# NATIONAL LEADERSHIP GRANTS FOR LIBRARIES

Sample Application LG-260154-OLS-26
Project Category: Applied Research

## Indiana University

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| Amount awarded by IMLS: | $487,960 |
| Amount of cost share: | $0 |

Indiana University will conduct a design-based implementation research study to understand school librarians' experiences with, and needs related to the assessment of making practices and engage in an iterative co-design process of tools to meet these needs. Project activities include meetings with librarians to learn about their needs; co-design and testing of possible supports; and dissemination of findings and resources. The project will result in tools and approaches appropriate for use in public school libraries and resources and supports that librarians can use to adapt or develop their own tools. Project beneficiaries include public school librarians, media specialists, educators, and researchers. The project will work collaboratively with school librarians to develop and disseminate assessment tools, approaches, and resources to support school librarians in measuring the process and outcomes of maker programming that are specifically designed to be used in and meet the unique needs in public school library spaces and contexts.

Attached are the following components excerpted from the original application.

- Narrative
- Schedule of completion

When preparing an application for the next deadline, be sure to follow the instructions in the most recent Notice of Funding Opportunity for the grant program to which you are applying.

**An Investigation of Making and Assessment in Public School Libraries**

## INTRODUCTION

The Center for Research on Learning and Technology at Indiana University submits this proposal to the ***National Leadership Grants for Libraries*** program for a $487,960 applied research grant for a two-phase project to understand and address the specific needs of public school librarians and media specialists (hereafter "school librarians") in order to support the development of their competency in aspects of maker education, including planning, integrating, and assessing making in their spaces. We intentionally aligned this project with Objective 1.1 as we strive to support serving the learning needs of libraries, focusing specifically on the hands-on learning activities that occur during making activities and programming. Due to the increasing use of AI tools in learning, maker programs are beginning to explore and incorporate these AI as not only a support in the making process but as an alternative means of assessing learning (Craddock & Moorefield-Lang, 2026). Consequently, the project will support digital and information literacies associated with the use of AI tools. We will work collaboratively with school librarians to develop and disseminate assessment tools, approaches, and resources to support school librarians in measuring the process and outcomes of maker programming that are specifically designed to be used in and meet the unique needs in public school library spaces and contexts. We believe that it is important to engage directly and collaboratively with the end-users of the assessments, namely school librarians, so that these assessment tools and resources are useful for and usable by librarians. We intentionally partner with public school libraries who engage in making programming as there is a lack of assessment tools developed to meet the unique needs of these spaces, with the tools that do exist having been created for use in different – albeit adjacent – contexts, such as public libraries, museums, and classrooms. Using a co-design process that engages practitioners (i.e., school librarians) and researchers, the project will comprise two phases: Planning & Exploration (Phase 1) and Co-development of Assessment Tools and Resources (Phase 2). Each phase will inform the subsequent phase as we seek to better understand and meet the needs of school librarians. The research questions we seek to address in this project are:

1) What are the needs of school librarians related to planning, integrating, and assessing making in their spaces? How do emerging AI tools influence the process and assessment of making in school library maker contexts?
2) What can we learn from using a co-design approach that could inform (a) best practices for using such an approach to develop tools and resources in similar contexts and (b) the effectiveness of using such an approach for research?
3) What are school librarians' perceptions of the usefulness and usability of these solutions?

We expect three primary results from this project. First, the project will result in a set of assessment tools, supports/guidance, and approaches that center the unique needs and experiences of public school librarians to measure the process and outcomes of maker programming. Second, the project will generate information and resources designed to build the capacity of librarians to implement and sustain their making programs and to modify and utilize the developed tools and resources across differing contexts. Finally, the project findings will build on and add to the existing literature on assessment tools (including the process of co-design and AI to support learning and assessment) for use with maker programming in school library spaces.

## PROJECT JUSTIFICATION

***Uniqueness of Public School Library Makerspaces.*** Public school libraries serve as more than just book distribution centers that foster the development of reading skills of students (Shaji, 2023). The growing number of makerspaces in public school libraries supports academic, social and emotional needs of learners (Murphy, 2023) and can support student learning by making connections to curriculum and by encouraging creativity (Woods & Hsu, 2019). Because public school libraries serve a wide range of learners K-12 (5-18 years of age), school libraries have wide, far-reaching access to almost all K-12 learners who access school libraries at

some point in their educational career. As such, makerspaces located in these spaces provide access to a broader group of youth than any other maker context or programming that currently exists.

Despite sharing some similarities, school library makerspaces often differ in substantive ways (e.g., goals, activities, participants) from those located in other contexts (e.g., museums, mobile spaces, public libraries; Wang et al, 2016). Therefore, it is imperative that we focus on them and create assessment tools that meet their particular and unique needs. Makerspaces and programs that occur in public school libraries exist at the intersection of formal and informal settings (see Figure 1), sharing features of both that make them unique.

