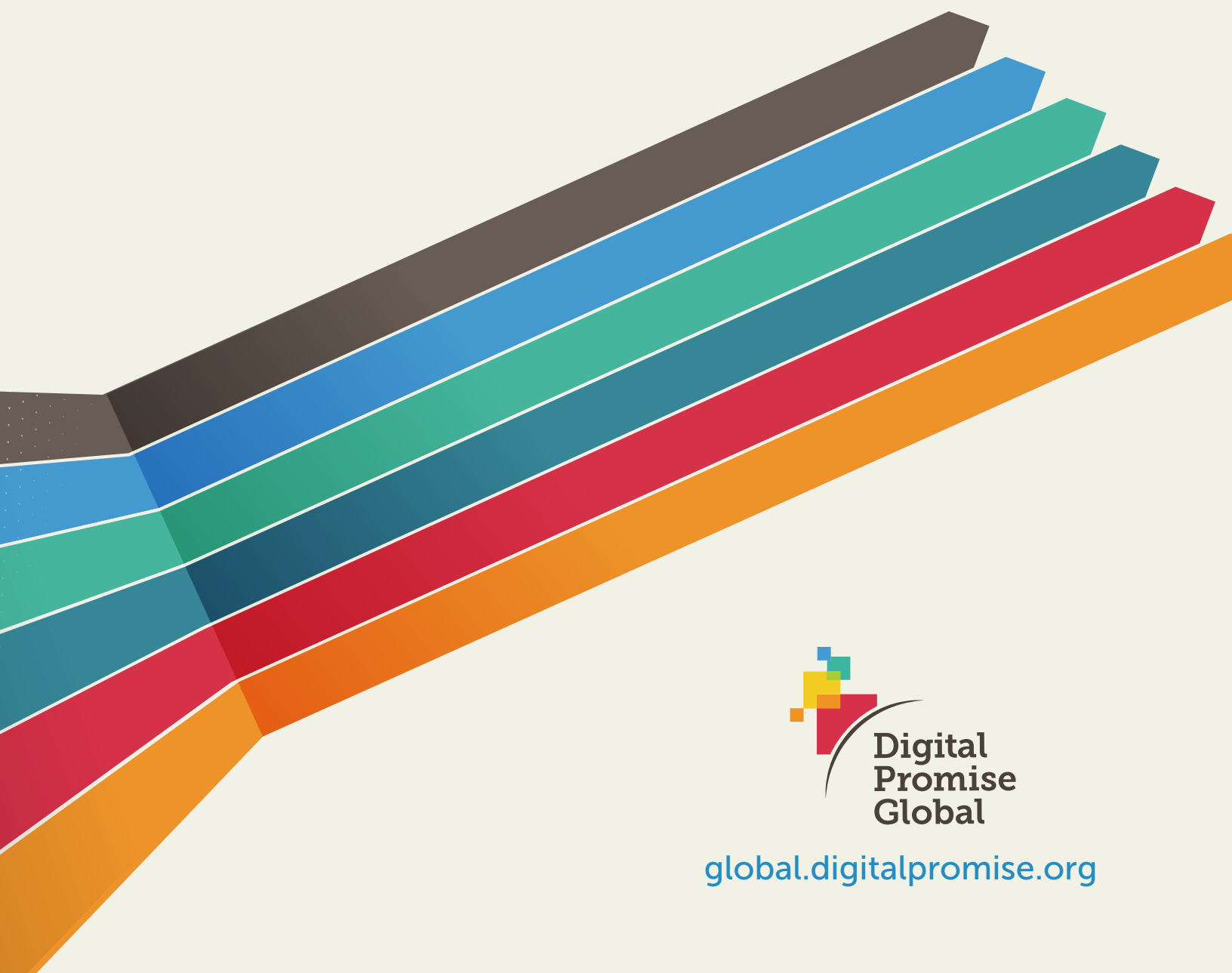


Learning Studios Project

Fall 2016 Interim Report



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Introduction

As part of HP and Microsoft's Reinvent the Classroom initiative, Digital Promise Global is directing a worldwide network of 60 Learning Studios designed for student-centered, experiential learning. Each Learning Studio is equipped with powerful technology for creation and collaboration.

