



# EXECUTIVE SUMMARY: OVERVIEW AND FUTURE VISION FOR OPEN PORTFOLIOS

**Kylie Pepler**, Indiana University  
**Anna Keune**, Indiana University  
**Stephanie Chang**, Maker Ed

In collaboration with National Working  
Group members: **Seth Corrigan** and  
**Larry Gallagher**

MakerEd

Open   
Portfolio  
Project

RESEARCH  
BRIEF

10

Throughout our work on open portfolios, we called for openly networked, decentralized, and distributed systems in which youth can maintain control of their content and curation processes. This has implications for the way in which young makers' portfolios are considered for assessment purposes—that they present youth's interests, their experiences, as well as insights into how well youth might strive within another environment (e.g., a college or professional setting).

Open portfolios are an important form of assessment within maker education because they can showcase examples of the kind of learning that happens in making beyond numerical assessment of knowledge and skills. Instead, collections of images, videos, and sketches can facilitate the exploration of a maker's personal creative process and ways of doing beyond a one-size-fits-all model. Additionally, open portfolios can support youth taking ownership of their work and contributing to maker communities inside and outside of their own learning environments.

This Research Brief series focuses on open portfolios as a form of assessment of youth-driven making and provides a broad survey of existing assessment practices in makerspaces that builds on and advances traditional portfolio assessment. We highlight aspects that educators in a range of maker settings consider when working to integrate youth practices:

- In **Research Brief 11**, we outline the key tensions as we move portfolio assessments into makerspaces in and out of school, including aspects to consider when designing assessments that foster rather than counter the interest-driven, serendipitous, and community-centered learning of making.
- In **Research Brief 12**, we offer a close look at three prominent maker-centered learning environments to document, describe, and analyze their approaches to portfolio assessment. This sets a context to understand the practices and larger learning ecologies at work in a sample of today's maker programs.
- Our engagement with field sites consistently examined the various tensions among motivations of educators and youth for creating portfolios. In **Research Brief 13**, we closely examine some of the main motivations for youth in their portfolio creation, because often this perspective is overlooked in the broader literature on assessment and portfolios, privileging instead institutional motivations for portfolio assessment.
- In **Research Brief 14**, we take a deeper dive into the portfolio assessment practices at work in two specific maker environments servicing both elementary and high school age groups. In this work, we wrestle with what it means in these spaces to use assessment to deepen the learning process. In addition, we offer an appendix that showcases a broader range of assessment instruments not highlighted in the brief. Our hope is that future research can leverage this existing work to inform the design of new assessments.

- **Research Briefs 15 and 16** focus on in-person and online professional development opportunities for educators, as well as design workshops that support our understanding of the capturing and sharing of youth creative practices. These briefs serve as inspiration for workshops that educators may wish to adopt in their own settings.
- Our series closes with a report of our 2017 Maker Site Survey (**Research Brief 17**) that captured demographic data, program information, and assessment statistics of youth-serving makerspaces, underscoring the wide-scale support of assessment in makerspaces, the critical need to design new approaches to assessment, as well as a call to renew our core commitments to serving underserved communities through the broader maker movement.

In sum, the second phase of the Open Portfolio Project provided a platform for inquiry into the tensions around integrating traditional portfolios into maker educational settings, how these tensions are negotiated in practice, how youth are motivated to capture their work, and how opportunities for supporting these motivations can be formalized into assessments.

---

## Status of the Field

Of course, use of portfolios in the assessment process has been a longstanding part of education in the U.S. Their use in writing and art classrooms, for example, are standard (e.g., Gardner, 1989; Wolf, 1989; Yancey, 2009). However, as practitioners come to employ portfolio assessment in the context of maker activities, there are few guidelines to steer their efforts. It would seem the nature of the work itself—the various work products that result as well as the norms and values associated with makerspaces to date—are novel enough to require some amount of re-thinking of assessment approaches. From the project’s efforts, described in Research Brief 14, we know that practitioners are assessing youth work products in school and out-of-school environments, but that assessment is largely taking place amidst an absence of strong traditions and examples. In spite of that void, practitioners are moving ahead, developing their own tasks and rubrics, and modifying those that already exist.



This is as it should be. The knock-on benefits of having practitioners review student work are well recognized (Shulman, 1986); Wolf, 1989) both for student and teacher learning. And the potential for variety in what gets assessed allows practitioners to shape their assessment practices to best reflect local values and norms. On the other hand, there's significant room to improve practitioners' current assessment efforts and assessment practices within makerspaces more broadly. There's some urgency in the latter.

As the maker movement looks to continue to grow, there will be increasing pressures to provide evidence that makerspaces are effective contexts for learning. Who benefits from maker activities? To what extent? And in what ways? Investigating these questions and others will require improved assessment practices within makerspaces.