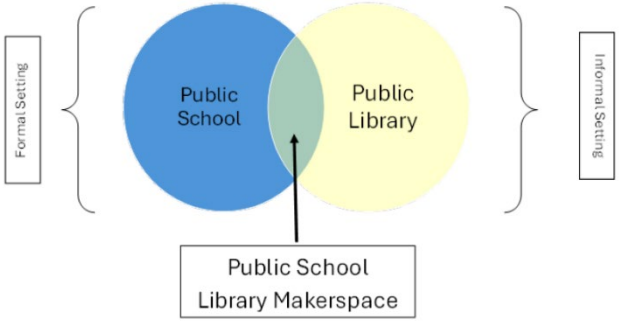


Figure 1. The Unique Setting of Public School Library Makerspaces

Public school libraries operate within formal school settings; as such, they operate under different constraints than makerspaces that exist outside of schools. Makerspaces located in public school libraries must function within the bounds of the vision, mission, and curricular goals of the school and district and provide services and resources that fit within the approved curriculum and learning standards of the school (Dawkins & Eidson, 2021). Further, they must work within the constraints imposed on them by state and local policy, funding, and requirements. ?? libraries face challenges that makerspaces in other contexts do not, including heavily reduced funding, staffing shortages or elimination of librarian positions entirely, overworked staff, book bans, etc. (Maughan, 2022) all while still being expected to provide safe, welcoming spaces where all students can learn, explore, engage, and collaborate with one another (AASL, n.d.). ?Similar to? makerspaces in more informal contexts, public school library makerspaces provide a wide variety of topics and equipment that range from low-tech recyclables and crafting supplies to high-tech 3D printers, circuit boards, and computers. These spaces share a common feature of most maker-centered instruction, namely following the lead of the learners. Often, formal settings require learners to follow a directed curriculum. However, informal settings often have more flexibility to provide learners with opportunities to explore their interests and engage in hands-on projects centered on student-driven inquiry (Chang & Ratliff, 2016; EveryLibrary, 2021; Woods & Hsu, 2019). As such, learners within the same makerspace may be exploring different activities and goals (Halverson & Peppler, 2018). These spaces focus on "the *how*: the process, the socio-emotional skills, and the application of problem solving, collaborating, and persisting" (?italics? included, Chang & Ratliff, 2016).

As the use of generative AI tools continues to grow, schools must consider whether and how to incorporate these tools while ensuring that student data are protected, that the tools are approved for and appropriate for youth under 18 years of age, and that the tools enhance learning rather than replace it. Serving as both a hub for digital and information literacy and a context for making programming, libraries are uniquely positioned to guide responsible AI use in the design process, making AI literacy a natural extension of existing library instruction into the making curricula and assessment. Within making activities specifically, students can utilize AI tools as supports in all phases of the design/making process (e.g., as a feedback mechanism during cycles of iteration).

***Assessment of Making.*** Regardless of setting, assessments provide useful evidence to librarians about how makerspaces meet the mission and goals of libraries (Wardrip et al, 2019) as well as the value of and learning that takes place in library makerspaces (Cun, Abramovich & Smith, 2019). However, the more informal nature and structure of the activities in many makerspaces poses challenges when it comes to assessing the

learning that occurs within them. Formal school settings tend to use more traditional standardized assessment tools which often do not meet the needs of makerspaces due to their typical focus on specific content areas (Murai et al, 2019). Additionally, practices, processes, ways of thinking, and 21st Century Skills that tend to be valued in makerspaces often go unassessed by these types of tests (Chang & Ratliff, 2016). As maker programs increasingly incorporate AI-supported tools, librarians lack practical assessment tools to evaluate students' use of these tools, critical evaluation of AI outputs, and documentation of human–AI collaboration during making activities (i.e., their literacies with using these tools). However, more than simply an outcome, the use of AI tools in making provides support for and a potential alternative path for the assessment of learning (Craddock & Moorefield-Lang, 2026), both of which warrant further exploration.

