National Inventors Hall of Fame®

NOW IS THE TIME FOR INVENTION EDUCATION

As schools begin the 2021-22 academic year in earnest, the unfortunate truth is that there is only so much that educators and district officials can control. Because COVID-19 continues to spread at a rapid pace, it is difficult to determine if classes throughout the year will be held in person, at home or in a hybrid setting.

For students and teachers alike, this uncertainty can cause feelings of anxiety. How does one plan for a pandemic that can change from week to week? How can we help both educators and children regain a sense of control and help restore their joy for learning and exploration?

Rethinking COVID-19 Slide

In April 2020, NWEA Research, a research-based nonprofit that provides PreK-12 assessments in 145 countries around the world, published a report warning educators about the negative impact of school closures and educational inequities on student achievement across the country. The estimates were troubling: Up to a 50% decrease in mathematics learning gains and a reduction of 30% in learning gains in reading relative to a normal school year.[1]

The researchers named these predicted losses "COVID-19 slide," after the decreases in academic performance that are typically experienced during the summer months[2], known as summer slide. A national conversation began to form around the importance of mitigating the expected math and reading literacy losses.

On the surface, this focused attention on math and reading literacy makes sense. Through standardized testing, a student's progress in these subjects can be tracked, so the effectiveness of educational funding and programming meant to mitigate these losses can also be measured and accounted for. Over time, the detrimental educational impact of COVID-19 on students from a national perspective has become focused primarily on math and reading literacy scores.

Though well intentioned, exclusively framing the challenge from this narrow perspective fails to account for an aspect necessary for learning to occur in the first place: students' social-emotional well-being.

Evaluating Social-Emotional Impact

The pandemic's effects on social-emotional health and well-being have been all encompassing. When schools nationwide began closing in March 2020,[3] students lost in-person contact with their teachers and classmates. Schools also began canceling or postponing extracurricular activities and social events like pep rallies, formal dances and sports events to help prevent the spread of COVID-19.

Beyond this, students also had to confront the effects of the pandemic on their immediate family. From sickness to economic hardship, many children experienced significant challenges and had to shoulder additional responsibilities. For older children, this sometimes meant taking care of a sick family member or picking up a job to supplement their household income.[4]

In a recent study[5] published by the Center on Reinventing Public Education (CRPE), a nonpartisan research center dedicated to improving student outcomes, researchers articulate five clear findings[6] that speak to the negative impacts of COVID-19 on students' mental health:

- A significant portion of young people, likely 30% to 40%, have experienced negative impacts on their mental or social-emotional health during the pandemic.
- Students who learned remotely for long periods of time and historically marginalized students were more likely to experience these negative effects.
- Rates of anxiety and attempted suicides, already on the rise pre-pandemic, appear to have increased among all students, especially among girls.
- While some students fared well initially, or even fared better when learning remotely than they did in person before the pandemic, these positive effects did not last.
- Negative effects for students increased over time.
- Schools and districts, especially in rural areas without a strong social-service infrastructure, lacked systems to track student well-being or strategies to address and improve it.

1. Kuhfeld, M., & Tarasawa, B. (2020, April). *The COVID-19 slide: What summer learning loss can tell us about the potential impact of school closures on student academic achievement.* www.nwea.org. Retrieved from https://www.nwea.org/content/uploads/2020/05/Collaborative-Brief_Covid19-Slide-APR20.pdf
2. Quinn, D. M., & Polikoff, M. (2017, September 14). *Summer learning loss: What is it, and what can we do about it?* Brookings. Retrieved from https://www.brookings.edu/research/summer-learning-loss-what-is-it-and-what-can-we-do-about-it/
3. Education Week. (2020, July 1). *The coronavirus spring: The historic closing of U.S. Schools (a timeline).* Education Week. Retrieved from https://www.edweek.org/leadership/the-coronavirus-spring-the-historic-closing-of-u-s-schools-a-timeline/2020/07

Given the current educational environment, it's clear that to best support our nation's students during these unprecedented times, a holistic approach is needed now more than ever. To this end, the CRPE advises educational policymakers to reimagine their approach to measurement. As the researchers of the study accurately state,

> "Simply measuring student learning is not sufficient. Without some effort to ensure that users of that student achievement data understand the factors that might have contributed to outcomes, we run the risk of misinterpretation and stigma, especially when disparities across subgroups are large. We cannot make sound decisions about interventions and support without accounting for the impact of students' circumstances."