About the Research Study

The goal of research within the Learning Studio project is twofold: to document benefits of the program for teachers and students, and to shed light on best practices and contextual factors that inform this and future implementations. **Four driving research questions were developed:**

1 How is technology used in the Learning Studios?

2 How do participating teachers and students learn and grow?

3 How does implementation context relate to differences in 1 & 2?

4 What insights related to challenges and best practices can inform the broader field?

Pre and post surveys were administered for participating teachers and students, and teachers were interviewed and asked to complete an additional survey at the start of the 2016 school year to gain greater clarity around implementation models.

Additionally, teacher interviews and student focus groups were conducted virtually at ten sites to collect qualitative information about changes in engagement, agency, empathy and design thinking in students.

Preliminary Results and Themes

Quantitative data from teacher and student pre-post surveys indicate a number of trends associated with project participation. While dramatic changes in student learning and growth were not anticipated after only three to

four months of classroom implementation in each location, we saw trends of improvement in several areas. Below we provide an overview of preliminary student and teacher outcomes.

Student Outcomes

There were clear positive trends for all agency, persistence, and community indicators in the Learning Studio, with a clear trend of growing frequency from elementary to middle to high school. Students' comfort engaging with new technology and engineering practices was also found to increase during the Learning Studios program.

Technology, Engineering, and Design Thinking

- By the end of the pilot, 10 percent more high schoolers considered themselves a designer or maker.
- Across-the-board increases in comfort with using the technology (particularly the Sprout computer and Dremel 3D printer), teaching others the technology, and troubleshooting technology issues. Sprout-related data are presented in Figure 1.
- Statistically significant increase in high school students' confidence in creating a digital 3D model, and a positive trend for comfort in defining problems to investigate.
- For all grade bands, students reported a statistically significant increase in their comfort assembling objects without instructions; a positive trend was found for students' openness to new and diverse perspectives.
- Significantly positive reports of overall confidence in making abilities, with 54 percent of students reporting increased confidence in strategies for making since working in the Learning Studio.

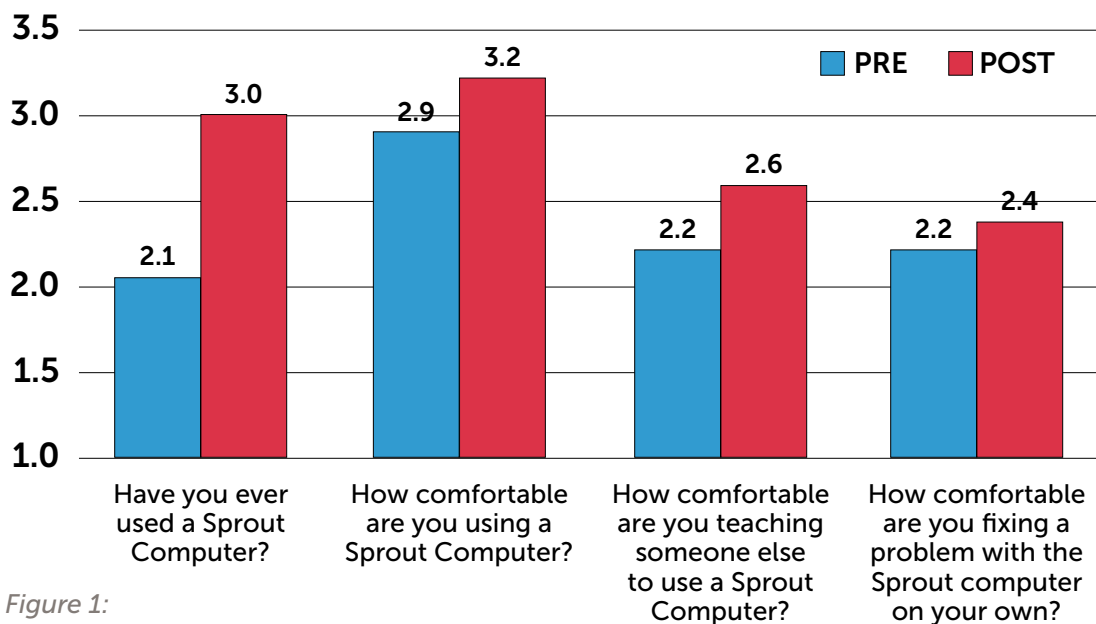


Figure 1:
Student Reports of Use and Comfort
with Sprout Technology (5-point scale)

Agency and Initiative

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. As shown in Figure 2, across all grade bands, over 66 percent of students reported

acting on all five indicators on “more than a couple” 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.