Beyond documenting student learning, assessments also provide valuable information that public school librarians can use to demonstrate and justify the existence of their spaces, but who often lack the tools to do so. With approximately 40% of makerspaces located within schools (Peppler et al, 2017), a substantial amount of time and financial investment has been made in these spaces, without a consummate growth in research that specifically examines the effectiveness of these makerspaces in meeting the goals of these programs (Mersand, 2020). Attempts to assess the impacts of making are not new. However, much of this work focuses on making in museums (Bevan et al., 2015; Petrich et al., 2013; Wardrip & Brahms, 2015), public and academic libraries (Cun, Abramovich & Smith, 2019; Wang et al, 2016), school classrooms (Kim, Murai & Chang, 2021; Murai et al, 2019), or other out-of-school time contexts (Bergner et al, 2019; Kumar, Millerjohn & Wardrip, 2019; Maltese, Simpson & Anderson, 2018). Tools appropriate for these contexts are not always *useful for* and *usable by* public school librarians given their unique needs and challenges. We will draw from these tools and approaches, adapting them to meet the needs of public school library makerspaces. Specifically, we can apply characteristics of features of these tools that work well (e.g., tools that can be embedded into the making process and that are flexible and customizable, successful uses of DBIR/co-design approach) and learn from challenges experienced (e.g., difficult to implement, requires a large amount of technical support). Table 1 provides a brief overview of 7 programs that have developed assessments and highlights the advantages and limitations for the use of these tools in public school library makerspaces.

Table 1. Overview of Work to Develop Assessment Tools and Approaches Across Settings

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| **1. COVES** (*Collaboration for Ongoing Visitor Experience Studies project*; IMLS MG-20-14-0060-14) (Grack Nelson et al, 2019; Lussenhop, 2018) | |
| Museums | • Sought to create tools that could be used in standardized ways across sites [+]<br>• Focus on visitor demographics and overall experience rather than learning outcomes [-] |
| **2. Making Observations** (IMLS MG-10-16-0073-16) https://pittsburghkids.org/program/maker-education-research/ | |
| Museums & Public Libraries | • Tools assess engagement in learning during making; tools can be used to improve decisions or practice [+]<br>• Protocols intended for use by researchers or evaluators [-] |
| **3. The Bubbler** (Cun, Abramovich & Smith, 2019; Kumar et al, 2019; Wardrip et al., 2020) | |
| Public Libraries | • Created observation tools to assess learning during making activities [+]<br>• Challenging to use in the moment; tool aimed at patrons that come and go in space [-] |
| **4. IMPACT** (*IMProving Assessment of Computational Thinking in Libraries;* IMLS LG-14-19-0079-19) (Koren, Weintrop & Subramaniam, 2022) | |
| Public Libraries | • Successfully used DBIR approach to develop tools [+]<br>• Specific focus on Computational Thinking content [-] |
| **5. Observation Deck** (https://odeck.org/; https://odeck.org/about/the-research.php) | |

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| Public Libraries | • Flexible and customizable to your setting; rigorous development process [+]<br>• Requires robust IT team to embed it [-] |
| **6. Beyond Rubrics Toolkit** (Kim, Murai & Chang, 2021; Murai et al, 2019) | |
| K-12 Classrooms | • Tools focus on the process of making and are embedded in the making process [+]<br>• Focuses more on classroom teaching [-] |
| **7. MakEval** (Maltese et al, 2019) | |
| Youth Maker Programs | • Created a suite of tools to assess 5 areas (e.g., creativity, agency, STEM practices) [+]<br>• Geared towards assessing program level impact; not all tools are fully developed [-] |

"+" = Advantage. "-" = Limitation.

***The Proposed Project.*** While the above discussion highlighted work on assessment in makerspaces located outside of school settings, this is not to say that assessment does not occur within school library makerspaces. A 2017 survey indicated that the majority of school makerspaces (90%) used assessments, including self-assessments, rubrics, and portfolios (Peppler et al, 2017), which likely reflects the integration of making activities into the curriculum and the need to demonstrate student learning (Peppler et al, 2017). As noted previously, traditional summative assessments often do not reflect the open-ended, collaborative, and interdisciplinary nature of making programming and rarely reflect the process or learning journey that takes place during making. Further, current assessments are not designed to account for the role or impact of the use of AI tools in making activities. While some recent work on assessment in public school makerspaces acknowledges the uniqueness of and the challenges posed to assessment in these settings (Yorio, 2018), there still exists a need for assessment tools that meet the needs of school librarians which includes building their capacity in such aspects of maker education as planning, integrating, and assessing making activities in their spaces, including how emerging AI tools influence the process and assessment of making in school library maker contexts. This project seeks to meet this need by working with public school librarians to understand their needs, work to co-design assessment tools and resources that are both useful for and useful in their spaces, and to build the capacity of librarians in integrating assessment into their makerspaces to measure and evaluate competencies, skills, and content knowledge developed while engaging in the *process* of making (rather than end product).