This call to reexamine how we talk about learning loss mirrors the views of Rachael Gabriel, an associate professor of literacy education at the University of Connecticut. In an article[7] published in the Washington Post, Gabriel argues that because children are natural learners, "learning is never lost, though it may not always be 'found' on pre-written tests of pre-specified knowledge or preexisting measures of pre-coronavirus notions of achievement."

Gabriel goes on to explain that because the entire world is undergoing a process of learning and unlearning, it's unfair to categorize an entire generation of students as lacking or behind in some way.

"Our imagined trajectories were disrupted, and this particular disruption with its layers of grief and edges of uncertainty cannot be overestimated in scope or impact," Gabriel said. "This is precisely the reason we must stop telling the Corona Kids that they fell behind and have to catch up."[8]

Integrated Invention Education – Jayme Cellitioci, Creativity and Innovation Strategist

In addition to formal interviews, we often have the opportunity to spend quality time with Our Nation's Greatest Innovators™. It is sometimes fruits of organic conversations that have the greatest impacts on my fellow writers and me as invention education curriculum designers. I once found myself on a shuttle ride to an event discussing the power of learning STEM in context with NIHF Inductee Gary Sharp (co-inventor of polarization-control technology). We were discussing how much more youth are pulled to build STEM skills when they are pulled by an engaging outcome, such as navigating the physics and math that might be involved in designing a skateboard. The integrated nature of invention education is one of its greatest attributes as a lens, umbrella and speedboat to learning critical skills — ranging from empathy to persistence to STEM, creativity and entrepreneurship — that will be demanded and employed in the future workforce.

Invention Education as the Solution

We at the National Inventors Hall of Fame® (NIHF) believe that now is the time for district administrators to rethink tradition and incorporate invention education pedagogy within their plans for the 2021-22 school year and beyond.

Two students show off the invention sketch and prototype they created collaboratively as part of a National Inventors Hall of Fame® in-school program.

Invention education invites participants to discover or "invent" solutions to real-world problems through hands-on prototyping and exploration.[9] In the process, students are introduced to academic concepts in ways that are relevant to the project they're working on.

4. Reilly, K. (2020, April 30). *Teens shoulder adult responsibilities amid covid-19 pandemic.* Time. Retrieved from https://time.com/5828492/teens-coronavirus/
5. Hamilton, L., Gross, B., Adams, D., Bradshaw, C. P., Cantor, P., Gurwitch, R., Jagers, R., Murry, V. M. B., & Wong, M. (n.d.). *How Has the Pandemic Affected Students' Social-Emotional Well-Being? A Review of the Evidence to Date.* CRPE.org. Retrieved from https://www.crpe.org/sites/default/files/sel_report_2021_final_8_10.pdf
6. Ibid.,
7. Gabriel, R. (2021, March 10). *What 'learning loss' really means.* The Washington Post. Retrieved from https://www.washingtonpost.com/education/2021/03/10/what-learning-loss-really-means/
8. Ibid.,

This type of learning is especially useful for creating opportunities for students to collaborate and interact in ways that they might not have been able to throughout the COVID-19 pandemic. Working together to develop inventions, pitching a product or business idea and brainstorming to find better solutions are all activities common to invention education. Together, these activities can help children reconnect and explore in ways that are more fun and engaging.

Two Camp Invention® participants proudly share the marble obstacle course they've designed and built.

For example, in Trash Island: A Garbage Patch Journey™, a unit in NIHF's Club Invention® afterschool program, children investigate the extreme buildup of trash in the North Pacific Ocean Gyre between California and Hawaii. They are tasked with developing solutions to keep "Trash Island" from growing. In the process, they explore concepts including environmental conservation, design thinking, engineering design and mathematics.

