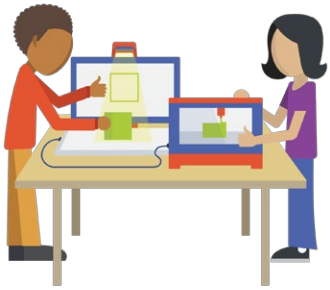
Student Growth through Design-Centered Learning

Report from the Learning Studios Pilot

Executive Summary

October 2017






Digital Promise Global

Executive Summary

Digital Promise Global is engaging a global network of 60 Learning Studios designed for student-centered, experiential learning, as part of HP and Microsoft's Reinvent the Classroom initiative. Each Learning Studio is equipped with technology, project guides, training and professional development to support teachers and students. Specifically, the technology and resources package includes a Sprout Pro by HP (all-in-one computer with integrated 3D scanner and interactive touch mat), a Dremel 3D printer, and notebook computers running Windows 10, as well as additional technologies and materials.

About the Research Study

Digital Promise Global commissioned research in order to learn more about how students and teachers made use of the technology, document areas of growth experienced by the participants, and understand the effects of implementation context on technology use and learning. We also sought insights related to challenges and best practices that could inform the broader field.

The study was conducted during the initial pilot year of the program between May 2016 and May 2017. Teachers were asked to complete a series of four surveys: baseline, mid-course, post, and follow-up. Teachers were also invited to a brief phone interview at the start of the program to ask about their implementation plans and progress to date. Students were asked to complete three surveys: baseline, post, and follow-up. Additional teacher interviews and student focus groups were conducted to collect qualitative information about changes in engagement, agency, empathy and design thinking in students.

Results

Below we present a summary of key findings from the exploratory research. The first sections focus on context of implementation, including students' and teachers' familiarity with the technology and confidence as makers and designers. The subsequent sections highlight results related to the focal outcome areas of engagement, agency, collaboration, and design thinking. For an in-depth analysis and detailed description of the study, please refer to the full report, available at global.digitalpromise.org/learning-studios.

Technology Use, Comfort, and Related Skills

One goal of the Learning Studios was to increase students' and teachers' access to advanced technologies for design-centered and maker learning. This access was associated with improvements in related skills, as well as comfort with the technology.

- Student comfort while using technology (specifically the Sprout computer and 3D printer), teaching others the technology, and troubleshooting technology issues increased significantly.
- Students whose teachers extended the Learning Studio implementation through the Spring period showed continued growth, highlighting the importance of time for building comfort and skill with advanced technologies.
- Teachers' comfort levels also continued to increase over the Spring 2017 implementation.

"In the beginning, I felt like I needed to really know how to do all the different things [the Sprout and 3D printer] could do... But I found that so long as I didn't have that expectation of myself, the kids weren't blocked by that barrier."

- Teacher

Student Identity and Confidence as Designers and Makers

Many students who participated in the Learning Studios reported increases in their sense of self as a designer or maker, and in their confidence with design-centered and maker learning activities.

- Four in five students reported that taking part in the Learning Studio contributed to their view of themselves as a maker or designer. From pre-surveys to post-surveys, there was a 10 percent increase in the number of high school students who identified as a designer/maker.
- Students who completed all three surveys reported a statistically significant gain in their confidence with design and maker related activities.
- Students attributed their confidence to increased skills, opportunities to practice, and the opportunity to access advanced technologies that were new to them.

"Giving [students] new tools is giving them the realization that they have the capacity to go out and learn. They never would have dreamed they'd be 3D printing or be able to design something that could be printed on a 3D printer."