***Project Beneficiaries.*** The direct beneficiaries of the project are school librarians who will gain assessment tools and resources they can use to demonstrate how making impacts not only their student learners but the school library overall. The indirect (although important!) beneficiaries of the project are the students who engage in maker activities in these spaces. Specifically, librarians can use these tools to assess students' individual and collective learning and progress which will provide librarians with data that can help improve programming to better meet the myriad needs of learners. While not a specific target of this work, another indirect beneficiary will be the wider group of maker educators, researchers, and evaluators who could utilize these assessments by adapting them to their respective contexts. Finally, researchers and evaluators seeking to utilize a co-design approach in their work may benefit from the best practices that are identified in this project.

**PROJECT WORK PLAN**

A key strength of the proposed project is the commitment to identifying and meeting the needs of middle school librarians across the country. We recognize that these experiences and needs vary across contexts, and we attend to these as we describe the practitioners and researchers who will collaborate throughout the project (the "who"), the activities we will engage in across the two phases of the project (the "how"), and the primary outcomes of the project (the "what"). This study is both community-driven and community-serving such that we seek to understand and meet the needs of school librarians and the students they serve. Throughout the project activities, we will forefront the voices and perspectives of school librarians, valuing and learning from their wide and varied experiences and expertise which will guide the development of a variety of assessment

tools and resources. As a result, these tools and resources will be rooted in both related theory and data collection approaches but, more importantly, will be driven directly by the needs of school librarians as they work toward continual improvement of their educational and assessment practices.

***Project Collaborators ("Who")***

We will bring together a group of school librarian practitioners and researchers with a wide range of expertise in school libraries, making and makerspaces, and assessment. Collaborators will consist of three primary groups: 1) the Librarian Partners, comprised of school librarians and media specialists who engage in maker programming at their respective public schools; 2) the Project Team comprised of two researchers and two library practitioners; and 3) an Advisory Panel, comprised of 4 members with varied library and making expertise who will serve as collaborators and evaluators of the project. We intentionally include school librarians in all three groups because they implement the maker programs in their spaces and best know the needs and challenges faced related to assessing making in their libraries and programs. As such, their voices and experiences are vital throughout the project. We will do our best to engage with school librarians that represent the variety of public schools (e.g., geographical location, rural-urban classification, socioeconomic and demographic characteristics, etc.) but also the different ways that makerspaces are implemented and utilized in public school library spaces (e.g., purpose of the makerspace, type of scheduling, etc.). We will work to ensure the inclusion of under-resourced school libraries to ensure their voices are represented.

***Librarian Partners***. We will recruit 15-20 public school librarians who work with middle school students (e.g., $5^{th}$-$8^{th}$ grade). We will begin by reaching out to librarians who previously participated in a recently complete landscape survey (described below in Project Activities) and who expressed interest in engaging with us in follow-up conversations about assessment in making. Additionally, we will work directly with state-level librarian coordinators and request their help in sharing information about the project with librarians in their state. Finally, we will utilize our Advisory Panel and the networks of our project teams to put out an open call through school librarian media channels to widen our scope and reach out to our professional networks (e.g., school library-focused Facebook groups, state branches of the ALA, department of instruction liaisons, statewide professional organizations, county and regional school library administrators, and state boards, such as the Boards of Cooperative Educational Services [BOCES] in New York). We recognize that participation in such a project asks a lot of school librarians who already are overworked. In acknowledgement of the time commitment, we will offer school librarians a stipend of up to $1,000 based on their level of participation in the project. We will invite our partners to provide feedback and participate in decision-making throughout the project, foregrounding their voices as we work towards a collective understanding of the current needs and challenges they face related to their maker programming and the assessment of maker experiences.

***Project Team.*** The project team will consist of both researchers and library practitioners who began collaborating on various maker-related projects over eight years ago. The **researchers** (from Indiana University) have experience in assessment, especially related to STEM interest and making/makerspaces. **PI Paul** has 10+ years of experience as an evaluator where she worked with a variety of stakeholders to plan and conduct evaluations of programs that focused primarily on STEM education. As a researcher, her work focuses on the development of STEM interests and career aspirations in children and adolescents, including the development of surveys and assessment tools around these constructs, as well as making and hands-on learning in informal spaces. **Co-PI Maltese** has conducted numerous research projects related to maker education, and STEM education more broadly. He runs a makerspace located in the Indiana University School of Education. An extensive part of this work has included developing or modifying research instruments to measure the outcomes of these learning activities. Additionally, Maltese has led numerous professional development offerings ranging from a few hours to a few weeks for more than 1000 educators in the U.S. and abroad. Most recently, Paul and Maltese completed a National Science Foundation project that investigated how museum educators assess making in their spaces. They will draw from what they learned in terms of both methods and