After review of the sample set of assessment tasks and rubrics collected by this Moore Foundation-funded effort, we have identified areas for additional research and development that would strengthen assessment in the context of makerspaces. First, when well designed, rubrics can convey to practitioners and learners alike the developmental nature of learning associated with maker education. This is a key function played by rubrics. They create the possibility for practitioners and learners to understand how their knowledge and skills have changed over time and how they can expect to change in the future. In the best cases, the developmental pathway conveyed by rubrics is based on empirical data. Currently, efforts to create such a portrait in the context of makerspaces is primarily theoretical, and when they're supported by observations, they're often limited to the authoring practitioners' own experiences. This impacts the reliability, validity, and bias of judgements made with the resulting rubrics.

Second, rubrics can be understood as assessment artifacts that reflect the norms and standards of a practice or community. When well designed and well used, rubrics convey these intangibles to both learners and practitioners. For learners, they become tools for shaping not only their knowledge and skill sets, but also the norms and values associated with designing and making, helping them transition along the path to expertise.

For practitioners, rubrics should also become a means for improving their pedagogical content knowledge and helping to align their own maker-related norms with those of the a broader community (Shulman, 1986; Park and Oliver, 2007). There remains an open set of questions regarding how to best design, use, and share rubrics so practitioners and learners can most effectively convey those norms to others.

## Next Steps for Practitioners, Researchers, Policymakers, and Designers

We expect it won't be long before policymakers and funders become more adamant about asking makerspaces to show evidence of their impact on learners' knowledge and skills. In that case, assessment practices will be under increasing pressures to reveal changes in student knowledge and abilities. This will be a significant and important effort—to develop a set of maker projects and associated rubrics capable of supporting such evaluations—and will require action from practitioners, researchers, policymakers, and the designers of future open portfolio tools.

### PRACTITIONERS

The role of practitioners in all of this work will be critical. To them, we provide the following advice:

1. *View the assessment process as continuous, or interwoven, with their instruction.* The rubrics and entailed expectations should be communicated as a part of the core, explicit instruction.
2. *Understand that the portfolio process can be used to advance their own learning as it advances their students' learning and skills.* Review of student work, particularly in concert with other practitioners, can be a fast track to improved instruction.
3. *Recognize that the interactions with learners over their work products and the associated rubrics are critical arenas* for conveying not only the technical aspects of design and making, but also the practices and norms that are held by members of the maker community, i.e., epistemic frames (Shaffer, 2006). It's expected that awareness of such practices and norms will contribute to improved student learning and success in making.
4. *Consider possibilities for portfolios to support permanence of creative projects.* This could include long-term display or storage, temporary permanence (where projects in progress remain in the open as invitations for youth to return to their projects over the course of several days), or opportunities for youth to take their work home to continue to refine and build on their projects. This contrasts to the idea of disassembling projects and returning materials to shelves and storage bins for organizational and cost-saving purposes. Where space availability can limit the amount and duration of such project (-in-progress) exhibitions, portfolios can become spaces for honoring and valuing students' creative productions, to encourage building upon prior work, and to make space for students to take ownership. This could have implications for learning because it could support learners to be emotionally and physically present within the makerspace, inflict change in the makerspace setup, inspire future projects, and strengthen intergenerational relationships.

## RESEARCHERS AND POLICYMAKERS

This project has opened up areas for further inquiry that need to be considered if researchers and policymakers are to take the commitment toward portfolios as an alternative and comprehensive assessment approach for maker education seriously. As a next step, researchers and policymakers can:

1. Assess the influence of bias within open portfolios. Assessors need to consider what contextual information is relevant to consider for the application and it puts portfolio assessment into a place where the reviewers open themselves up to liability concerns. This is particularly important for portfolio assessment, as it can help detect assessment bias, for example, by investigating what kind of equipment and learning narratives are included within high-rated portfolios and how they differ from low-rated portfolios across a range of institutions that accept portfolios in relation to tone and pitch of voice, setting, and editing.
2. Investigate links between maker education and humanities. Open portfolios are inherently interdisciplinary, yet our data shows that most maker-centered efforts are positioning their programs with links to sciences, technology, engineering, and mathematics (STEM). Though more of humanities (e.g., literature and history) is integrated and woven into maker programming today, it continues to be important to show how maker education might support their disciplinary practices. Through the centrality of talk about projects, portfolios highlight the importance of rhetoric and the art of persuasion as a means to reach out to these disciplines. As all assessment is part of a larger narrative of why learning happens and how, this approach of “making an argument” increases the way we can frame portfolios as contrasting to standardized assessment, taking away from the idea of “data speaks for itself.”
3. Support student ownership and control of data over a lifetime beyond the life cycle of a private corporation through data access across services and data storage as a right of every child. Inclusive of this is the importance of privacy and control of information in terms of transparency of who owns and contributes to an account and how this may be recognized. This is important for the possibilities of portfolios as a way to showcase experiences as well as to learn about data management and digital citizenship. As maker-centered learning environments serve the youngest of children, there’s a need to consider how portfolio data collected across learning environments can be supported on a large scale.