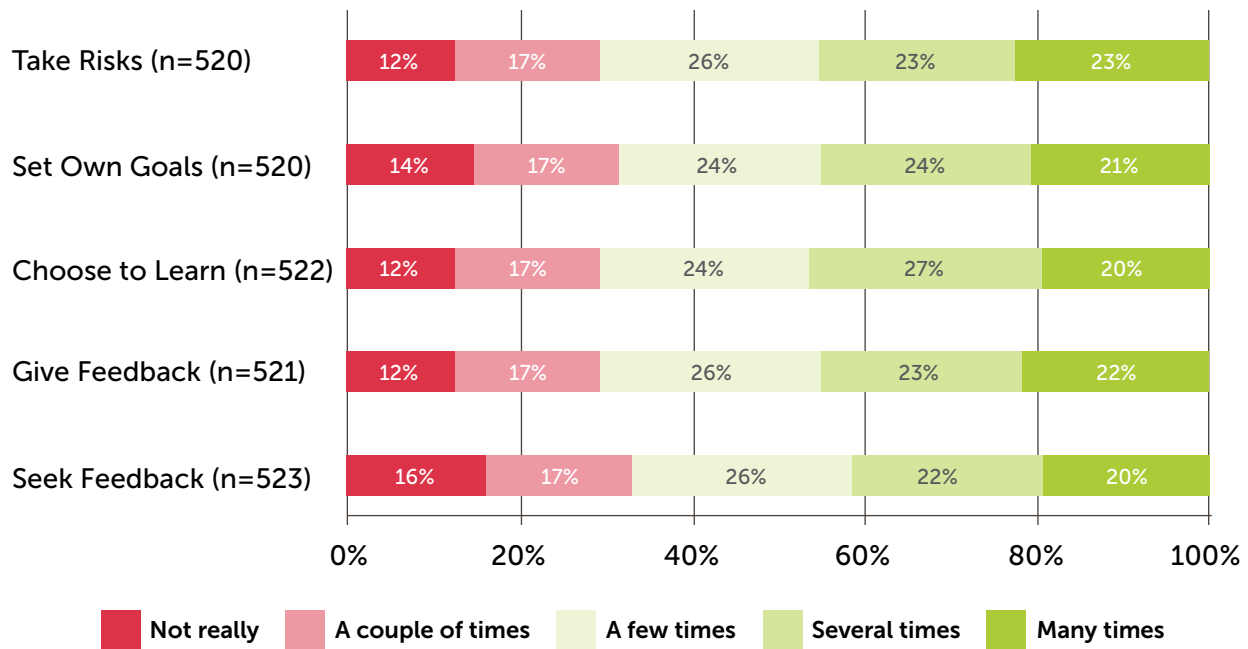


Figure 2: Student responses regarding how often they undertook specific actions during their time in the Learning Studio

“[In the Learning Studio] they no longer ask “*is it right or wrong?*” now they ask “*does it work?*” **Way more important question.**”

Persistence and Curiosity

In the areas of persistence and curiosity, 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. Results are presented in Figure 3.

On average, 75 percent of students reported experiencing these markers on more than a couple occasions; among high school students that average was 82 percent. These results are particularly noteworthy given the well documented downward trends in student motivation as they progress from elementary through high school, and the high proportions of disengaged students in US schools¹.