assessment challenges. The **practitioners** are school library maker specialists who have expertise as public school librarians, are published authors, stellar maker educators, and are leaders in school library making/makerspaces. **Mae Craddock** has 27 years of experience as a school librarian in Albemarle County Schools (VA) and is currently the librarian at the Community Lab Schools in Charlottesville. She has conducted seminars at the White House, the Bay Area MakerFaire, and South Carolina Association of School Libraries. Ms. Craddock was Virginia's 2019 Librarian of the Year, was named a Darden Fellow at Old Dominion University in 2019, and her work has been profiled by School Library Journal, Library Media Connection, NPR, and Edutopia. She won the Magna Award from the National Association of School Boards and has published in Library High-Tech, School Library Journal, and Knowledge Quest. The focus of her research is Maker Education and the role of school libraries in the community. **Kristina McGlaun** has taught middle school for over 25 years as the library media specialist. She currently teaches computer science as well as being the library media specialist at Jackson Creek Middle School in Bloomington, Indiana. She has hosted a makerspace club for the last ten years. She has attended several workshops focused on makerspaces and participated in the design of the school's STEAM lab. In 2007, she was awarded "Educator of the Year" in Monroe County, Indiana. In 2020, she was a STEM Fellow for the Regional Opportunities Initiative in Indiana.

***Advisory Panel.*** We will work with an advisory panel who will engage with us in discussions and planning, provide advice on our project decisions, and evaluate our progress. We will leverage their expertise across all phases of the project to ensure that our work foregrounds and accurately represents the voices, needs, and experiences of school librarians. Each of our advisors has experience as librarians, and each one brings additional expertise in making, assessment, and AI literacy. All advisors have agreed to participate and have acknowledged the need for assessments that meet the needs of school librarians. **Rachel Grover** is the librarian at Rocky Run Middle School (VA) and is an adjunct faculty at Old Dominion University. She is National Board Certified in Library Media and has presented at library-related conferences from the district level to the national level. Her work has appeared in several publications including *Knowledge Quest* and *School Library Connection*. **Kristina A. Holzweiss** is a high school librarian on Long Island (NY), adjunct professor, author, presenter, and advocate. She was the 2023 New York Library Association School Librarian of the Year, the 2015 School Library Journal School Librarian of the Year, and a 2018 Library Journal Mover & Shaker. She and her library team earned the 2024 American Association School Library of the Year and the Sustainable Libraries Initiative Designation. **Nicholas Provenzano** is the Community Manager at SchoolAI. Known as "The Nerdy Teacher", his work has been highlighted on CNN and in EdWeek. He was recognized as the 2013 Teacher of the Year by ISTE and has authored multiple books on Maker Education in schools. **Jennifer Moore** is an Associate Professor at the University of South Carolina, with 14 years of experience as a school librarian certification educator and curriculum developer in higher education and 4 years of experience as a school librarian. She has an extensive research record, primarily studying evidence-based practice in school libraries and curriculum development for computational thinking, evidence-based practice, and AI literacy.

**Project Activities (the "How")**

Similar to existing work in formal and informal spaces (e.g., Koren et al, 2023; Subramaniam et al, 2021), we will utilize a design-based implementation research (DBIR) approach to plan, co-design, and pilot making assessment tools and resources for school librarians. DBIR involves an iterative approach between researchers and practitioners with the goal of developing theory and/or tools to solve problems of practice (Fishman et al, 2013; Koren et al, 2023). Guided by four principles, DBIR focuses on persistent problems of practice by engaging multiple stakeholders in iterative, collaborative design processes to develop theory and tools related to learning and implementation while building shared capacity to sustain subsequent practices and changes in systems (Fishman et al, 2013; Penuel et al, 2011). At its core, the co-design process emphasizes equitable participation as school librarians and researchers work together to develop assessment tools that are *useful for* and *usable by* school librarians. The use of a collaborative co-design model not only increases the likelihood that the assessment tools are informed by the needs of school librarians but also serves to build the

capacity of school librarians to identify, create, and utilize tools specific to their own contexts and learners. The project consists of two phases, each of which is described in more detail below. After setting the foundation for the project, the primary project work will be conducted across two phases. Phase 1 (Planning & Exploration) will consist of discussions and planning with our project team and advisory panel members. Phase 2 (Co-development of Assessment Tools and Resources) will consist of discussions and engagement in work circles to understand the primary needs related to assessment of making and the development and testing of assessment tools to meet these needs. The findings from each phase will inform the subsequent phase, with more weight given to the qualitative approaches and data as they provide greater understanding of the needs of school librarians. Dissemination of findings and resources will occur in Phase 2. Prior to any data collection, Institutional Review Board approval will be obtained.