## DESIGNERS OF NEW PORTFOLIO SYSTEMS

Hardware documentation stations and software tools for curating and sharing personally meaningful projects are the basis for creating compelling open portfolios and require particular affordances to do this well. Yet, the tools currently being used haven't been designed for passion-driven learning where digital and tangible making frequently intersect, complicating the documentation and sharing of project work. Designing tools for capturing and sharing maker efforts is one of the salient challenges of the future for portfolio assessment. Four overarching themes will be particularly important to consider:

1. *Carefully consider the affordances and constraints of design features to guide narrative*, including the length of videos, word count, amount of projects included, as well as the possibility for editing videos (e.g., adjusting speed, annotating, etc.) without the need for third-party video-editing software. To continue to work toward differentiating portfolio assessment from standardized assessment, tool affordances and constraints need to balance between showing the richness of making and the amount of projects included in a portfolio.
2. *Scaffold the importance of self-reflections*, including finding ways for makers to share “failed” projects—thus embracing the role of iteration and failure as important to the learning process—as complementary to their showcased work.
3. *Carefully scaffold process* in a way that supports makers to identify their own personal, perhaps unique, approaches to creative practice while at the same time supporting the recognition of basic design processes within their work. This would require automatized visualizations of design practices that youth performed while making in order to see, share, and refine design cycles and personal strategies.

## ASSESSMENT DESIGNERS

There has been an ongoing debate between advocates for portfolio assessment and champions of standardized tests. Both groups claim they don't trust the results of the other. In domains such as maker-centered learning environments, the case for portfolio assessment or other approaches that incorporate authentic student work products now seems self-evident. Yet as organizations look to serve increasing numbers of youth, as policymakers and funders look to evaluate the impact of makerspaces, and as the field looks to continually improve maker learning, there will be growing value in providing access to one or more uniform, scalable approaches to portfolio assessment.

But the matter is sensitive. In particular, increased standardization of portfolio assessment puts interest-driven learning at risk. Current approaches to principled assessment design (Wilson, 2004; Mislevy et al., 2015) and machine learning stand to provide one possible solution. In particular, it may be possible to design tasks that afford many degrees of freedom for youth to pursue heterogeneous designs while supporting the use of machine learning to automate and standardize assessment of student knowledge and ability.

One such effort has made use of learning analytics and tools of machine vision to automate scoring of youths' e-textiles. The automation effort yielded a set of features and a predictive model able to reproduce human judgements of the quality of youths' e-textiles. Along the way, the approach provided initial evidence for the feasibility of developing assessment tasks that allow for student choice and creativity while also allowing for comparison within and between groups (Corrigan and Bhattacharya, 2018). Importantly, the approach is scalable.

## Conclusions

The aim of the second phase of the Open Portfolio Research Brief Series has been to review and advance the current state of portfolios and assessments across an emerging national and international network of makerspaces. We know that youth are spending an enormous amount of time in interest-driven activities through their maker educational practice, and we argue in this series for the need to capitalize on these interests and connect these maker experiences to future opportunity. At the same time, youth have much to teach us about making and learning that could equally inform future assessment designs.

Building on this foundation, this brief series seeks to inspire new pedagogical practices, the documentation and analysis of existing assessments, new tools to support the documentation of making, and further research in this area. Through coordinated effort between practitioners, research, policymakers, and designers of future portfolio tools and platforms, we can open up new pathways for youth to connect their making to the broader maker community, as well as future schooling and career options.



---

## References

- Baker, R. S., & Inventado, P. S. (2014). Educational data mining and learning analytics. In *Learning analytics* (pp. 61-75). Springer New York.
- Gardner, H. (1989). Zero-based arts education: An introduction to ARTS PROPEL. *Studies in Art Education, 30*(2), 71-83.
- Nash, P., & Shaffer, D. W. (2011). Mentor modeling: The internalization of modeled professional thinking in an epistemic game. *Journal of Computer Assisted Learning, 27*(2), 173-189.
- Park, S., & Oliver, J. S. (2008). Revisiting the conceptualisation of pedagogical content knowledge (PCK): PCK as a conceptual tool to understand teachers as professionals. *Research in science Education, 38*(3), 261-284.
- Riconscente, M. M., Mislevy, R. J., & Corrigan, S. (2015). Evidence-centered design.
- Shaffer, D. W. (2006). Epistemic frames for epistemic games. *Computers & education, 46*(3), 223-234.
- Wilson, M. (2004). *Constructing measures: An item response modeling approach*. Routledge.
- Wolf, D. P. (1989). Portfolio assessment: Sampling student work. *Document Resume, 351*.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational researcher, 15*(2), 4-14.
- Yancey, K. B. (2009). Electronic portfolios a decade into the twenty-first century: What we know, what we need to know. *Peer Review, 11*(1), 28.

---

## Acknowledgements

The work of the Open Portfolio Project is made possible by generous support from the Gordon and Betty Moore Foundation. The continuous conversations with and insightful feedback from our actively involved National Working Group members generated a momentum that propelled our arguments forward in ways that would not have been possible without their critical commentary. In alphabetical order, we thank Leigh Abts, Jon-Paul Ales-Barnicoat, Daragh Byrne, Christina Cantrill, Barry Fishman, Larry Gallagher, Shelley Goldman, Jay Melican, Vera Michalchik, Chris Peterson, and Jessica Ross.