their work, as the student's voice would need to be present. This appears not to be the case. While we did not find any evidence of outsourcing in the study, there were presentation videos that filmed a design artefact and superimposed text, rather than including a voice that would identify the student.

Technical aspects

Though it was not raised as a concern by students, a particular issue about how to handle late uploads became apparent in the three-stage process in Unit A. When students were late uploading to stage 1, it was possible to mitigate this by using a "least-critiqued" selection algorithm for stage 2. However, the same is not true for late uploads to stage 2. Each critique is addressed to a particular student, who we would like to review that critique. For online students, who do not review their critiques in a scheduled class, we therefore need to introduce a notification mechanism so that students can be informed when a new critique has arrived.

While we had wondered whether some students would object to being asked to upload their videos to YouTube, in practice none did. This was generally the smoothest process. One end-of-term demo video was accidentally set to *private* instead of *unlisted*, making it temporarily unviewable from within Assessory, but this did not interrupt a critique process. In units B and C, using a file upload process, there were significant issues with the size of the videos. As we did not know what device students would use to create the videos, we could not provide a specific compression and upload app. There were many cases of uploads taking long enough that students thought they had failed, and one where a student was unsure how to transfer the file from their phone to their laptop, let alone compress or upload it.

However, while using YouTube for upload provides the most convenience for students, in order to preserve student submissions after the due date, it becomes necessary to download the student videos. This is possible, and can be automated, but at the time of writing is not normally supported by YouTube's terms of service.

Conclusion

Critique processes can play a significant role in supporting reflective practice. They engage students not only in the skills required to produce their designs but also in the professional communication skills needed to articulate their designs. They give students the opportunity to learn from each other's problems and solutions as well as their own – observing each other's work as it is produced rather than just when it is delivered. We find that asynchronous video is a flexible and useful means for supporting this. Students apply a wide variety of techniques in the critique of each other's work as well as the presentation of their own work.

There remains some additional work to do to improve the technical ecosystem, in order to make it a smooth experience for online students. Particularly, to ensure the system connects to widely available video upload mechanisms, including institutionally hosted ones, and provide notification mechanisms for when critiques arrive. In this manner, critique processes are more akin to a structured video messaging task than a video assignment submission task.
In future work, we also intend to investigate the student experience in greater detail, through interviews with students and analysis of the content of student design, critique, and demo videos. For example, we would like to discover how strong the connection is between the feedback students ask for in their design videos, the feedback they are given in their critique videos, and whether it is taken account of in their eventual demo videos. Since our initial pilot, we have gathered a further 26 design, 25 demo, and 125 critique videos using Assessory within teaching units in the ongoing term, with further units planned for 2017.

References

Billingsley, W., & Steel, J. (2013). A comparison of two iterations of a software studio course based on continuous integration. In *Proceedings of the 18th ACM conference on Innovation and technology in computer science education* (pp. 213-218). ACM. https://doi.org/10.1145/2462476.2465592

Billingsley, W., & Steel, J. R. (2014). Towards a supercollaborative software engineering MOOC. In *Companion Proceedings of the 36th International Conference on Software Engineering* (pp. 283-286). ACM. https://doi.org/10.1145/2591062.2591157

Bleakley, A. (1999). From reflective practice to holistic reflexivity. *Studies in Higher Education*, *24*(3), 315-330

Brooks, F. P. (1987). No silver bullet – essence and accident in software engineering. *IEEE Computer,* 20(4), 10-19. https://doi.org/10.1109/MC.1987.1663532

Bull, C. N., Whittle, J., & Cruickshank, L. (2013). Studios in software engineering education: towards an evaluable model. In *Proceedings of the 2013 International Conference on Software Engineering* (pp. 1063-1072). IEEE Press. https://doi.org/10.1109/ICSE.2013.6606656

Carter, A. S., & Hundhausen, C. D. (2011). A review of studio-based learning in computer science. *Journal of Computing Sciences in Colleges*, *27*(1), 105-111.

Dewey, J. (1938). *Experience and education*. New York: Simon and Schuster.

Docherty, M., Sutton, P., Brereton, M., & Kaplan, S. (2001). An innovative design and studio-based CS degree. *ACM SIGCSE Bulletin*, *33*(1), 233-237. https://doi.org/10.1145/366413.364591

Dutton, T. A. (1987). Design and studio pedagogy. *Journal of Architectural Education*, *41*(1), 16-25. https://doi.org/10.1080/10464883.1987.10758461

Hendrix, D., Myneni, L., Narayanan, H., & Ross, M. (2010). Implementing studio-based learning in CS2. In *Proceedings of the 41st ACM technical symposium on Computer science education* (pp. 505-509). ACM
Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. New Jersey: Prentice-Hall.
Kuhn, S. (2001). Learning from the architecture studio: Implications for project-based pedagogy. *International Journal of Engineering Education*, 17(4/5), 349-352
Leitch, R. & Day, C. (2000) Action research and reflective practice: towards a holistic view, *Educational Action Research*, 8:1, 179-193. https://doi.org/10.1080/09650790000200108
Levy, A. (1980). Total studio. *Journal of Architectural Education*, 34(2), 29-32.
Long, J. G. (2012). State of the studio – revisiting the potential of studio pedagogy in US-based planning programs. *Journal of Planning Education and Research*, 32(4), 431-448.
Matthews, B. (2013). *Evaluating vicarious critiques as a tool for open online studio-based design education*. Unpublished grant application, University of Queensland
Nurkkala, T., & Brandle, S. (2011). Software studio: teaching professional software engineering. In: *Proceedings of the 42nd ACM technical symposium on Computer science education*, 153-158
Reardon, S., & Tangney, B. (2015). Smartphones, studio-based learning, and scaffolding – helping novices learn to program. *ACM Transactions on Computing Education,* 14(4), Article 23
Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155-169. https://doi.org/10.1007/BF01405730
Ronaghi, F., Saberi, A., & Trumbore, A (2015). NovoEd – a social learning environment. In: Kim, P. (ed.), *Massive Open Online Courses – The MOOC Revolution*, New York, Routledge, 96-105
Saghafi, M. R., Franz, J., & Crowther, P. (2012). A holistic blended design studio model: a basis for exploring and expanding learning opportunities. In *Society for Information Technology and Teacher Education International Conference (SITE 2012)*, Austin, Texas: EdITLib
Schön, D. A. (1983). *The reflective practitioner: How professionals think in action* (Vol. 5126). Basic books.
Schön, D. A. (1987). *Educating the reflective practitioner*. San Francisco: Jossey-Bass.
van Manen, M. (1995). On the epistemology of reflective practice, *Teachers and Teaching – theory and practice*, 1(1), 33-50. https://doi.org/10.1080/1354060950010104
Tomayko, J. E. (1996). Carnegie Mellon's software development studio: a five year retrospective. In *Software Engineering Education, 1996. Proceedings., Ninth Conference on* (pp. 119-129). IEEE. https://doi.org/10.1109/CSEE.1996.491367

Please cite as: Billingsley, W., Ngu, B., Phan, H., Gromik, N.& Kwan, P. (2016). Using a video based critique process to support studio pedagogies in distance education. In S. Barker, S. Dawson, A. Pardo, & C. Colvin (Eds.), *Show Me The Learning*. *Proceedings ASCILITE 2016 Adelaide* (pp. 43-48). https://doi.org/10.14742/apubs.2016.873

Note: All published papers are refereed, having undergone a double-blind peer-review process.