- Teacher

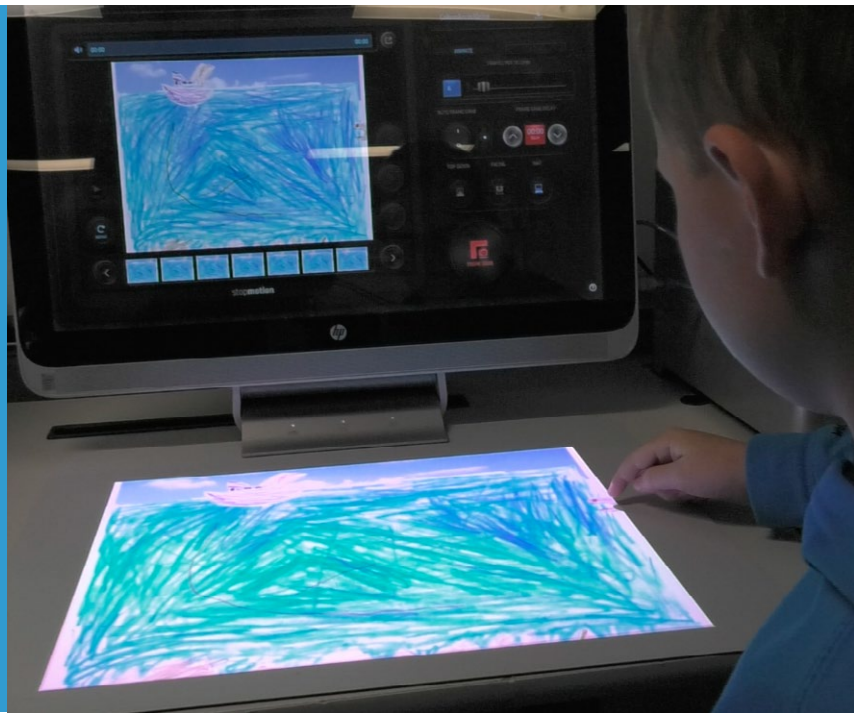
Engagement and Persistence

Analyses of the surveys, as well as focus groups and interviews with teachers and students, provided evidence that engagement and persistence had been positively impacted through Learning Studio participation.

- Students in the Learning Studios reported: how often they kept working on assignments beyond what was required, tried solving a problem in more than one way, used ideas from a classmate, stuck with a tough problem until they solved it, got curious about how something worked, and asked questions. On average, 75 percent of students in all grades reported experiencing these markers during their time in the Learning Studio; among high school students, that average was 82 percent.
- At the end of the one-year implementation, 85 percent of teachers agreed that students had invested more time than required, and nine in ten teachers (89 percent) agreed that the projects had personal meaning for students, with 44 percent strongly agreeing.
- At the end of the school year, nine in ten teachers agreed, with 41 percent strongly agreeing, that some students who are not typically engaged in classes got deeply involved in the Learning Studio projects.

"It can get frustrating trying to figure things out but once you stay with it, it gets easier. It is just hard in the beginning when you don't have the confidence or experience to get where you want to be."

- Student



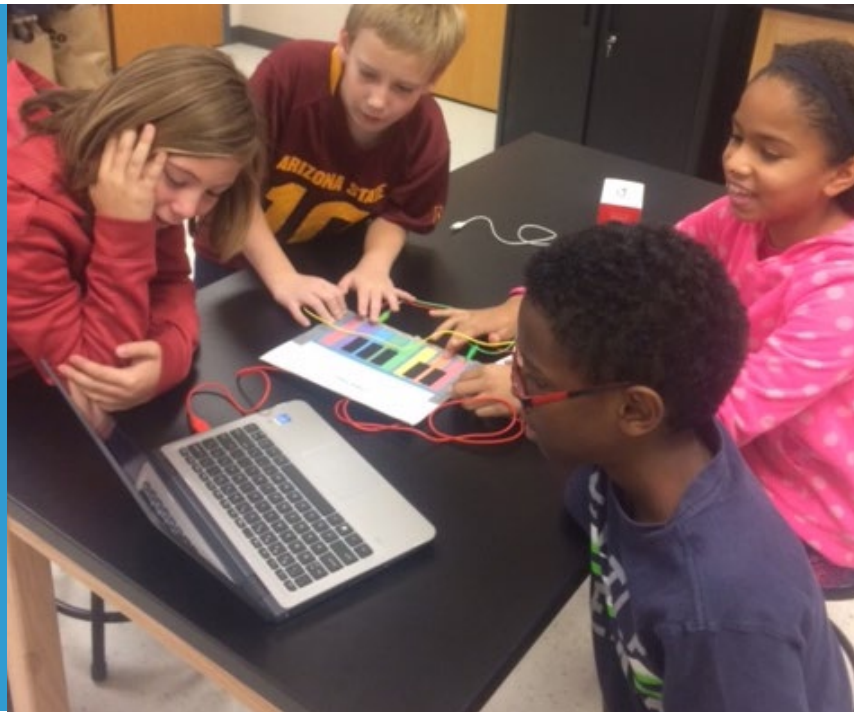
Agency and Ownership of Learning

One aspiration of the Learning Studios program was to help foster a culture of learning in which students take action to drive their own learning. Through surveys and interviews, we found support that Learning Studios participation was associated with positive indicators of agency and ownership of learning.