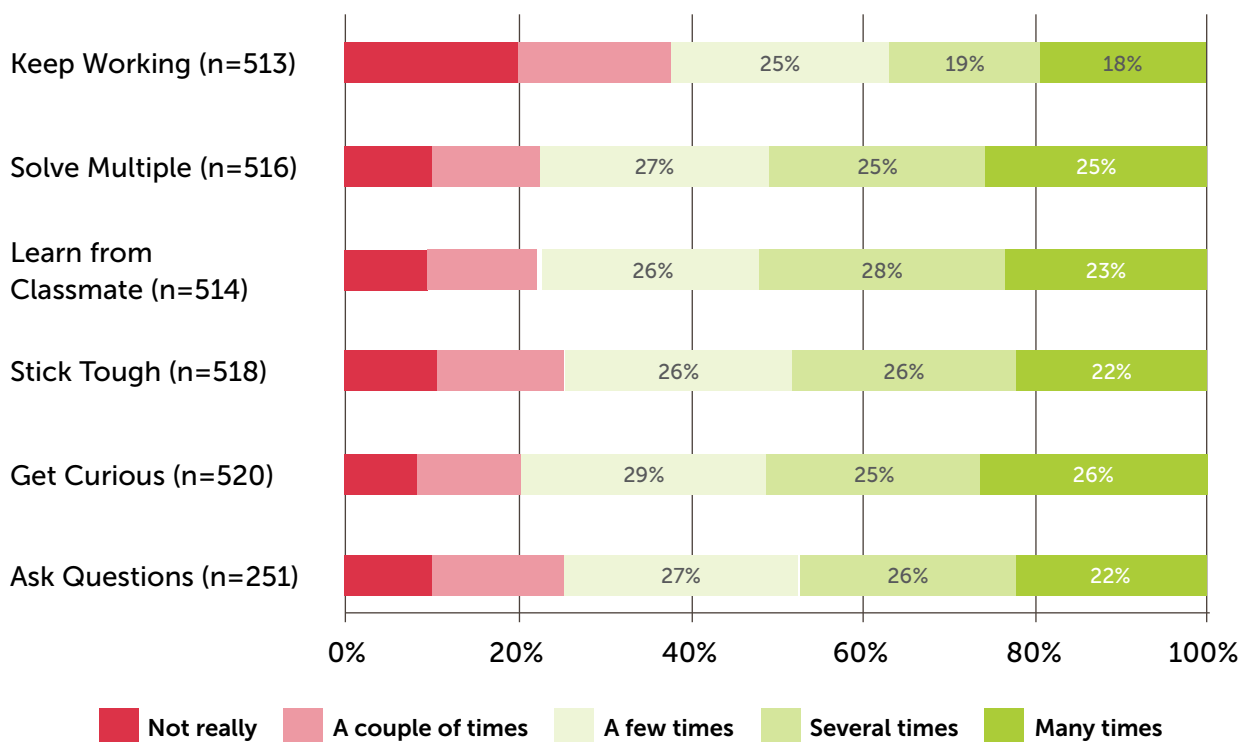


Figure 3: Student responses regarding how often they undertook specific actions during their time in the Learning Studio

¹ Fredricks, J., McColskey, W., Meli, J., Mordica, J., Montrosse, B., and Mooney, K. (2011). Measuring student engagement in upper elementary through high school: a description of 21 instruments. (Issues & Answers Report, REL 2011–No. 098). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southeast. Retrieved from <http://ies.ed.gov/ncee/edlabs>.

Community and Social Support

Indicators for community and social support 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. As shown in Figure 4, across these indicators, on average, over two-thirds of all students reported taking these actions more than a couple of times. For high schoolers, that average was 74 percent.

