

Maker Portfolios as Learning and Community-Building Tools Inside and Outside Makerspaces

Anna Keune, Indiana University, akeune@indiana.edu
Kylie Pepler, Indiana University, kpepler@indiana.edu

Abstract: Portfolio assessment gains new traction in youth-serving maker-educational spaces through increased inclusion of maker portfolios in college and job applications. However, the collaborative and cooperative character of making poses a tension to traditional portfolio assessment that is focused on showcasing individual achievements. Together, this calls for an expanded understanding of the use of portfolios in maker education. We examined the types of portfolio entries at two youth-serving makerspaces (one out-of-school and one in-school), and observed the documentation of personal and shared projects in personal and shared portfolios. Our main findings are that, compared to portfolios that focused on personal work alone, portfolios that included shared projects and documentation presented richer showcases, showing technical and social engagement, assessment by people across a distributed community, and possibilities to narrate work to multiple audiences. This has implications on the facilitation of maker portfolios and broadens portfolio assessment to show the role of the learner in society.

Keywords: maker education, portfolio assessment, maker portfolios

Introduction

Youth-serving makerspaces are spaces for learning, in which youth create projects using digital tools and tangible materials alongside their peers. Through design, learners become active producers of sharable artifacts (Pepler, 2013). By making projects publically available and sharing them within the maker-educational spaces, makerspaces become communities of learning that center around the collaborative construction of that community (Sheridan et al., 2014). This combination of design and sharing practices is in many ways similar to Knowledge Building, which sees learning as a production-centered, collaborative, and interest-driven design process that acts as a catalyst for collaboration and communities (Seitamaa-Hakkarainen, 2009). Aspects of the design process center on the use of mediating technologies to document, share, and reflect on contributions toward forming a shared understanding (Hakkarainen, Paavola, Kangas, & Seitamaa-Hakkarainen, 2013).

Documenting, sharing, and reflecting on learning in makerspaces is a promise of digital portfolio assessment. Portfolio assessment originated from the historical precedent of arts-based portfolios (Gardner, 1989). As a response to the increased pressures of accountability, portfolios were seen as a hopeful alternative to standardized testing and a way to provide a richer picture of student learning (Niguidula, 1993; Mills, 1996). Typical portfolio assessment processes tightly couple instructions and assessment to increase ownership over learning and to position portfolios as learning tools (Lamme & Hysmith, 1991; Love, McKean, & Gathercoal, 2004). While traditional portfolio assessment often culminates in one individual student's personal website, narrative, or collection, as students capture their accomplishments and learning processes online, portfolios can also become community-building tools, garnering constructive feedback on expressed efforts (Tseng, 2015). Today, maker portfolios are gaining traction as part of job and college applications, promising to expand access to opportunities beyond the makerspace (Pepler, Maltese, Keune, Chang, & Regalla, 2014). While traditional portfolio assessments have defined audiences, maker portfolios invite multiple audiences that are unknown at the time the portfolio was created. The community-oriented approaches of making and the potential multiple audiences of maker portfolios present tensions to traditional portfolio assessment and suggest that we cannot apply them to maker-education. The expanded role of portfolios as learning tools and community-building tools inside *and* outside of the maker-educational setting calls for a fundamental shift from valuing cognitive outcomes to valuing the role of the individual in society. Educators have to design portfolio practices that act as learning and community-building tools inside *and* outside the makerspace and the new purpose of representing youths' role in society is imperative. This leads us to the question: How do portfolio posts differ across youth portfolios and what kind of posts facilitate portfolios to function as tools for learning community building, and expanding opportunities beyond the makerspace?

The experiences which youth document today could dramatically shape the opportunities that they access tomorrow. Understanding how to successfully capture the richness of engagement in maker-educational settings promises to broaden opportunities, because not only products and individual achievement but also the role of collaboration and community engagement can become visible to people outside the maker-educational space.

