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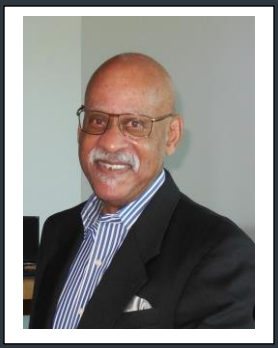
Reader's Platform

In this issue



This publication gives our readers and supporters in education, research, science, and technology opportunities to have articles published on issues not included in our series of article requests. Articles selected are of high interest to our community of technical professionals, high education administrators, and business executives.

We hope **Reader's Platform** connects more across our global audiences that have interests in common.

Larry King

A Disorienting Dilemma: Teaching and Learning in Technology Education During a Time of Crisis

The way individuals interpret and reinterpret their experience is central to meaning making and impacts teaching and learning.

Grounded in Mezirow's transformative learning theory, this research explores whether pandemic-related emergency remote teaching manifested as a "disorienting dilemma" for technology educators. Teachers negotiated curricular outcomes between physical aspects of making and doing, as well as creative problem solving through design, resulting in a pandemic transformed pedagogy. Thematic analysis revealed that making and doing was severely challenged due to decreased communication, student motivation, and engagement.

However, most concerning to educators was the heightened disparity in equity and access in their most vulnerable and at-risk students. In conditions of fear and trauma, little is known about the impact a chaotic way of being has on learners and educators. While we cannot predict what the "new normal" will look like for schools, and what the long-term effects of emergency remote teaching will be, our research demonstrates that the disorienting dilemma COVID-19 presents will continue to shape the pandemic transformed pedagogy of technology educators.

IOScholarships

I'm María Fernanda and I am the Founder of IOScholarships, a digital platform and ecosystem for underrepresented diverse students in STEM. With a team of talented engineers, we created the iOScholarship platform to ensure tech jobs are powered by Black, Native American, Latinx and diverse innovators of the future. As we all are painfully aware, people in these groups are desperately underrepresented in the STEM industry.

I have been helping grow high-growth tech and financial companies for over 20 years and one common problem all companies face is the shortage of STEM talent.

The stark reality is that by 2030 there will be a labor shortage in the tech industry of 4.3 million workers. That's 59 times the number of employees of Alphabet, Google's parent company.

The skills gap is widening, unemployment in the US is at its lowest rate since 2000 and employers struggle to fill job vacancies with qualified talent costing companies trillions of dollars in lost economic opportunity. On top of this critical labor shortage, the tech industry faces growing problems with diversity, equity, and inclusion.

Diverse students need access to STEM educations because the population reality is that by 2044, who we used to call "minorities", will be the new majority. The tech world simply cannot fill a robust talent pipeline without closing the diversity gap.

IOScholarships is changing more than the narrative. We are filling the talent pipeline by not only connecting students to educational funding and opportunities, but by building long-term impactful relationships with users of our platform.

"IOScholars" have access to not only a huge array of scholarships, but bilingual financial education and planning tools, and hands-on internship opportunities that will prepare them to be first-class talent recruited and ready to join high-growth corporations.

Most importantly, IOScholarships is creating a STEM ecosystem where everyone can feel a strong sense of community and belonging. Support from people inside your community, combined with being able to see others who look, speak, and aspire to the same goals as they do, is vital to sustained career success. Partnering with, and receiving support from, companies that will value and support students from diverse backgrounds is essentially to create the inclusive world we all want and increasing need to inspire creativity and drive innovation. https://ioscholarships.com/

IOScholarships was created by María Trochimezuk, who won scholarships to pay for her entire education. Her determination and hard work paid off as she won grants and scholarships from Stanford University and UCSB to continue her post-graduate education. Since launch, this platform engaged over 11,000 STEM students and our efforts are supported by the National Scholarship Providers Association (NSPA).

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Boosting K-12 Student Motivation and Engagement through Hands-On Learning

Many of us already knew it, but the pandemic made it crystal clear: our current education system is failing to prepare students for the real world. Yes, there are exceptions and pockets of success, but generally speaking, this is the truth. Educators across the country share similar sentiments regarding student performance since the pandemic began and likely even before – many students are bored, disengaged, quick to quit, and barely putting forth minimum effort in their work. But can we blame them? It must be impossible to see the worthiness in worksheets and seat minutes when the world our youth are inheriting is full of problems and complexities they feel unprepared for.

"For kids, motivation and engagement in school on average drops as they move from the elementary school into the secondary school system," says Jacquelynne Eccles, PhD, an education professor at the University of California, Irvine. "You see it in attendance, in getting into trouble, in drop-outs from high school and also in dropping out of college." As educators, we must intervene. But what will re-engage and motivate our students and allow all educators to provide their students with a high-quality learning experience?