- To assess agency, students were asked how often they took risks in the Learning Studio, set their own project goals, chose to learn something to make their project better, offered peers feedback, and sought feedback on their work. Across all grade bands, over two-thirds of students reported acting on all five indicators on "more than a couple" of occasions, with approximately 20 percent reporting these behaviors "many times." A clear trend was also observed for older students, with 75 percent or more of high school students reporting frequent indicators of agency and initiative.
- At the follow-up survey, teachers expressed nearly unanimous (96 percent) agreement that through their participation in the Learning Studio, they are now more comfortable leading projects in which students have a high degree of agency.
- In the follow-up survey, eight in ten teachers agreed that their students had gained facility in requesting and offering feedback through participation in the Learning Studio; nine in ten felt that their students now were more able to integrate feedback from others into their work.

"Students are deciding what they want to learn about and finding a way to incorporate that into their day."

- Teacher



Empathy, Collaboration and Communication

Learning Studios seemed to contribute to student growth in the areas of collaboration and communication among a subset of students. Whereas ceiling effects on survey items limited insights about impacts in this area, open-ended responses from students and teachers on surveys and in focus groups and interviews generated many anecdotes of growth, especially for teamwork and collaboration.

- A positive trend was found for students' openness to new and diverse perspectives.
- Indicators for collaboration and communication asked students how often they encouraged a classmate; learned from something a classmate did; chose to work with classmates they don't usually work with; helped classmates brainstorm ideas; and helped classmates solve a problem. Across these indicators, on average, over two-thirds of all students reported taking these actions more than a couple times in the Learning Studio. For high schoolers, that percentage was 74 percent.
- From pre- to post-survey, teachers reported statistically significant personal growth on two of the four indicators: communicating new ideas to others and incorporating group input and feedback into their work. From the outset, teachers were highly confident in their ability to facilitate students in these areas.
- In the follow up survey, all teachers agreed that their students had become better collaborators, with nearly two-thirds (63 percent) strongly agreeing. All but one teacher agreed that their students had improved in their ability to communicate their ideas to others, with over half (55 percent) strongly agreeing.
- When asked in open-ended questions what they had learned in the Learning Studio, 14 percent of students cited collaboration and teamwork as an area of growth.

"I learned how to work with others and be more open minded to different ideas."

- Student

Design Thinking and Problem Solving

Our research showed positive impacts on students' beliefs and attitudes towards design thinking and problem solving. However, evidence of growth in students' awareness of, and facility with, design-based processes was mixed. On the one hand, quantitative responses from students and teachers regarding design-related activities showed increases, and interviews with teachers offered some examples of students engaging in design processes. At the same time, few differences were found from pre- to post-survey when students were asked to describe a designer or maker in their own words. Moreover, the great majority of students' solutions to three distinct design-thinking prompts did not demonstrate a grasp of key characteristics of the design process, such as developing an understanding of the problem space, developing prototypes, testing and iterating the design.

- For all grade bands, students reported a statistically significant increase in their comfort assembling objects without instructions
- Among teachers, we found increased personal comfort in defining problems to investigate and assembling something with instructions. Regarding teachers' comfort facilitating students in these activities, the only significant increase from pre- to post-survey was in assembling something using instructions.
- In classrooms where a design process was already present—for instance, for students following a Project Lead the Way curriculum—the addition of the Learning Studio technology enabled them to focus more on design thinking and an iterative process.

"Design thinking is for the community, so these projects need to be about the community. And I had to learn to let go of myself in order to help them..."

- Student

Students Who Struggle

In schools around the world, many students struggle to succeed academically in a variety of ways, and for a variety of reasons. For some, the format of the traditional classroom fails to capture their interest and energy. Others face learning disabilities related to cognitive processing or attention. Because the Learning Studio program aimed to foster an interactive, collaborative learning environment that differs from typical classrooms, we anticipated that students who struggle at school might find new opportunities to engage and experience success. By teachers' estimates, well over 300 students with documented learning difficulties and disabilities (LDD) were served by the Learning Studios program. Overall, we found good evidence that the Learning Studios provided opportunities for students who struggle to discover new interests, to develop valued expertise, to grow in their confidence, and to build positive rapport with their classmates.

- A strong theme that emerged from teachers' written responses, as well as in focus groups and interviews, was the opportunity for LDD students to develop expertise that gave them confidence as well as new status among their peers.
- At one elementary school site, teachers and students were especially struck by the unexpected emergence of an autistic student as the school expert. "It was new for him to be such a help -- for him and for everyone else. That opened up a lot of eyes in the class. The student told me it was the best thing he's ever done in school. 'Because I'm helping everybody. I feel really good because I'm good at it.'