**Laying the Foundation.** Our team recently conducted a national landscape analysis survey of maker programming with K-12 public school librarians to gain a better understanding of their needs and "pain points," including assessment of making practices. To our knowledge, there is no current dataset that documents the status of making and assessment in public school libraries. The development of the survey was informed both by existing surveys of maker programming in other contexts (Bergner et al, 2019; Maltese, Simpson & Anderson, 2018; Peppler, Maltese, et al, 2015) and by feedback provided from members of our Advisory Panel. Survey items asked librarians to indicate how they are involved in making, the support they receive, what experience they have with assessment of making, and what their perceived needs are in this realm. Of the 170 librarians who responded to the survey, 70 librarians from 21 states offered maker programming at the time of the survey. These librarians noted varying perceptions (positive and negative) about assessment and its value in maker programming in libraries. While they mentioned using multiple types of assessments that informed different decisions, they also noted barriers faced when using assessments in school library contexts. These findings provide a baseline understanding of the needs and experiences of librarians related to making and assessment that will be foundational to the proposed project activities, allowing us to start with and forefront the voices of school librarians from the very beginning.

**Phase 1 – Planning & Exploration (Year 1).** Phase 1 will consist of discussions and planning with our project team and advisory panel members and will address our first research question: *What are the needs of school librarians related to planning, integrating, and assessing making in their spaces? How do emerging AI tools influence assessment in school library maker contexts?* Using small-group open conversations, we will seek to understand the lived experiences and perspectives of school librarians as we explore various topics including: common ways school librarians integrate making; how they identify or create assessments and collect data about their maker programming, including the influence of emerging AI tools in the assessment process; how school librarians make sense of the data they collect; and how they act on results. These conversations will be informed by the results of our national survey described above. Towards the end of Phase 1, we will begin recruiting school librarians to participate in Phase 2 of our project. Specifically, we will seek to recruit 15-20 public school librarians who work with middle school students (e.g., $5^{th}$-$8^{th}$ grade) that represent a wide variety of libraries. As part of our sampling approach, we will reach out to survey participants from the landscape survey as an initial starting point to recruit librarians to collaborate with us on the project.

During this phase, we will employ a similar process to our recently completed NSF planning and development grant where we worked with museum educators to identify their needs related to the assessment of making in their spaces. In that project, exploration meetings with both museum educators and advisory panel members led to fruitful discussions and findings which illuminated a wide variety of needs and challenges in these spaces. Key to these discussions was the inclusion of participants who represent a wide variety of museum spaces (e.g., location, size, type of activity, etc.). Drawing from what we learned in that project, we will begin Phase 1 with a virtual introductory meeting that will bring together the project team and advisory panel to meet one another and to learn about the project. While some project team members and advisors have worked together

previously in a variety of capacities, further developing these relationships from the start of the project will be crucial. We will use initial meetings to establish norms of communication and discuss expectations of roles and the overall collaboration process through all phases of the project. Subsequent virtual meetings will be held monthly and will be used to establish our collective understanding of the needs and challenges that school librarians face related to their maker programming with particular focus on the assessment of maker experiences.

**Phase 2 - Co-development of Assessment of Tools and Resources (Years 2 & 3)**. Phase 2 will consist of engaging in work circles to co-design and test assessment tools and resources. This phase will address our second and third research questions: *What can we learn from using a co-design approach that could inform (a) best practices for using such an approach to develop tools and resources in similar contexts and (b) the effectiveness of using such an approach for research?; and What are school librarians' perceptions of the usefulness and usability of these solutions*? We will utilize a co-design model in Phase 2 to ensure that the tools and resources developed and/or adapted will be useful for and usable by school librarians. Using a co-design model brings multiple voices and perspectives to the table and fosters equitable participation among school librarians and researchers as they collaboratively develop assessment tools. Such a process increases the likelihood that the assessment tools will meet the needs of the end user, namely school librarians. A secondary benefit of the co-design process is that it supports and fosters the assessment capacity of the participating Library Partners, building on their expertise of assessment in K-12 settings. Drawing upon our own work and that of others (Koren et al, 2023; Subramaniam et al, 2023), we will identify currently existing assessment tools that will serve as a starting point. The goal of Phase 2 will be to advance the development of a set of tools and resources that can be used to assess and evaluate maker activities in public school libraries that address 3-5 specific constructs/assessment needs and challenges surfaced in Phase 1, recognizing that these needs likely will differ across content area, activity type, grade level, and librarian role.

