COMMENTARY: **Laura Arndt**

# Inspire Problem Solvers With Purposeful STEM Projects

By Laura Arndt

*Laura Arndt*

When science, technology, engineering, and mathematics (STEM) first entered the academic mainstream, it promised integrated, deeper learning rooted in real-world experience. Classrooms became filled with the latest STEM gadgets, tools, and technology. The engineering design process took center stage as students engaged in more hands-on experiences. This movement renewed enthusiasm among students, teachers, and administrators and initiated a new wave of community programming.

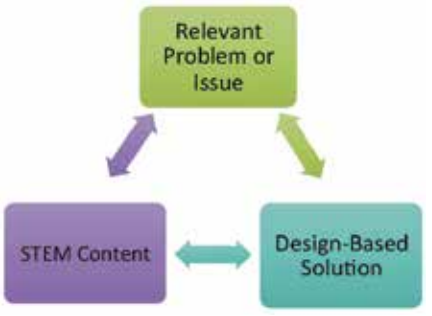
Now, however, many STEM educators are finding that the novelty is fading and with it the enthusiasm for STEM learning. Transforming an activity that is materials-based into a real-world project that sparks curiosity in the learner is challenging. Yet this is the educational strength offered by the engineering design process and the *Next Generation Science Standards* (*NGSS*). Without pedagogical support, STEM educators may continue to introduce learners to new technologies as the latest fad instead of as the next fundamental tool for addressing actual problems.

In the flurry to incorporate STEM, many educators overlooked its core strength: using technology and the engineering design process to address the real-world problems and issues meaningful to the learner's culture, community, or interests. When we incorporate these elements into dynamic, project-based STEM lessons, we not only deepen relevance, but we also create opportunities for 21st-century skill application and cross-curricular connections.

## Grounding STEM Projects

In an authentic STEM project, content and lesson design are grounded in a problem or issue that the learner cares about, offering real-world impact to learning content and designing solutions.

In one Colorado classroom, for example, students used a 3-D printer to make Braille books for sight-impaired students. In two Massachusetts and Colorado middle schools, students have used their printers to design prosthetic limbs for war veterans in their community. These students were directly connected to the outcome of their engineering design efforts.




## Where to Start

Three essential pieces unite to create an authentic, relevant STEM project: a problem, the content, and the solution. The primary curricular goal starts the creative process as the first piece. The other two pieces support the goal to create a project with an impactful purpose.

**Start with content:** A Georgia eighth-grade class wanted to apply their understanding of electricity by helping to solve a local problem, re-routing a transmission line across a lake. They collaborated with the professional engineers working on the problem. The students researched and offered input on the engineers' proposed solution to build structurally sound, aesthetically pleasing towers that would support power lines spanning the water. The students built relationships with role models in electrical and structural engineering careers, explored community issues, and applied their required learning about electricity to help solve a real-world problem.

**Start with the problem:** Students in Arkansas noticed an ecological dead zone in the Gulf of Mexico near the Mississippi River delta. They wanted to determine why the water lacked enough oxygen to support life and to report their findings to decision makers. How would they monitor and collect data about the water? The solution they chose was to build a data-collecting drone to fly over the targeted area. Achieving this required students to learn about and apply content concepts (e.g., water quality, chemical composition, watersheds, agricultural practices) to understand and address the problem, design the solution, and present findings to decision makers.

**Start with the solution:** A Colorado school district created a sustainability program highlighting ideas that schools could implement to address school-relevant problems. Schools choose a goal—gardens, lunchroom composting, school-wide recycling, or electrical use and cost reduction—to integrate into their students' learning experience. Then they match the academic content needed, and students apply their learning to create a solution.

These real-world STEM experiences provide clear purpose and inspiration for learning academic content to understand and solve problems students care about. In turn, students gain confidence in using critical-thinking and problem-solving skills beyond the classroom and throughout their lifetimes. Sara Cooper, science education specialist at the Nebraska Department of Education, explained the essence of purposeful STEM: "As we think about the world we are preparing students for, we know they are going to be solving problems we don't even know exist. The only way to prepare them for the future is to facilitate their learning by engaging them in solving problems that we are faced with in our schools and our communities today."

Have you considered what purposeful relevant STEM experience would inspire and empower your students? ●

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