The Importance of Implementation Context for Student Outcomes

All Learning Studio sites were provided an advanced technology package for designing and making, access for teachers to an online professional learning community, and a set of project guides and design challenges which teachers could choose to implement at their discretion. This resulted in marked variation across sites in terms of which projects were carried out, the ways in which Learning Studio activities were integrated into students' broader curriculum, and the nature of the guidance and instruction students experienced. Another factor distinguishing each site was the unique background each teacher brought to their respective Learning Studio implementation. We found several differences in student outcomes associated with these variations in context.

- For three of the four focal areas (engagement, agency, and collaboration), the more project guides (provided by Digital Promise Global) a teacher implemented with students, the stronger their students' outcomes were. For engagement and persistence indicators, every indicator had positive and significant correlations with the number of Learning Studio projects implemented in the classroom. Similarly, all indicators related to agency and ownership of learning were at least marginally significant. The highest correlations were found in this category, with choosing to learn something new and giving feedback to peers showing the strongest relationships with project exposure. All but one of the collaboration indicators reached at least marginal statistical significance.
- An early analysis allowed us to qualitatively group teachers into categories based on their personal and professional experiences with maker and design-centered learning. The entire set of responses, both quantitative and qualitative, were used to holistically generate four categories of participating teachers. Several patterns of association were found between the level of students' comfort with the technology

and teacher background, as well as for focal outcomes of agency, communication, and collaboration.

Overall, it appeared that specific program benefits depended on whether the context was an emergent or established Learning Studio environment. In what we could call "emergent" contexts, the focus tended to be on developing technology skills, executing specific assignments, and opening new possibilities for the uses of technology. At these sites, the Learning Studio also brought to the fore the importance of fostering students' skills such as collaboration, time management, persistence and problem-solving ability. In contrast, in "established" Learning Studio contexts, some elements of student-driven learning, design thinking and collaboration were in place prior to program implementation. In these settings, the Learning Studio enabled greater design focus and cross-site collaboration than previously experienced. While the outcomes at "established" sites were generally stronger, the Learning Studio was one of many causal contributors; in "emergent" sites, Learning Studios served a larger role as a catalyst for new ways of engaging students in 21st century competencies.

Program Reach

- This first implementation of the Learning Studio program reached over 4,000 students. Teachers reported that 2,286 students participated occasionally in the Learning Studio, 1,133 students participated regularly, and 805 were avid participants.
- At follow-up, 85 percent of teachers agreed that taking part in the Learning Studio had helped their students develop their knowledge and understanding of the world; half (52 percent) felt the international scope of the program had added value to their students' experience. Seven in ten reported that their experience had been enhanced by the participation of teachers and students from other countries.

Insights for Future Implementations

Based on the findings from this exploratory study, we identified four main insights for future implementations.

- **Time and Technology:** Making sure teachers have ample opportunity to familiarize themselves with the technology, and ensuring that the right infrastructure is in place, are important for teachers building their personal comfort before facilitating students' use of it. Teachers also noted the importance of full buy-in and expectation-setting at the school and district level, to ensure that the needed technology supports were in place for the software and hardware.
- **Professional Development and Mentorship:** Findings related to teachers' facility with advanced technology, and especially with design thinking and problem-solving processes, suggest that an important focus for future implementations is extended professional development opportunities for teachers, both prior to and during implementation. One promising model is a small professional learning community (PLC) of two advanced and two novice teachers, who share insights and tips.
- **Intentional Instruction:** Our data suggest that intentional instruction is an important context for students' development of design thinking and related competencies. This is especially likely to be the case when students have not self-selected into the Learning Studio experience, and may be more naturally drawn to interests other than designing and making activities. The teachers in our study who described the most impressive gains in students' persistence, collaboration, and other skills were those with pedagogical practices specifically targeting these areas of growth.
- **Scope of Implementation:** Learning Studio sites differed in the scope of their implementation. In some cases, entire grade levels were involved; other programs focused on a small group of students. Figuring out the right grain-size for initial implementation is an important consideration. Our observations suggest that starting on the smaller side, and ensuring that teachers have ample opportunity to grow their own confidence and comfort level, lead to the greatest student gains.

In-depth analyses and additional insights into program impacts, as well as insights gleaned for future implementations, appear in the full white paper.

Learn more about the Learning Studios:
global.digitalpromise.org/learning-studios

The Learning Studios exploratory research was conducted by Designs for Learning in partnership with Digital Promise Global.