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Supporting Documentation of Informal Learning and Making from a Distance with Voicethread

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Abstract: This best practices session and paper describes the incorporation of Voicethread as a tool for supporting design documentation of makerspace projects among graduate distance education students in a course on informal learning. All students successfully utilized the tool to present photographic and video evidence of design processes with oral annotations, and received clarifications and feedback from peers. Students reported positive affordances of the tool in terms of marking up slides to communicate particular design decisions, sharing video as "proof" of successfully completing a particular make project and as exemplars of makers' problem solving and thinking, documenting a linear process with media evidence as a preferred approach to written documentation for informal settings, and making comparative assessments across peer designs with the ability to question and clarify through interaction. The choice of asynchronous documentation versus synchronous collaboration is considered.

Introduction

In the spring and fall of 2016, two sections of a new online course on "Leading Informal Learning Environments" were taught to 17 graduate students in a College of Education Digital Learning program. The course provides a brief introduction to a range of informal learning programs before concentrating on one specific type of program in makerspaces. Given makerspaces and most informal learning programs are typically physically sited with ready mentor and peer support, a challenge for this course was how to provide similar mentor and peer support for geographically dispersed participants as they engaged with six make projects (i.e., conductible ink circuit, copper foil circuit, soft circuit, spinbot, programmed PicoBoard, and 3D design).

In this best practices session, the presenter will discuss a rationale for selecting the Web-based tool Voicethread (http://voicethread.com) for students to document their design processes and receive online feedback from peers and the instructor. Voicethread allows users to post a set of slides, or in the case of this course, a set of critical photos and video taken to illustrate one's make process. For project documentation, students were required to talk aloud and leave oral annotations on each of their slides to discuss their design. On a set of instructions for documenting make projects, the instructor guided students for things their reflections could include: challenges faced, modifications one would make to their designs, and realizations one came to during design about the process or how the project could tie into teaching and learning. For each make project, students shared their Voicethread with peers, who were required to post oral/textual comments or clarifications.

Summary of Voicethread Design Documentation and Peer Response

An overview of student Voicethread documentation from the spring 2016 semester is presented in Table 1. As shown, students varied somewhat in terms of the number of Voicethread slides used to document their six make projects, and the mean number of minutes of oral annotation. Some students were able to describe their design process with fewer images and less speaking time. Other students were not as concise and discussed many more details, some relevant and some that could probably be cut without negatively impacting their ability to describe the overall process. For the second section, the course instructor considered dictating a "maximum" number of slides and oral annotation time to encourage students to be more selective and less "rambling" in their documentation, but decided not to do so for fear suppressing students' reflections and different natural styles of reflecting.

Students	Total # Slides	Mean # Slides Per Project	Mean # Minutes of Annotation Per Project	Mean # Peer Replies Per Project
A	92	15.33	6.46	24.0
B	93	15.50	15.75	16.2
C	58	9.67	8.55	17.0
D	94	15.67	12.16	10.5
E	91	15.17	10.58	24.0
F	93	13.83	7.51	7.7

Table 1. Overview of Student Voicethread Documentation

A few excerpts from two students' design documentation is included here to give the reader a sense of the reflecting students engaged in with Voicethread:

> *So I decided to include this to demonstrate my wonderful sewing skills and abilities. You'll notice here that I have this huge loop [draws on Voicethread slide] that when I went through and made the stitch and then I went up here to where the flower was, I definitely didn't pull it all the way through before I made the second stitch with the flower. Yeah, you live and you learn I guess, definitely making sure you pull it through. I would probably suggest you definitely make sure you have a little more thread than you really expect to have in case something like this happens, you can deal with that. I was also concerned that having this big loop here might cause some issues with conductivity, and I wonder if there would be a possible way to snip it and trim it, and then trying to tie it, if that would mess with how conductible the thread would continue to be. But I guess I have to wait and finish to see exactly what effect that would have. (See Figure 1)*

> *So here in this video I was testing the noise [sensor]. If you do notice [draws on Voicethread slide], you will see the legs of the sprite moving here. Once the sounds get louder, and I tried to do it a little bit slower and faster with time to just kinda see how that affected the sprite and what the code was making it do. I was pretty happy that eventually I did get it. You can see that it was able to work, and again I had success and I was pretty proud of myself. (See Figure 2)*

