READER'S PLATFORM

October 2023

A RECENT SUCCESS

As interest grows in issues related to science education and a host of matters concerning marginalized groups access, the span of our engaged readers from across the globe have provided articles on a range of issues. STEM News Chronicle continues our subscription expansion and looks forward to 2024 as we offer more opportunities to share their work with peers and to add value to our subscriber's experience.

STEM NEWS CHRONICLE

"A Ray of Hope: The Inde Ed Project's Game-Changing Donation Boosts STEAM Education in Africa."

Exciting news from our corner, Larry! We're thrilled to share our latest blog post,

Miss Kim (Sally Kimangu), CEO @ Edustore Africa

Our struggle to keep the lights on turned into a moment of transformative revelation when **Douglas Alford** from the Indeed Project stepped in with a game-changing donation. His generous contribution of electronics, STEAM e-books, funds, and time has ignited a spark of hope for hundreds of kids in Africa.

In the midst of this joy, we must give a heartfelt shout-out also to **Heidi Lovett**. Her kind and selfless act of bringing these resources from the USA to Botswana has been a vital part of this journey. Heidi is on a STEAM Education training mission. Tinkering and travelling with awesome teenagers, good will ambassadors and Educators in Botswana. Thank you, Heidi, for your unwavering dedication. Your contributions are making a real difference!

We're beyond excited to set our Makerspace Implementation Plan into motion, providing quality STEAM education for marginalized communities. Read about our journey, the incredible contribution from the Indeed Project, and our vision for the future in the blog. Now, over to you! How can we all contribute to making quality education accessible to every child, regardless of their circumstances?

"That women fall off the STEM career ladder more than men do. is hardly a secret."

There are still not enough women reaching the upper end of the stem career ladder. Although the numbers of women starting stem degrees has risen over the years – particularly in the biological sciences, much less so in engineering or computing – estimates for how long it will take for parity to be reached range from decades to a century or so. Not exactly encouraging if you believe, as I do, that discovery and innovation are most successful when teams are diverse in constitution. The mounting evidence shows this is as true for research in the lab as for the bottom line of a company with a diverse board. What goes wrong?

First of all, it is clear that the problem does not simply lie with individual women. nor does the solution. my book not just for the boys: why we need more women in science, published last month, explores the evidence of how women have fared in the past and what the current state of play looks like.

I argue that the problems are largely cultural and systemic and start essentially at birth. How parents, teachers and society collectively interact with toddlers and young children is easily deduced from the messages emblazoned on their clothes. children pick up social cues from an early age, even if they are non-verbal, and t shirts that stress 'love' for girls but say 'adventure is out there' for boys – of course appropriately colored in pink and blue respectively – convey a message that's easily internalized about what is 'gender-appropriate' behavior."

Stephanie Espy, mathsp Founder and CEO

How a Cybersecurity Program Nearly Doubled the Number of Female and Male Students in Only 5 months

After participating in a WomenTech Educators Onsite Training, Fayetteville Technical Community College (FTCC) increased female enrollment in the introductory courses in the Cybersecurity AS Program by 20 female students—from 12 to 32 women in 5 months. Male enrollment also increased from 58 to 101 men. FTCC hosted a WomenTech Training conducted by Donna Milgram, Executive Director of the National Institute for Women in Trades, Technology & Science, in March 2019. Four teams participated from 4 career pathways, one of which was Cybersecurity. In 5 short months, the Cybersecurity team nearly doubled the number of female and male students and exceeded their recruitment goal (see chart).

Cybersecurity Course Enrollment Data (FTCC) 1 Semester from WomenTech Training to Enrollment				
Timeline	# Female Students	# Male Students	Total # of Students	% Female
Before Training Fall 2018	12	58	70	17%
After Training Fall 2019	32	101	133	24%

How did the Cybersecurity team achieve these results?

A team of 12 key stakeholders in Cybersecurity education—including the Chair of the Networking Department and 6 instructors—developed a robust WomenTech Recruitment Plan using the plan template provided in the WomenTech Training. One of FTCC's key strategies was to repurpose a "Monthly Tech Talk" event at the college and turn it into a recruitment event. It became a "Women in Technology Tech Talk" and the messaging was, "It's Ladies' Day at FTCC Computer Technology/Cybersecurity Labs!" Publicity included "Men are welcome too!" and indeed some came.