Similar to Phase 1, we will begin Phase 2 with a virtual introductory meeting that brings together the project team and librarian partners to meet one another and to learn about the project. We will establish norms of communication, develop relationships among participants, and discuss roles and expectations of the collaboration process throughout the co-design phase of the project. Developing relationships from the start of the project will be crucial to help ensure that all voices and perspectives are welcomed as we work together to develop tools and resources that reflect and meet the needs of librarians. At the end of the initial meeting, we will establish work circles, which are a key feature of our co-design process. Work circles bring together researchers and practitioners to engage in a collaborative co-design process that values and learns from the expertise of all members (Wardrip, Gomez & Gomez, 2015). For each work circle, we will work to include members from across a variety of public school library contexts to provide richer, more representative perspectives and experiences related to maker assessment in these spaces. We will host monthly virtual meetings (via Zoom) with each work circle to support the development of assessment tools and resources for maker spaces (e.g., connecting them to extant tools, developing new or adapting existing assessment tools, and/or supporting them in best practices for embedding assessment throughout the making process). We will adjust the frequency of meetings to accommodate the schedules of the librarian partners. As needed, we will communicate asynchronously between meetings (e.g., via email or other platforms such as Slack or Basecamp).

Each work circle will focus on 1-2 of the construct/assessment needs surfaced in Phase 1. Together in the work circles, we will investigate the construct of interest and work to revise existing tools or create new ones to best fit librarians' needs in terms of measurement and practical use. Each work circle will be facilitated by one or more project team members who bring expert knowledge in assessment best practices and existing tools for a given construct and/or extensive experience as a library practitioner. Library partners bring expertise in the current needs of K-12 public school students and library settings. Our intent is that each work circle will follow a similar process and progression, but how that plays out for each group may differ. We anticipate a cycle of iterative discussion → testing → revision that will include: 1) discussion and definition of the construct, 2) identification of indicators in maker programming and discussion of why existing tools may/not work in their

local context, 3) introduction to basic assessment topics (e.g., validity, reliability) and revision of existing tools and/or creation of new ones, and 4) pilot testing of tools in local contexts. This cycle likely will involve multiple iterations before each group feels that the developed tools and resources (e.g., guidance for use) have reached acceptable levels of usefulness and usability. At this point, the tools and resources will be shared with other work circles to review and/or try out. Work circles will engage in this iterative design process for approximately 7-9 months, with cross-circle meetings every two months to share progress and challenges. During these *crossover* meetings, researchers and Library Partners from across the project can connect and talk with librarians in other work circles about their assessment tools, progress, and challenges. Additionally, each set of tools will be used by at least two different work circles, staggered in four cohorts to allow for continuous improvement of the tools and resources themselves but also the overall work-circle process. Because we are asking school librarians to engage in this intellectual co-design process in addition to the responsibilities of their daily job, we want to recognize and appropriately value their time and efforts. Therefore, we will offer a stipend to all school librarians who engage in this co-design process with us, offering librarians up to $1000 based on their level of participation.

**Data Collection and Analysis.** Across both project phases, we will utilize similar data collection and analysis procedures. We will record all virtual discussions, planning sessions, and work circle meetings using a video conferencing platform (e.g., Zoom). We will conduct brief interviews with librarians (either individually or together as part of work circle meetings) to collect feedback on librarians' experiences developing and piloting assessment tools with their students. Finally, we will interview all participants (library partners, advisory panel members, and project team members) about their overall perceptions of satisfaction with and suggestions for improving the co-design process. Thematic analysis (Braun & Clarke, 2006) will be used to inductively code the data. We will also employ natural language processing (NLP) to complement our traditional coding approaches to cluster and synthesize themes (e.g., Paul et al, 2022).

To address RQ1, we will summarize recorded discussions and meetings to determine the primary constructs of interest/assessment needs of school librarians as identified by library practitioners on our project team and advisory panel. To address RQ2, we will document the co-design process by creating summaries and reflections following each work circle meeting. All summaries will be anonymized, especially given the small size of the work circles. We also will interview members of each work circle about their perceptions of and experiences during the co-design process. Data analysis will focus on identifying what worked/did not work, strengths and weaknesses, challenges, suggestions for improvement, and lessons learned when using a co-design approach. To address RQ3, we will summarize librarian feedback related to their perceptions of the usefulness of the assessment tools and resources, challenges faced with using the tools, and suggestions for improvement.

The primary outcome of Phase 1 will be a better understanding of the specific needs and challenges of school librarians and identification of the top 3-5 assessment needs/constructs of interest on which to focus. The primary outcomes of Phase 2 will be assessment tools and resources (e.g., use guidance) as well as the identification of best practices related to using a work circle co-design process for creating assessment tools.

