A crisis in STEM education: We must fund STEM education research focused on interdisciplinary problem solving

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Emily Warrender June 12, 2025

Reductions in STEM education funding occur at a crucial time when interdisciplinary problem-solving is vital for innovation. Nancy Butler Songer highlights the importance of Iterative Science and Engineering (ISE) programs, where students engage in cycles of designing and testing solutions to regional problems

Recent reports indicate that in 2025, the National Science Foundation, which funds a significant portion of research in fundamental science, technology, engineering, and mathematics (STEM) at American universities, terminated more than 1,600 active grants worth approximately $1.5 billion. The area experiencing the most significant cuts is grants focusing on STEM education. In addition, in 2025, the National Science Foundation demonstrated the slowest pace of new grant awards seen in 35 years, with an 80% reduction in funding for STEM education (Bhatia, Cabreros, Elkeurti, & Singer, 2025).

This crisis comes at a pivotal time. As innovation continues to rely on interdisciplinary problem-solving and collaboration across areas of expertise, we need scientists and engineers who are fluent in problem-solving across overlapping areas of science, technology, engineering, and mathematics to design, revise, redesign, and implement interdisciplinary solutions. As outlined in one recent policy document, ‘Science is an essential tool for solving the greatest problems of our time and understanding the world around us… [it] enables people to address complex challenges in local communities and at a global scale, more readily access economic opportunity and rein in life-threatening problems such as those wrought by a global pandemic’ (NRC, 2021).

However, interdisciplinary problem-solving and collaboration in STEM cannot wait until individuals have completed their schooling or are active professionals. Students are aware of interdisciplinary STEM issues that affect their future. We must develop, evaluate, and revise excellent STEM education resources to guide their learning.

New instructional approach

Over several years, our research team has developed an instructional approach and classroom activities that support students in iterative cycles of science and engineering activities, resulting in the design and testing of solutions to local environmental issues. Our instructional approach, Iterative Science and Engineering (ISE), guides students

through multiple iterative steps to select and define a regional problem, conduct research, create various designs, build one or more solutions, and test their solutions in authentic contexts.

In our curricular programs, we select pivotal interdisciplinary STEM topics as focal points for our six-week curricular units. For example, a recent curricular program guides adolescents to conduct research on the impact of invasive insects on local agriculture or study the worldwide decline of pollinator populations, as over 87% of flowering plant species and 87% of global food crops rely on pollinators for seed production (Brunet & Fragoso, 2024). After conducting the research, students engage in iterative cycles of designing and testing a solution to the local problem.

Research studies

Over several years, we conducted research studies on student learning associated with our ISE curricular programs. Working with 554 adolescents and seven teachers in five schools, we conducted three research cycles to address the question: What science and engineering knowledge do adolescents demonstrate associated with curricular programs that follow the Iterative Science and Engineering instructional approach? Between each research cycle, we analyzed student outcomes and gathered information from teachers and students to make improvements to the Invasive Insects unit.

Our results demonstrated significant statistical improvements in students' performance in each research cycle, with varying outcomes. For example, while most students demonstrated considerable learning of science and engineering concepts and argument construction across all three cycles, significant gains in engineering design were not observed until the third cycle. These differential outcomes correlate with two changes to the cycle three curricular program. First, in cycle three only, all students physically constructed and evaluated at least two trap designs. Second, all students conducted a guided reflection on the feasibility, stability, cost, and impact of their first trap to inform the creation of a more successful second trap. As a result, the changes to the curricular program, which emphasized iteration between engineering design and scientific investigations, led to the strongest outcomes (Songer, Calabrese, Cordner, & Aina, 2024). Interestingly, this iteration process between engineering and science mirrors the work of professionals. 'The line between applied science and engineering is fuzzy. It is impossible to do engineering today without applying science in the process' (NRC, 2012; p. 32).

Conclusions

Interdisciplinary problem-solving in STEM is challenging; it requires multiple exposures, diverse expertise, reflection, and practice. Therefore, we must continue to introduce all students to interdisciplinary STEM problem-solving in primary and secondary schools. Research studies in STEM education are essential not only to determine how to best prepare learners for reflective, iterative, and interdisciplinary STEM problem-solving but also to help attract a diverse range of individuals to STEM fields and prepare all citizens for the challenges ahead.

References

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ADOPTING A SOLUTION

WHAT IS A LANTERNFLY?

A Lanternfly is a planthopper insect that originates from Asia.It is an invasive species that currently resides in 4 other countries. It has spotted wings that are red and black

BACKGROUND & SOLUTION

Invasive species?

An invasive species is a non-native species that spreads and harms the environment and other organisms in that area.

appetite & negative impact

The Lantern fly feeds on the sap from plants, primarily the sap coming from trees. Their harmful existence not only damages the plants, but also the animals thriving from these plants, such as bees, whom´s lives positively affect the environment

Solution

We have adopted the solution to this problem: Egg scraping.

How it works

When you see Lantern-fly nests of eggs, make sure to scrape them with the listed materials below. It is probably best to study the eggs just to be sure that another species´ eggs are not killed

When it should happen

We should begin in the late fall to winter, once eggs have been laid and adults begin to die off

materals needed

Use any logical object to eliminate the eggs. Things like credit cards or keys could work to scrape off the eggs

Make sure you properly egg dispose of the effectively mass to effectively get rid of those eggs