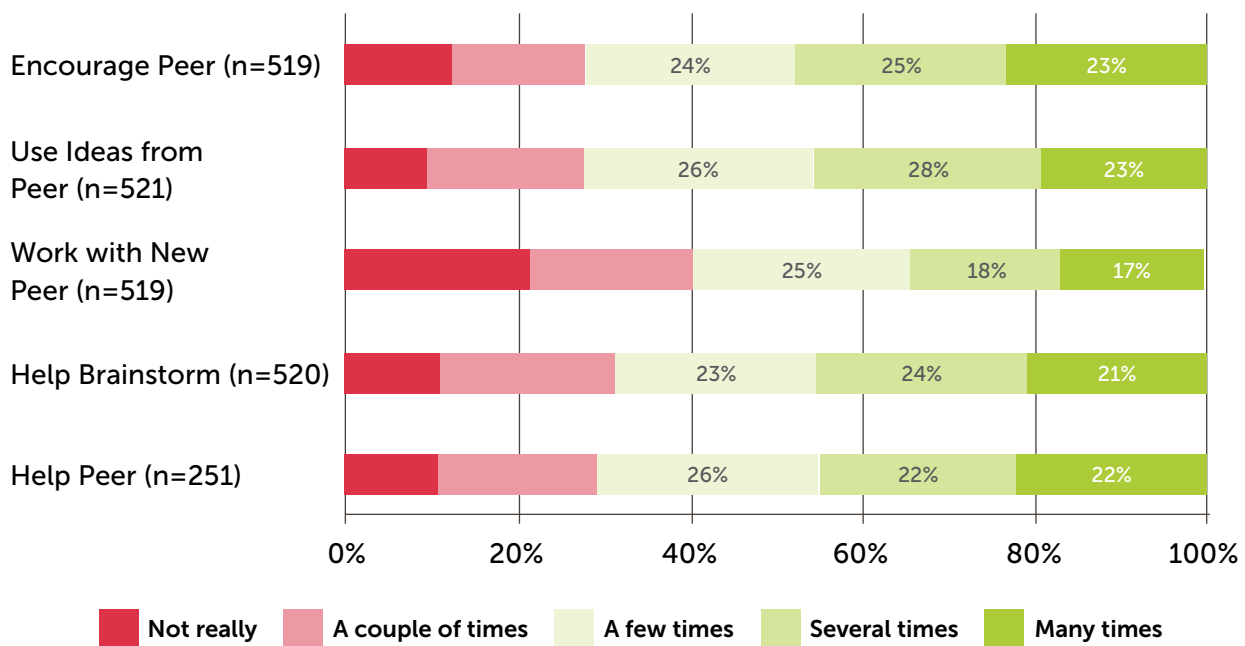


Figure 4: Student responses regarding how often they undertook specific actions during their time in the Learning Studio

Teacher Outcomes

Positive impacts on teachers also emerged in the initial months of implementation. Specifically, teachers reported:

- Substantial and statistically significant increases in their personal comfort using advanced technologies such as the Sprout and 3D printer, as well as increases in related processes such as creating digital 3D models and assembling objects.
- Importantly, teachers also reported statistically significant increases in their comfort facilitating students in these technology and making skills.
- Statistically significant gains in their personal comfort defining problems to investigate, communicating new ideas to others, and integrating group input and feedback; and a positive trend in their openness to new and diverse perspectives were also reported.

Relation between Student Outcomes and Learning Studio Exposure

In addition to providing advanced technologies to participating schools, the Learning Studios team created a suite of ten Learning Studio Projects, along with a global culminating project, for educators to implement with students.

Each Project highlighted an aspect of technology and engineering skills, as well as elements of the design process and design thinking. While all sites were expected to implement the culminating project, it was up to each teacher whether to take up any of the ten Projects.

To explore whether level of exposure to the Learning Studio, defined as number of Projects completed, was related to student outcomes, correlations were calculated. Positive and statistically significant correlations were found on many indicators, with some interesting variations by grade band. **Specifically:**

- **Agency and Initiative.** At the middle and high school levels, there were positive correlations between Learning Studio exposure and how often students reported taking risks and choosing to learn something new to improve their project. For high school students, a significant correlation was also found between Learning Studio exposure and how often they reported setting their own learning goals. Among

middle schoolers a marginally significant correlation was found for how often they reported giving feedback to peers.

- **Persistence and Curiosity.** For all grade bands, the more Learning Studio exposure, the more students reported trying to solve problems in multiple ways, learning from a classmate, sticking through a tough problem, getting curious about how something worked, and asking questions. These correlations were all strongly statistically significant.
- **Community and Social Support.** Among high school students, statistically significant associations were found between Learning Studio exposure and all indicators of community and social support. The more Learning Studio Projects completed, the more often high schoolers reported encouraging a peer, using ideas from a peer, working with a new peer, helping a peer to brainstorm, and helping a peer in the Learning Studio.

These results provide early evidence of the importance of programmatic support for developing key learning and non-cognitive skills in students.

Relation between Student Outcomes and Teacher Background

A related exploration focused on the relationship between teachers' making background and student outcomes.

Based on a holistic analysis of teachers' pre-survey responses, we classified teachers into four categories. The first category, while evidencing enthusiasm and buy-in for the Learning Studio project, came with little background in making and did not indicate prior exposure to or awareness of design thinking principles or strategies. The second category of teachers described some personal experience with making, and generally did not bring experience facilitating students to make. Like the first group, the second category did not offer evidence of awareness of design thinking processes. The third category brought both personal and professional experiences with making, having facilitated student making projects, including robotics clubs and other initiatives. For these teachers, design thinking did not figure prominently in their responses

on the pre-survey. The fourth and final category of educators evidenced knowledge and experience of the design process, situating making within a larger culture of pedagogy related to project-based learning.