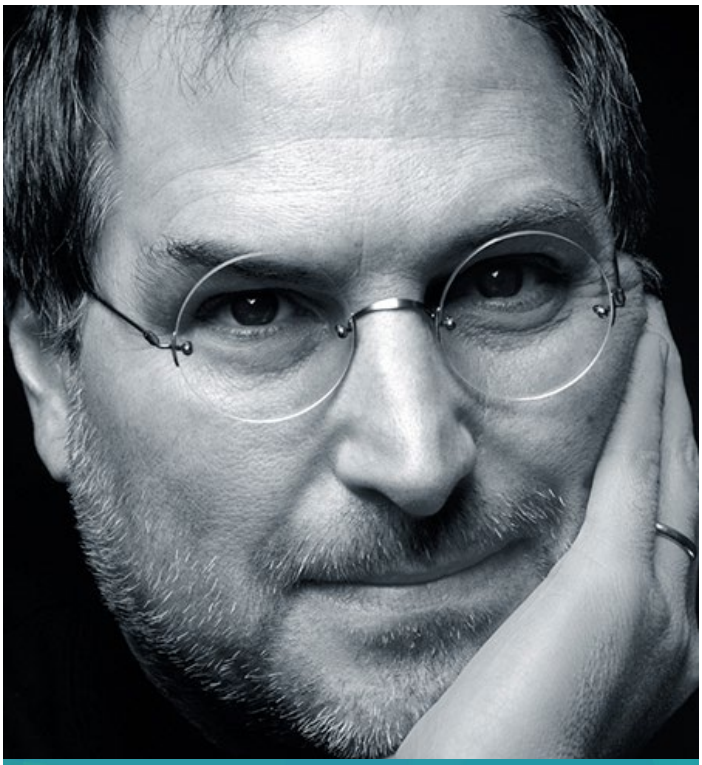
Students are given the responsibility to follow their passions and interests during their unique invention process, engaging in activities that naturally build confidence and give them a safe space in which to explore their identity as creators.

A Camp Invention participant prototypes a launching device while attending an at-home program.

A study recently published in the Journal of STEM Outreach supports this and found that NIHF's style of invention education provides an environment and context for creative identity exploration. Additionally, the researchers found that students in the study preferred activities that made them feel confident, included novel elements and were relevant to their interests.[10]

All NIHF education programs are developed using lessons and stories from NIHF Inductees, so students who attend these programs are introduced to a diverse group of STEM role models. These role models not only promote encouragement but also show students what they too can achieve if they practice persistence, embrace their curiosity and boldly explore the world around them.

Now is the time to give students agency over their learning and help them realize they can make a mark on the world. Now is the time for invention education.



"Life can be much broader once you discover one simple fact, and that is – everything around you that you call life, was made up by people that were no smarter than you. And you can change it, you can influence it, you can build your own things that other people can use. The minute that you understand that you can poke life [...], that you can change it, you can mold it. That's maybe the most important thing. It's to shake off this erroneous notion that life is there and you're just gonna live in it, versus embrace it, change it, improve it, make your mark upon it."[11]

– National Inventors Hall of Fame Inductee Steve Jobs

9. The National Inventors Hall of Fame. (n.d.). *How NIHF Embraces Authentic Invention Education.* The National Inventors Hall of Fame. Retrieved from https://www.invent.org/blog/trends-stem/21st-century-skills-students
10. Garner, J., Matheny, E., Rutledge, A., & Kuhn, M. (2021, August 11). *Invention Education as a Context for Children's Identity Exploration.* Journal of STEM Outreach. Retrieved from https://www.jstemoutreach.org/article/27331-invention-education-as-a-context-for-children-s-identity-exploration
11. PBS. (2011). *Steve Jobs: One Last Thing.* Retrieved from https://www.pbs.org/show/steve-jobs-one-last-thing/