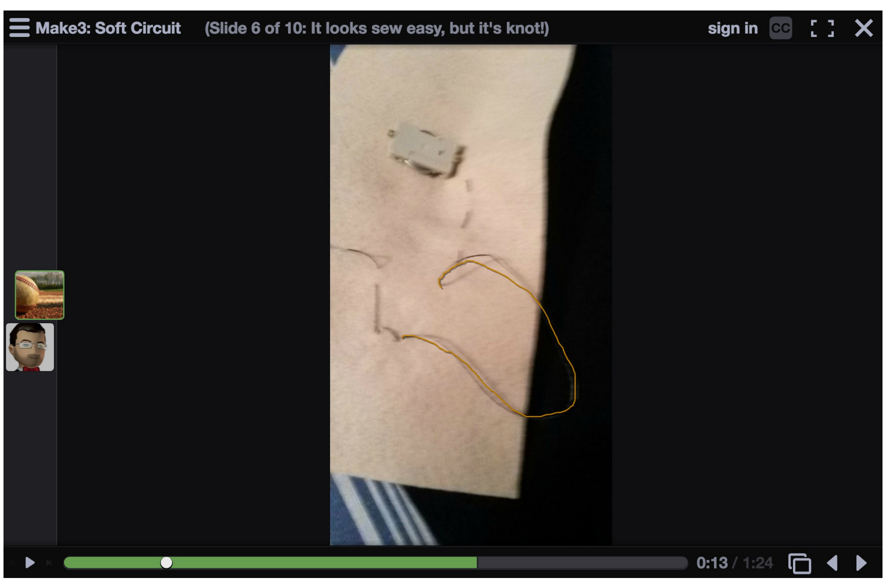

Figure 1. Sample Make Project Documentation in Voicethread with Drawn Markup on Still Image

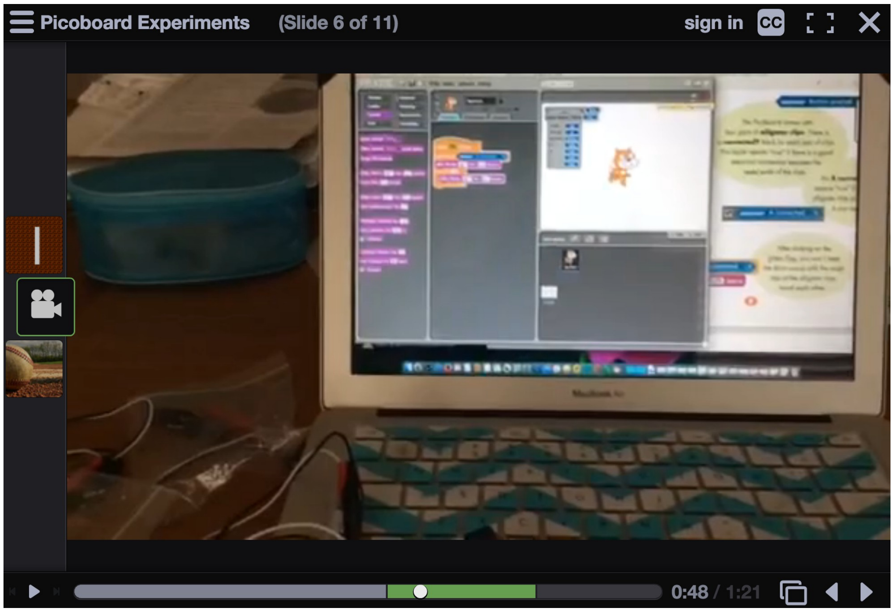

Figure 2. Sample Make Project Documentation in Voicethread with Inserted Video Clip

Also shown in Table 1 are the mean number of peer replies students in section one received per project, not counting the instructor's replies. Given the small section size of only six, students were required to reply to at least two peer projects, ideally more. It's encouraging that these students went considerably beyond this minimum, and their replies in a given project were not one culminating comment at the end, but rather several comments peppered throughout the Voicethread indicating they were listening intently to the entire thread. The first four projects in the course generated the most mean number of replies, including a conductible ink circuit (mean of 18.3 peer comments per project), a copper foil circuit (mean of 20.3 peer comments per project), a soft circuit (mean of 19.3 peer comments per project), and a spinbot (mean of 16.7 peer comments per project). The final two projects received fewer peer replies overall, including programming a PicoBoard (mean of 12.3 peer comments per project), and creating two 3D designs with TinkerCad (mean of 12.3 peer comments per project). These results are difficult to interpret, as two students turned in projects four through six later than their peers, and each student had zero peer comments on these projects. The lower mean number of comments on projects four through six could simply be the result of students having fewer completed projects to comment on, rather than any inherent difficulty for projects one through three that might have led to more conversation. Regardless, the results demonstrate the tool was successful at eliciting peer replies, and that students were generally motivated to comment beyond a minimal threshold.

Several general categories of peer response were identified from student Voicethread documentation, including the following:

- acknowledging good design ideas, complimenting ("Great idea to have him use the protractor--one you probably have perfect circles. Two--he got to incorporate what he is learning in math class!" "Nice contingency planning on your part. Way to go." "Love the addition of the purple overlay. It really pulls the aesthetic of your card together." "This is a really neat design. I like how you took a different approach and used safety pin holes to have the lights diffuse through the card rather than have your LEDs directly appear outside your card.")
- comparing design strategies, acknowledging similar issues encountered ("That's such a good idea. I kept mixing up the wires because once they are bent it's hard to tell which one is the longer wire." "I had the same experience with the sewing needle. I initially chose too large of a gauge to get through the battery hole, it didn't end up being an issue, but definitely something to consider when prepping the activity for students.")
- connecting a design to a related concept ("Such a great idea to make it connect. Reminds me of the singing cards.")