Female role models in Cybersecurity were featured during the 2-hour event. The Keynote Speaker was in the military reserve and a consultant for Booz Allen Hamilton. The women spoke about their experiences, the career pathway and encouraged participants to register for the introductory courses.

About IWITTS

The National Institute for Women in Trades, Technology & Science (IWITTS) has been helping educators nationwide close the gender gap for women and girls in technology since 1994. IWITTS provides tools, resources, and professional development for educators to help them broaden female participation in STEM and CTE programs where they are underrepresented. Visit our website at: www.iwitts.org

Donna Milgram, Founder IWITTS

Spreading STEM in Ghana

IoT Network Hub - Africa, is here to bridge the gap between academia and industry. We're on a mission to #empower students at tertiary institutions with the knowledge and skills they need to thrive in the era of emerging technologies, the 4th industrial revolution, and the ever-evolving world of work.

Every year, a staggering 120,000 students graduate from Ghana's tertiary institutions. However, only a mere 20% find employment. Why? Because there's often a mismatch between what schools provide and what industries require. This misalignment, coupled with a lack of essential skills, job opportunities, and inadequate job market preparation, leaves many talented graduates struggling to find their place.

IoT Network Hub - Africa is committed to preparing #graduates for the future and the evolving world of work. Through our IoT Campus Clubs, we offer a wide range of initiatives:

- Relevant & Employable Skills Training: We provide training that is in high demand in today's job market.
- Career Counseling and Guidance: We offer valuable insights to help students make informed career decisions.
- Mentorship: Our mentorship programs connect students with industry professionals.
- Industrial Internship Programs: Gain real-world experience in your field.
- Impactful Events and Conferences: Stay updated with the latest trends and insights.

Joshua (IoT Evangelist) Opoku Agyemang, President of Ghana STEM Network & IoT Africa

AI to support science teachers and their students

In spite of the billions of dollars spent on education every year in the US, American students continue to score much lower on science compared to students from other developed countries. For example, on our last international comparison, American students scored 18th, down from 13th in 2009. The Next Generation Science Standards (NGSS, 2013) and other science frameworks (k-12 standards), seek to improve students' STEM competencies at doing authentic science practices; this includes (but is not limited to) forming testable questions, collecting data, interpreting data, and communicating findings. Teachers, too, must assess these competencies. However, they lack time, lab space, and materials for both assessing and teaching the practices, particularly when they have large class sizes (e.g. Oregon with up to 50 students per class).

Typical assessments, such as multiple-choice tests, are not fine-grained enough to enough to assess students' competencies at doing science, and lab reports, typically done in conjunction with hands-on labs, do not necessarily reflect students' competencies. For example, in our research, we have shown that between 30-60% of students are mis-assessed if students' writing is used as the primary means to assess them. Specifically, those who are good at parroting what they've read or heard, but don't have a deep understanding of the practices of science, represent a false positive, and will be passed along until they "hit a wall". Conversely, those who are skilled at doing the practices of science but not good at communicating what they know in words, represent a false negative, and may not gain entry to AP science classes in high school or to STEM majors in college. Given that mis-assessments of these types occur between 30-60% of the time, this is demonstrable evidence that writing should not be used as the only form of assessment; nor should multiple choice items (as outlined above).

Inq-Blotter paired with Inq-ITS.

In our work, we argue that performance assessment undergirded by AI can rigorously assess and scaffold students in real time on all the practices expected by the NGSS and can also support teachers

in the assessment and instruction of these practices in real time—all at scale so that science literacy can be broadly realized.

The result of our efforts is Inq-ITS, an authentic, reliable, system that is aligned to the NGSS, which is now adopted by 44 states. Inq-ITS, designed using findings on how students learn science and iterative development and piloting with teachers and students, automatically assess students' inquiry competencies from their logfiles (i.e. mouse clicks) based on knowledge-engineered and patented data mined algorithms and automatically scores students' C-E-R statements based on natural language processing algorithms. The system and its algorithms allow the system to rigorously capture and assess what kinds of difficulties students have with inquiry and communicate those difficulties to the teacher in real time via an alerting tool called Inq-Blotter; the alerts give the educator a 'diagnosis' of what specific difficulties that student is having, permitting the teacher to intervene with formative support. Inq-Blotter also generates TIPS (Teacher Inquiry Practice Supports), which are instructional supports for teachers to help their students. These yield improvement on students' inquiry on their next inquiry activity, thereby demonstrating robust transfer. As of September 2023, Inq-ITS has been used in all 50 states and 57 countries. Inq-ITS and Inq-Blotter offer many benefits for students' learning and teachers' pedagogical practices, as listed below.