When we compared student outcomes for each group of teachers, we found some interesting trends. For instance, student responses to "Are you a maker" were significantly lower for teachers with little making background, and were relatively high for students of teachers who reported prior experience with making and facilitating students in making activities. Students of teachers in the most experienced group had significantly higher comfort using and teaching others to use the Sprout and 3D printer.

While still preliminary, these results speak to the importance of supporting teachers in developing their own comfort and experience with making, in order to best facilitate positive student outcomes.

In Teachers' Own Words

As we delve into the rich data gathered via teacher interviews, open-ended survey questions to students and teachers, and student focus groups, additional insights are emerging that we will continue to analyze.

What follows is a sampling of teacher observations related to individual differences, the enabling role of advanced technologies, and student initiative.

- // I have a student who has major obstacles when it comes to traditional education and maybe doing a worksheet or reading ... When we make, that goes away. That student is shining, they're happy and proud of their thing. It puts everyone on an equal playing field and some of the students who are "good at school" - the kids who can whiz through something might be struggling with creativity and imagination and thinking outside the box, and for another student, who struggles with traditional school, that comes more easily for them. You can see this whole shift and there's more respect. **It's like a magical thing that happens** - you see the kids who beam. And you see the kids who think school's too easy realize there are challenges here. Seeing those kids think outside the box is pretty incredible."
- // The guidance counselor came to me about one kid in particular. He has lots of social anxiety, he covers his face with a hoodie, lots of academic issues, and also doesn't really talk to kids. She said this is something he might be interested in. [Now] he is in here every day, working with the other kids. At first he just sat there. Now he talks with them, sometimes does his homework with them. **His parents are thrilled that he's excited to be doing something in school.**"
- // The education model is broken for today's students. The biggest challenge is they're bored, they don't understand why they have to memorize things they can look up. The classwork is irrelevant to them. In the Learning Studio they want to learn by doing and trying it immediately. It gives them chance to try things. In the traditional classroom they'd be told to wait, draw it out. **[In the Learning Studio] they no longer ask "is it right or wrong?" now they ask "does it work?" Way more important question.**"
- // I think [my goals for the program] always change. At the start of the year I didn't know what [the Learning Studio] was capable of or what it did or how the students would react to it. **They very quickly exceeded my expectations.** So have to go back and revamp my own expectations to push them further. ... These students had never seen a Makey Makey before. They got it up and working. So I said, now make it attractive. They took what they did there and designed and envisioned something bigger. And now they have a nice neat product."
- // Students who may be struggling with tech are partnering with students who are good at it. I'm seeing some maturity at the younger grades, [too]. When they get into project mode they would have tended to fool around more but here I see the older students holding them accountable. They are engaged and interested, they see a new tech and see how the Sprout and 3D printer work together. So **students who might not normally pull their weight or do their fair share are being held accountable.**"
- // This year for the first time, students are at the very least designing parts of their projects or their entire project in TinkerCAD and sending it to the 3D printer. Some groups sending the whole thing to 3D print. [The tech became] a way we could increase the level of complexity. Very interesting to design those things and print them: It opens up the possibilities, makes them so much more endless. **The shapes that they are coming up with are not things they would have thought possible before.** In years past, students relied exclusively on playing cards, index cards. Now they are doing research and finding out where wind turbines are in the world, where is the tech sitting - and they recreate that tech."

What's Next

A forthcoming white paper will feature additional results and analysis from this phase of the Learning Studios research study. Given the preliminary results above, we expect to further explore several topics, including:

- Trends in students' design thinking strategies and confidence;
- Trends in student learning and confidence, in relation to grade level and program exposure;
- Correlations between implementation models and student learning and growth, identifying the most impactful instructional practices and approaches; and
- Teacher perspectives on student learning and growth, including key insights for future implementations.



Learn more about the Learning Studios:
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The Learning Studios research study was conducted by Designs for Learning in partnership with Digital Promise Global.