Methods

To study youth maker portfolios, we performed a year long qualitative inquiry in two maker-educational spaces with continuous space-wide portfolio efforts: an out-of-school and a high school makerspace in the eastern United States. We selected the sites from 10 youth-serving makerspace because both spaces integrated making across subjects and programs and all youth had personal websites for documenting projects, processes and reflections. The out-of-school space offered programs to youth from 8 to 18 through summer camps (e.g., 3D printing, digital filmmaking), open-ended programs, and foundational courses. All youth had a personal website that linked to a shared page that showed all current projects. At the high-school space, students documented assignments and work-in-progress on personal websites, and teachers worked with portfolio templates or designed their own approaches to facilitate portfolio processes.

Our engagement began with conference calls with educators and site administrators to get an overview of the makerspace portfolio practices and to plan field site visits. During two field site visits to each site, we observed youth working on portfolios and asked 10 youth to “walk us through” their portfolios, which fused usability walkthroughs (Rieman, Franzke, & Redmiles, 1995) with semi-structured interviews (Merriam & Tisdell, 2015). Here, youth talked about their projects, learning, and reasons for documenting. We also studied the online portfolios of 37 youth (22 from the out-of-school and 15 from the school space), who were recommended by educators as particularly engaged in portfolios. The portfolios included 569 posts in total.

Following Erickson’s (2004) approach to qualitative research, we iteratively looked across entries and identified themes within the makers’ projects and documentation to help characterize the portfolios in relation to their function as tools for showcasing individual work as well as presenting the role of the individual in society inside and outside of the makerspace. The themes we identified were: (1) personal projects paired with personal documentation, (2) shared projects paired with personal documentation, (3) personal projects that were documented in shared spaces, and (4) shared projects that were documented in shared spaces.

Categorizing the portfolio entries and walkthroughs according to these themes, we identified patterns in the way that social engagement in projects and documentation was represented across portfolios. This highlighted both frequently reoccurring practices and unique portfolios. An in-depth analysis of theme-related portfolios identified how portfolio entries characterized makers’ experiences inside the makerspaces as well as some of the opportunities that portfolios may open up for youth outside the makerspace.

Findings

Of the 569 posts reviewed, the majority (81.5%) showed **personal projects paired with personal documentation**. The posts included projects related to 3D printing, game design, and digital image manipulation. When we observed maker activities that were framed as personal projects and captured in personal portfolios, we noticed that youth nevertheless actively crafted together, pointing at or commenting on each other’s projects and techniques, while educators facilitated feedback and peer-review activities. The entries acted as learning tools, because youth could revisit them and see their personal progress in technical skills. In addition, the entries served community because the youths’ technical explanations could act as guides for similar projects. And finally, outside the makerspace portfolio entries on finished products could elevate college or job applications.

By contrast, **shared projects paired with personal documentation** did demonstrate social practices. Of all posts, 12.6% were of this type. They included personal reflections on small-group collaborations, such as descriptions of prototyping new makerspace furniture within small groups. The portfolios with entries that referenced social interactions during making also contained entries on finished projects and techniques. When youth augmented the documentation of final projects with evidence of social interactions during making, the portfolio showed teamwork development over time, suggesting how an applicant might fit into a new community by showing the youth’s role in their community to an outside audience.

The out-of-school makerspace curated all individual youths’ portfolios on one website and highlighted the latest entries by each youth on one page (Figure 1). This was an example of **personal projects that were documented in shared spaces**. Youth described this particular page as a tool for learning and community building. Seeing the accumulated work served as a springboard for new projects. As a barometer of community projects, shared documentation of personal projects could provide visitors with insights into the community and the types of projects that individuals have access to as result of their makerspace membership.

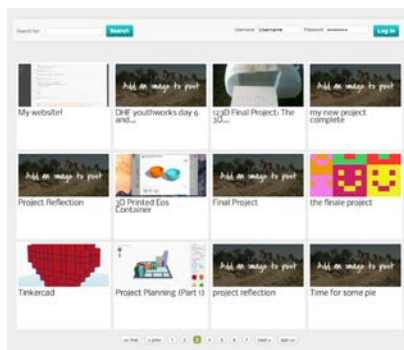


Figure 1. Personal projects that were documented in shared in the out-of-school makerspace.