Regarding Students' Learning

☐ Rex, our AI agent, helps students learn key NGSS practices and apply them across different science topics.

☐ Students retain practices long-term, tested up to 170 days.

☐ Students are more systematic with hands-on experimentation after using Inq-ITS

☐ English Language Learners, Special Education learners, and students on Individualized

☐ Education Plans show marked improvement with Inq-ITS

☐ Many typically at risk students did better at home with Inq-ITS than they did in their regular classrooms during COVID (Spring 2020)

☐ Improved state science summative test results in schools (OR, AZ, NH, MA, etc.)

☐ Students' perceptions "… I know it is important to my learning!"

Regarding Teachers' Assessment

☐ Auto-scoring greatly reduces teachers' grading time of labs.

☐ Algorithms match human scoring with up to 95% accuracy.

☐ Inq-ITS identifies mis-match between students' competencies e.g. "doing" and writing about their inquiry

Regarding Teachers' Instruction

☐ Inq-Blotter alerts enable teachers to give personalized help to more students, more accurately, and more quickly than typical approaches.

☐ It helps teachers identify students that typically go unidentified.

· TIPS provide guidance to teachers as to how to help their students.

Summary

Improving students' STEM competencies is critically important and supporting teachers in their assessment and instruction of science is a key component to developing students' inquiry competencies; cutting edge technologies like Inq-ITS & Inq-Blotter support both students and teachers to: 1) assess students' competencies in real time, 2) drive a pedagogical agent to scaffold students' inquiry in real time, and 3) generate teacher alerts and TIPS in real time to support instruction. This work reflects advances in several areas including science cognition, performance assessment, and intelligent tutoring systems for science, as well as teachers' instruction of science. Due to these functionalities, systems like Inq-ITS will eliminate the separation between learning activities and assessment activities, realizing the long-range vision for both technology-based environments and reform policies like NGSS and 21st century skill frameworks. See inqits.com/research to learn more about how Inq-ITS was developed as well as some of our latest findings demonstrating students' and teachers' success with Inq-ITS.

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Janice D. Gobert, Rutgers Graduate School of Education & Apprendis, LLC & the Inq-ITS Research and Development Team

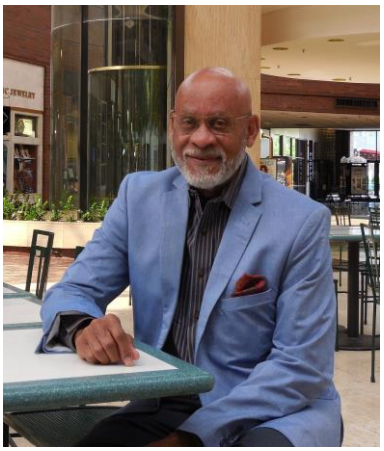
Transforming a System Built on Historical Inequities

Research and innovation benefit from a diversity of ideas, approaches, backgrounds, and experiences. Despite efforts to make science, technology, education, and mathematics—the STEM disciplines—more diverse, results have been disappointing at the national level. And the effect of the Supreme Court's recent decision outlawing race-conscious college admissions is not yet clear.

One promising effort to accelerate the systemic change needed in STEM is the Eddie Bernice Johnson INCLUDES Initiative at the National Science Foundation. In addition to the cultural and organizational shifts that are the focus of the initiative, Fay Cobb Payton and Ann Quiroz Gates emphasize the importance of sustained institutional leadership.

Higher education leaders play a critical role in championing inclusive practices and transforming their institutions. They are able to set a vision of inclusive excellence, have necessary but difficult conversations, and initiate and sustain reform efforts. Drawing from real-world examples, Payton and Gates argue that a more inclusive STEM ecosystem "will have benefits that go far beyond individual people, specific schools, or even whole communities; indeed, it promises to transform the outcomes of science itself."

Lisa Margonelli, Senior Editor, Issues in Science and Technology



Lawrence P King, Founder

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FOUNDER'S COMMENT

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