- asking for clarification about a given design ("Is your bottom LED blue or white shining through your blues and purples?" "The bottom is a blue LED. I didn't have any white in this pack... but I thought the blue still looked cool.")
- discussing how a project would work with younger K-12 students ("That's a good idea for the students. Hopefully that will help ease some frustration of sewing something "backwards" and it not lighting up." "Sounds like you want them to have that exploring opportunity. If they are getting really frustrated and near that "give up point" how would you coach them through?" "I would probably direct them to the diagram over going back to the written direction. It might also be good to have them draw out their plan so that they see exactly where/how to thread.")
- discussing how a project could tie into the curriculum ("Great connection with ELA to tie in possibly a poem or saying similar to the first project.")

Unique Applications of Voicethread

A few interesting uses of Voicthread by students warrant closer inspection. First, beyond general reflecting on one's design, a few students utilized Voicethread's markup tool to draw circles around specific objects on their slides and highlight particular elements. For example, one student used the drawing tool to highlight different stitches and knots on their soft circuit project that were small and would be difficult to identify without some highlighting.

Second, while the norm was for students to share still images on their Voicethread slides, as the semester wore on, more and more students opted to share short video clips of their designs. Video was particularly helpful for students to illustrate finished products as a type of "proof" that they were successful with the design (e.g., the LED on my copper foil greeting card is lighting up, the propeller on my spinbot is causing a spinning motion). Video was often shared toward the end of a student's Voicethread documentation to provide this "proof."

Third, some students also used the video capabilities of Voicethread to bring in the perspectives of third parties. For example, graduate students in this course were encouraged to work on their make projects with their own K-12 students if they were teachers or their own children if they were parents, and three of six students opted to do so in the first section of the course. The graduate students included short video clips of their children working out problems associated with different make projects, as well as clips of children discussing the scientific principles behind a particular design. These clips were excellent examples to bring into the course of K-12 students' thinking about different projects, as this conversation between a mother, daughter, and son, collaborating on a soft circuit project together illustrates:

> *Mother: What did you learn about electricity with this experiment?*
> *Daughter: Electricity needs a lot of power to do it. It flows kinda through.*
> *Mother: What would happen if we peeled off some of the paint from that paper?*
> *Son: It wouldn't flow and it wouldn't work.*
> *Mother: The light wouldn't light up?*
> *Son: No, cause that's electric paint. The electricity flows through that, so it wouldn't work.*

Affordances and Limitations of Tool

Students from the spring 2016 section were asked to provide informal feedback on the use of Voicethread in this course for project documentation and feedback. As a general indicator of value, all six students in this section indicated they would be interested in using a tool like Voicethread to encourage documentation of make projects in their own makerspaces, so it seems students did find value in using the tool for personal reflection and peer interaction.

Students also noted that being required to think in terms of a set of linear set of slides on Voicethread paralleled their design process and its different phases, and that it was easy to capture and repost media with readily available mobile devices during making. Students were encouraged by the natural style of documentation in Voicethread with spoken voice and photos in lieu of written documentation that they believed young students would find more tedious, particularly in informal learning settings where "academic" work is not expected and resisted. Students were also encouraged by the capabilities Voicethread supported for comparing one's design against others in the same class, and asking questions of peers when a particular design decision did not go well (e.g., my LED blew out).

On the negative side, students did note that it took some time to remember to take photographs and video during their making, but this eventually became a learned routine. Students also noted that the asynchronous nature of Voicethread documentation meant they were unable to receive feedback from peers until after their projects were complete and fully documented. By contrast, a synchronous session or tool might allow students to work simultaneously on projects and ask questions and receive feedback during the design process.

A secondary option for supporting informal learning and making from a distance, then, could be synchronous tools such as Google Hangouts that would allow a small group to designate a common time for making and log-in to work on a particular project together. Our concern with synchronous collaboration over asynchronous documentation, is that it doesn't provide students with the same opportunity to intentionally stop and reflect. Further, when difficulties in projects are encountered, instead of students learning to problem solve and troubleshoot on their own, they may over rely on peer expertise in a group-make setting. Certainly makerspaces by design are learning environments in which community collaboration and support from peer expertise is encouraged, but we found value in students attempting a project independently, before peer questioning and clarification. The same might be expected in a physical makerspace where a facilitator encourages a student to tinker and explore without giving away the answers to a particular design problem.

In summary, we have found Voicethread to be an excellent tool for capturing distant students' design processes around different make projects and for supporting a diverse range of peer response. Our students adapted to this tool easily and reported numerous affordances. We continue to use the tool in new sections of this course. Online tools like Voicethread address known limitations in maker community platforms that "do not deliberately address the needs for connected making such as allowing members to build on other's work, share know how, and critique each other's design to foster new interactions" (Litts et al., 2016, p. 1044).

References

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