Linking Passions with Real-World Problems

If you were given two tasks, one being filling out an attendance tracker and two being developing an attendance improvement initiative with colleagues, which task would engage you more? Two, of course! Humans are naturally drawn to problems they care about, and this is key in rethinking how we ask students to engage in learning.

Students crave creative, hands-on learning that has direct connections to the world around them. And fortunately (or unfortunately, really) the world is full of problems just waiting to be solved. School motivation often increases when said problems are related to things students care about. As Professor Michael Roberto wrote in an article for Harvard Business Publishing Education, “Engagement happens when the work we give students is personally meaningful. Why does what we’re talking about matter? What are the implications for students’ lives? Based on your knowledge of the students, how does the topic relate to their next classes, to their careers, to whatever they’re passionate about outside the classroom?” Find out what your students are passionate about, identify real problems in those areas, and infuse your content into those contexts. Try this free Project Planner to connect your students’ passions to your content!

Start With Heart to Create Problem-Solvers

Pandemic-related learning loss rears its ugly head on a daily basis in classrooms across the world. Student discourse is lower caliber or practically non-existent and student work is often lackluster. To engage and inspire our students, we must connect with their hearts.

Getting students involved in quality, hands-on STEM projects is naturally engaging, piques their curiosity, and helps them see themselves as problem-solvers. Using the design thinking process, STEM projects can be broken into manageable chunks, which helps learners feel confident in mastering new skills. A crucial phase of the design thinking process is “empathizing” – giving students authentic practice putting themselves in others’ shoes in order to understand others' perspectives.

STEM teachers that utilize hands-on learning report increased student investment, stronger perseverance and higher quality work for more students. Hands-on learning fosters higher-level thinking skills and flexibility as students work through challenges and grow in their problem-solving skills. When we ask students to discuss topics they truly care about and have immersed

themselves in, we see elevated discourse and communication.

Hands-On Learning for Students and Educators

Learning by doing, or hands-on learning, was championed by John Dewey (1902) to present real-life concepts to children at school that could be used at home and in their daily lives. An article on curriculum research from the National Math Foundation states that "kinesthetic learners make up a significant portion of our classrooms and our communities." They point to an early study by Dunn and Dunn (1978) that found 30-40% of school-age children are kinesthetic/tactile learners. Further, the kinesthetic learning style was found to be the most preferred learning style among English Language Learner students in a study by Mulalic et. al (2009). Put simply, students want to learn by doing because they are natural doers.

The good news is that, in a survey conducted by the International Technology and Engineering Educators Association, over 99% of STEM educators feel students benefit by doing activities in the classroom and nearly 95% would have their students do more if time and resources permitted. So, if students want hands-on learning and research shows it is good for students, what are the barriers keeping this from happening?

Often, a barrier is simply giving educators a starting point. Teachers receive a barrage of opinions about what they should be doing in their classrooms, but rarely is that followed up with support about how to make those changes. If we want our students to engage in hands-on learning, we must provide teachers with opportunities to learn these practices and content! WhyMaker's vetted STEM challenges and daily design challenge prompts give educators an easy first step to see how students dive into hands-on learning.

Curious About Making the Shift to Hands-On Learning?

We all see it – the world is rapidly changing around us. According to the Institute for the Future, "up to 85% of the jobs that today's college students will have in 11 years have not been invented yet." By 2029, STEM jobs are projected to grow by 8.8%. If we lack the bodies to fill these new STEM jobs, our country will fall behind in innovation and economic growth. As our friend Chris Woods says in his book Daily STEM, "STEM is not just the future of jobs, it's part of every job right now!" Engagement in STEM education across K-12 classrooms is crucial for the success of our students, our economy, and our future. However, adopting 21st century instructional practices can feel daunting, especially for those of us who have mostly traditional schooling experience. For educators looking to start their STEM and hands-on learning journey, WhyMaker workshops offer participants with immersive professional development to get them skilled up in STEM education. Feeling like you need development but at a time that's convenient for you? Try this online course – it breaks down instructional steps one-by-one so educators can jump right into STEM project-based, hands-on learning.

About the Author

Liz Gallo is a trained technology and engineering educator, international speaker and thought leader in K-12 education, she inspires and empowers teachers in schools and districts around the world with her innovative approach

to teaching STEM and Maker Education through design thinking. She is the creator of the **WhyMaker** and **The Ultimate Guide to Teaching Maker Ed** online course.

STEM Enrichment Partnerships UK

Our contact in the UK suggested we share what part of what the Innovation Corridor in the UK is doing in STEM.

Daljit Kaur is Regional STEM Lead for STEM Learning an experienced IT professional with a wealth of Project Management and technical skills who thrives in a challenging environment.

