Experiential Learning Drives STEM Interest from an Early Age

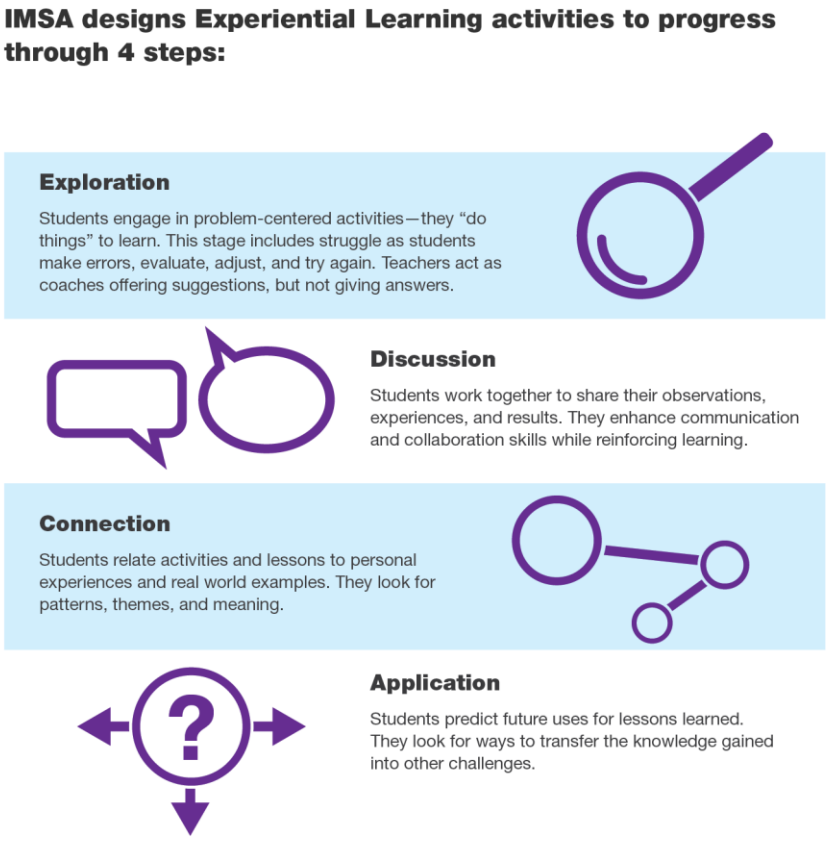
By Michelle Kolar, Executive Director for Professional Field Services, Dora Phillips, Director for Statewide Educator Initiatives, and Chris Kolar, Director of Institutional Research and Effectiveness

"Am I ever going to use this in the real world?" is a common question in science and math middle school and high school classrooms. Students taught using experiential learning techniques, however, already know the answer. They learn content by solving real world problems through hands-on activities. In other words, they learn science, technology, engineering, and math (STEM) the same way professionals do every day—by doing, sharing, and improving. Experiential learning provides the promise that the U.S. can reverse the trend of students losing interest in STEM subjects during middle school and create life-long learners who apply the scientific thought process to their career path of choice. Learning through experience is not a new concept, but it is essential in STEM classrooms. The United States needs a world-leading STEM workforce and education will determine whether our current students will be able to compete in the global marketplace of the future.

What does experiential learning look like?

Because targeting students at a young age is particularly important, the Illinois Mathematics and Science Academy (IMSA) developed IMSA Fusion, a program designed to engage children through experiential learning activities. As part of the IMSA Fusion program, you will see 4th and 5th graders studying ways to block cell phone transmission inside their research and development labs. In this activity, students build Faraday Cages out of common items including cardboard boxes, aluminum foil, and plastic containers to understand the way radio waves travel. Across the hallway, middle school students are solving problems in the aviation industry using Google Sketch-up, improving the design of airplane cabins without sacrificing profitability. In both classrooms, teachers listen to students explain their process and encourage their designs as small group facilitators.

IMSA is also proud to be a partner of Illinois Science and Technology Institute's R&D STEM Learning Exchange (RDLE), a coalition of 40+ cross-sector partners dedicated to educating, recruiting and retaining the next generation of STEM talent for Illinois industry. The Learning Exchange aligns experiential learning with Next Generation Science Standards through Challenges that match high schools with industry partners to tackle authentic, real-world problems. These Challenges range from developing new technologies for first responders in partnership with Motorola Solutions to conducting a missile trade study for Northrop Grumman. Students also lead research and collaborate with industry and university mentors through the Mentor Matching Engine.



Why do experiential learning?

Research suggests that experiential learning may boost students' standardized test scores. As part of the National Assessment of Educational Progress eighth-grade teacher questionnaire, educators were asked how frequently their science students participated in hands-on activities or scientific investigations. Teachers selected one of four responses: "never or hardly ever," "once or twice a month," "once or twice a week," or "every day or almost every day." In 2011, students whose teachers reported that their students did hands-on projects every day or almost every day, scored higher on average on standardized tests than students whose teachers reported less frequent hands-on activities.

IMSA created the student enrichment and teacher professional development program IMSA Fusion to foster hands-on learning that is competency-driven, inquiry-based, problem-centered, and integrative. The program began during the 2000-2001 academic year with seven pilot sites serving students in 6th through 8th grades. In 2007, IMSA Fusion was expanded to include a program designed for 4th and 5th grade students acknowledging research that shows 65% of doctoral-level science candidates established their interest in science before middle school (Maltese & Tai, 2010). This year IMSA Fusion will serve approximately 4,000 students in 160 programs across the state, targeting students who are historically under-served and under-represented in STEM.

IMSA Fusion also addresses needs identified by The President's Council of Advisors on Science and Technology Executive Report, which states that US schools, "lack teachers who know how to teach science and mathematics effectively—and who know and love their subject well enough to inspire their students. Teachers lack adequate support, including appropriate professional development as well as interesting and intriguing curricula" (2010). All IMSA Fusion curricula provide experiential learning STEM activities that are student-centered, standards-based, and engaging. Participating teachers receive professional development and ongoing support in order to solidify and strengthen a strong and positive association between student interest in science, teacher discussion of STEM careers, and activities that bring examples of local applications of science into the classroom (Maltese & Tai, 2011).

By transforming the way students and teachers engage with science and technology in the classroom, experiential learning promises to address some of the most persistent challenges in STEM education. The results from innovative programs and initiatives, such as IMSA Fusion and the R&D Learning Exchange, will help transform how STEM subjects are currently taught in Illinois schools and beyond.

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