Shared projects that were documented in shared spaces (e.g., across online platforms) further augmented portfolios. One example of this was Ted’s high school maker portfolio. Involved with media production courses, Ted captured his motion pictures on YouTube, including music videos, digital animations, and effects (Figure 2, left). His channel had over 7,000 subscribers. At first glance a personal space for documentation, Ted linked his channel to collaborators and actively called for reviews, which encouraged the building of a community around his work and attracted requests for tutorials on his special effects. In addition, his portfolio included a Soundcloud account, co-owned with a friend, which offered audio remixes they created together. It had more than 19,000 followers (Figure 2, right).

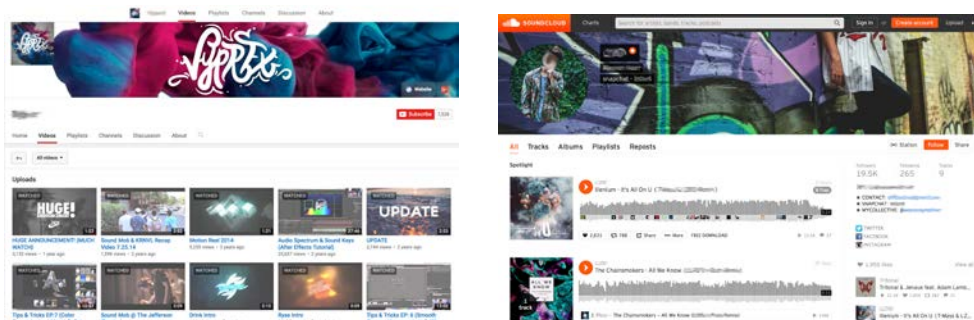


Figure 2. Screenshot of Ted’s YouTube channel (left) and Ted’s shared Soundcloud account (right).

Ted’s distributed body of work supported him in building a strong online presence and a community outside school that was willing to assess his work. While people inside the community and school setting might not require descriptions to understand his work, people outside the community would need such background information. When applying to college, Ted curated his work on a website that had expired when we spoke to him: “For now I’ve already gotten into college. (...) My portfolio is almost word-of-mouth at this point so people can show other people the things that I’ve done.” Ted was not concerned about the “sketchbook” character of his portfolio, which lacked a unified narrative. The distributed pieces that included shared projects and were documented in shared spaces allowed him to establish himself as an accomplished maker who engaged people across communities, and to spin-off narratives when needed.

While all portfolios allowed youth to present products and processes to an audience, different types of portfolio entries painted different pictures of engagement. Individual making paired with individual documentation privileged the presentation of final projects and technical processes, which could potentially promote a youth’s job or college application. Shared projects captured in personal entries augmented final projects and techniques with displays of social engagements, which could help employers or college boards imagine how prospective candidates might fit into a workplace or college culture. Personal projects documented in shared portfolios further expanded portfolios to give insight into the community for external reviews. Even further augmentation occurred in portfolios that included shared projects and shared documentation, which facilitated the engagement with communities outside the makerspace and challenged portfolios as unified narratives. Although a majority of the posts and portfolios included personal rather than group projects, we found that portfolios that included diverse types of entries led to a strong online presence and community participation. Compared to portfolios that focused on personal work alone, portfolios that included shared projects and documentation presented richer showcases, showing technical and social engagement, assessment by people across a distributed community, and possibilities to narrate work to multiple audiences.