The Innovation Corridor network of STEM Enrichment Partnerships combine local expertise to provide a program of enrichment support and opportunities to schools, colleges, students and employers to enhance young people's STEM education. They are available to support with anything related to the STEM Enrichment Program, including:

STEM Clubs - STEM Clubs are out-of-timetable sessions that enrich and broaden the curriculum, giving young people the chance to explore subjects like science, technology, engineering and math in less formal settings.

Clubs are an important outlet to ignite new interest and to raise attainment in STEM subjects through more imaginative and inventive teaching methods. For more information about our program of support, please email STEMClubs@stem.org.uk

ESERO-UK - , also known as the UK Space Education and Resource Office, aims to use the context of space to open doors for young people by delivering engaging, world-class teaching in science, technology, engineering and mathematics (STEM).

Working alongside STEM Learning, ESERO-UK is able to provide influence, funding and services to improve the teaching of STEM subjects in schools and colleges and inspire young people through enrichment activities.

Nuffield Research Placements - For over 25 years Nuffield Research Placements (NRP) have matched thousands of students to thought provoking research projects. By taking part in the Nuffield Research Placements program, high attaining year 12 (or equivalent) students have the opportunity to carry out STEM research in a professional setting.

How Can We Increase Minority Representation in STEM Fields?

Many research studies have supported the findings that fewer students of color choose not to pursue degrees and careers in STEM. So many leave science, technology, engineering, and math programs before graduating with those degrees. And those students who persevere in pursuing degrees in STEM fields of study struggle to complete their degrees in four years or drop out of the STEM programs due to frustration because of lack of support (I almost did!).

Although there was an increase in the number of black students pursuing STEM degrees before the end of the 20th century, the number has stalled and declined, especially among black males, according to the National Science Foundation (NSF) Minority STEM Representation is Disappearing — Observatory Institute for the Future of Education (tec.mx),

After Years of Gains, Black STEM Representation Is Falling.

Why? (undark.org). Several factors contributed to the decline in the representation of blacks pursuing degrees and careers in STEM. For example, persistent income inequality, the disproportionate lack of access to quality schools among people of color and minority communities, the decline in outreach mentoring programs that target people of color and minority communities and fostering interest in STEM have been driving this decline since the 2000s according to the article After Years of Gains, Black STEM Representation Is Falling. Why? (undark.org. Another contributing factor was the weakening government policy on Affirmative Action.

In light of the shifted landscape of government, private organizations, and various institutions of learning policies on inclusion in STEM fields, could small steps like getting parents involved in STEM activities elevate the importance of degrees and careers in STEM fields in our community? Chris Coia suggested simple steps as visibility and participation through mentoring (as a member of a minority community) goes a long way How Can We Increase Black Representation in STEM Fields? | Diversity in Research. And I agree!

To reverse this trend, we need to double our efforts bringing awareness about the importance of STEM degrees and careers in STEM fields through small actions like parental involvement that encourage parents' participation in STEM activities at the schools, STEM clubs, and afterschool programs. Although we know that we could always count on you (parents) at the elementary school level to be involved. The focus on parent involvement must be at the elementary and also secondary and collegial levels.

I took my son to a track and field meet two weeks ago. Many parents and children were at the track event. I was in awe with the number of participants and the number of us (parents) willing to risk our health and safety in the middle of a pandemic to support our children's extracurricular activities in sports. We need this kind of community involvement and enthusiasm to encourage and cultivate STEM enthusiasm in our community. We need to design our STEM activities to include parents as we do during the parent nights at the elementary and middle school. Middle and elementary school teachers know what I am talking about. Not only for entertainment, getting parents involved in school governance, but also for STEM educational nights through fun activities.

We could name the event father and daughter, mother and son night, or Saturday event, or call it after that tv show hosted by Steve Harvey (family feud)! Wait a minute! What about getting him to host something like this? And if he got too busy (Steve is a busy man), I could host it! After all, I have the passion, enthusiasm, and charisma! (Lol, but seriously!). I could use sponsors. Any serious takers! Hollywood, I hope you are reading this post.

Furthermore, the activity could be as simple as getting parents and children to perform a simple task like acid and base reactions with simple home products or as complex as building robots for competition. Have you seen some of you (parents) with your competitive streak on the track fields?

For example, two weeks ago, parents were asked to participate in the track and field 4X100 relay at my son's track event. You should have seen us (the parents). It was fun to watch us be the admiration of our kids! Parents try out-competing each other and strategizing! I know you still have that competitive streak. It never dies. Oh, I see you dreaming of an opportunity to show what you got! You wouldn't mind competing against your kids who feel they can outrun you! I know you cannot wait to show them you are savvy when it comes to skills in science, technology, engineering, math, and the arts! You are waiting to bust out at seam! Okay, okay, take it easy; the fun and challenge will

soon ensue once the STEM community gets some buy-in from all of you (parents).

Dr. Ayo Olufade, STEM Educator, Curriculum/Teaching Specialist in STEM Education, Biotechnologist, and Consultant in STEM Education.