**Evaluation**. We will utilize an Advisory Panel to provide evaluative feedback for this project and add to our understanding and findings related to assessment of making. Based on the goals of our project, we feel strongly that those best suited to evaluate whether or not we are meeting the needs of school librarians as well as the goals of this project are school librarians themselves. Rachel Grover, Nicholas Provenzano, Kristina A. Holzweiss, and Jennifer Moore will serve as advisors – all of whom have extensive expertise in areas related to this project. We will work with our advisors to support iterative improvement and to promote accountability throughout all phases of the project, including asking them to review: (a) exploration of the experiences and needs of librarians (including the findings from the external survey conducted prior to the proposed project), (b) the process and progress of the work circles, (c) assessment tools and findings from piloting the tools in classrooms, and (d) dissemination of findings and tools. At the end of each phase, we will ask the Advisory Panel to review

the work conducted to ensure that we are meeting the goals of each phase prior to moving to the next phase. We will ask the panel to pay special attention to the implementation of and collaboration within the work circles to ensure that all voices are being heard and represented so that tools developed meet the needs of our target group, school librarians.

**PROJECT RESULTS (the "What")**

The project will result in a set of assessment tools, supports/guidance, and approaches that center the unique needs and experiences of public-school librarians to measure the process and outcomes of maker programming, including how AI tools are integrated into and influence the making process and assessment of learning in these spaces. Additionally, the project will generate information and resources designed to build the capacity of librarians to implement and sustain their making programs and to modify and utilize the developed tools and resources across differing contexts. Finally, the project will add to the research on the current status of making and assessment in public school libraries as well as on the efficacy of using a DBIR approach to co-design assessment tools for these spaces. The project will result in documentation that will include summaries, reflections, and perceptions from the exploration (Phase 1) and co-design (Phase 2) meetings from all participants (i.e., project team members, advisory panel members, and library partners).

Because sharing the tools and resources is just as important as their development, we will work with our librarian partners to disseminate our findings and tools as widely as possible with other school librarians, practitioners and researchers in spaces and formats that are targeted to and most useful for school librarians. All findings and assessment tools will be made readily available to public school libraries and practitioners for use beyond the project via the updated MakEval website and other open-access repositories, and we will share them as widely as possible through public school library community networks via a variety of formats (e.g., publications, presentations, videos, and workshops). We will make results available through our project website, as well as the IU ScholarWorks Open Access repository, online communities, publications (e.g., *School Library Research, Knowledge Quest, Educational Technology Research and Development, Library and Information Science Research, Library Hi Tech*, *Teacher Librarian* and *School Libraries Worldwide,* etc.) and relevant conferences (e.g., AASL, AERA). We will work with our library partners to determine and develop other formats in which to actively disseminate our tools and findings that would be most useful for practitioners, which might include hosting webinars, producing videos for YouTube or posting updates on social media. We plan to host a meeting/session coinciding with the AASL National Conference and will seek to share results at meetings run by state public school library organizations. For those unable to attend the in-person meeting/session, we will utilize other networks of school librarians to advertise online webinars where we will replicate our dissemination and discussion.

To promote the sustainability beyond the project funding, we will establish Creative Commons licenses for and make all tools and resources available through open-access repositories (including our MakEval project website) so that they are freely available for all to use. Rather than starting a new site, we will continue to use the MakEval site since it already draws web searchers looking for maker assessment tools. To further support sustainability, the resources developed to supplement the assessment tools will serve to build the capacity of librarians to implement and sustain their making programs as well as to modify and utilize the developed tools and resources across differing contexts. As such, these resources have the potential to result in more librarians trained in best practices of assessment. Finally, we will share as much of our data as possible and as allowed per our IRB. Data will not be shared if we cannot ensure the protection of privacy, confidentiality, security, intellectual property, and other rights or requirements.

**Schedule of Completion by Project Phase (September 2026 – August 2029)**

| Phase and Key Activities | Year 1 (2026 - 2027) | | | | Year 2 (2027-2028) | | | | Year 3 (2028 – 2029) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sept - Nov | Dec - Feb | Mar - May | Jun - Aug | Sept - Nov | Dec - Feb | Mar - May | Jun - Aug | Sept - Nov | Dec - Feb | Mar - May | Jun - Aug |
| **Phase 1: Planning & Exploration** | | | | | | | | | | | | |
| 1.1: Recruitment | | | | | | | | | | | | |
| 1.2: Planning Meetings | | | | | | | | | | | | |
| 1.3: Analysis/Evaluation | | | | | | | | | | | | |
| **Phase 2: Co-development of Assessment Tools** | | | | | | | | | | | | |
| 2.1: Work circle meetings | | | | | | | | | | | | |
| 2.2: Develop assessment tools | | | | | | | | | | | | |
| 2.3: Pilot/Evaluate/Revise tools | | | | | | | | | | | | |
| 2.4: Analysis/Evaluation | | | | | | | | | | | | |
| 2.5: Disseminate of Tools and Findings | | | | | | | | | | | | |
| • Create/Update Website | | | | | | | | | | | | |
| • Conference attendance | | | | | | | | | | | | |
| • Analysis/Evaluation | | | | | | | | | | | | |