Discussion and implications

Few projects and documentations reviewed in this study captured collaboration, yet group projects and shared documentation had a strong visible impact on the community outside the makerspace. Our findings have implications for the design of portfolio processes and assessments. They point to the importance of facilitating collaboration in creating projects *and* documentations and encouraging adaptive sketchbook portfolios over unified narratives. However, the fact that portfolios did not show collaboration does not mean youth did not collaborate. Through shared projects and shared documentation, the youths' roles inside and outside of the makerspace can be encouraged and made visible, broadening portfolio assessment beyond capturing knowledge and skills. This pushes our understanding of the role of portfolios as tools for assessment toward evidence of the role youth play in society. Furthermore, adaptive portfolios could be curated more readily into different emergent narratives, which could broaden opportunities for youth to frame their experiences to unanticipated audiences after capturing portfolio entries. Overall, the findings point to the importance of considering collaboration in making and documenting when designing portfolio assessments that are intended to serve as learning and community building tools inside and outside the makerspace. Future work should focus on identifying specific facilitation strategies for collaboration in making and documenting as well as investigating the implications of the online availability of shared and potentially conflicting accounts of youth creative experiences, for example through the study of youth creative processes within online portals (e.g., the Scratch community).

References

- Gardner, H. (1989). Zero-based arts education: An introduction to ARTS PROPEL. *Studies in Art Education*, 71-83.
- Erickson, F. (2004). Demystifying data construction and analysis. *Anthropology & Education Quarterly*, 35(4), 486-493.
- Hakkarainen, K., Paavola, S., Kangas, K., & Seitamaa-Hakkarainen, P. (2013). Sociocultural Perspectives on Collaborative Learning: Towards Collaborative Knowledge Creation. In C. E. Hmelo-Silver, C. A. Chinn, C. K. K. Chan & A. O'Donnell (Eds.), *The International Handbook of Collaborative Learning* (57-73). New York: Routledge.
- Lamme, L. L., & Hysmith, C. (1991). One school's adventure into portfolio assessment. *Language Arts*, 68(8), 629-640.
- Love, D., McKean, G., & Gathercoal, P. (2004). Portfolios to webfolios and beyond: Levels of maturation. *Educause Quarterly*, 27(2), 24-38.
- Merriam, Sharan; & Tisdell, Elizabeth (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.
- Mills, R. P. (1996). Statewide Portfolio Assessment: the Vermont Experience. In *Performance-Based Student Assessment: challenges and possibilities* (pp. 192–214). Chicago, IL: University of Chicago Press.
- Niguidula, D. (1993). The Digital Portfolio: A Richer Picture of Student Performance. *Studies on Exhibitions*, 13, 1-12. Retrieved from <http://files.eric.ed.gov/fulltext/ED400261.pdf>
- Peppler, K. (2013). *New Opportunities for Interest-Driven Arts Learning in a Digital Age*. Wallace Foundation.
- Peppler, K., Maltese, A., Keune, A., Chang, S., & Regalla, L. (2014) Survey of makerspaces, part II. *Open Portfolios*. Maker Education Initiative.
- Rieman, John; Franzke, Marita; & Redmiles, David (1995, May). Usability evaluation with the cognitive walkthrough. Paper presented at the conference *Companion on Human Factors in Computing Systems*, 7-11 May 1995, at Denver, Colorado, USA.
- Seitamaa-Hakkarainen, P. (2009). Craft Design Processes in Virtual Design Studio. *Techné Series-Research in Sloyd Education and Craft Science A*, 14(1), 214-226.
- Sheridan, K., Halverson, E. R., Litts, B., Brahms, L., Jacobs-Priebe, L., & Owens, T. (2014). Learning in the making: A comparative case study of three makerspaces. *Harvard Educational Review*, 84(4), 505-531. doi: <http://dx.doi.org/10.1177/0013164414263723>
- Tseng, T. (2015). Making make-throughs: Supporting young makers sharing design process. *Proc. of Fablearn*.

Acknowledgments

The research was made possible^{SEP} by generous support from the Gordon and Betty Moore Foundation and our continuous collaboration with Maker Ed and Stephanie Chang. We also thank the members of our national advisory board and the Creativity Labs at Indiana University for constructive comments and valuable insights, as well as the adult and youth members of the makerspaces whose willingness to share made this work possible.