Will design-thinking strategies benefit students after class is dismissed?

April 22 2019

Credit: CC0 Public Domain

As schools focus on building students' capacity to learn and solve problems outside the formal classroom, many educators have embraced "design-thinking" strategies as a promising approach.

The appeal of design thinking, which evolved out of strategies to improve product design, is that it fosters brainstorming and collaboration

skills that are valuable in a changing world where many challenges don't have textbook answers.

But do design-thinking strategies actually improve a student's performance? Perhaps more important, will students use those strategies outside of school? Until now, both questions have been hard to measure.

A new study by researchers at the Stanford Graduate School of Education (GSE) provides some answers: yes and yes.

The study, published in the Journal of Learning Sciences on April 15, found that students applied the strategies they had learned to entirely new problems, without prompting, and that they also performed better on projects. Notably, the biggest benefits went to low-achieving students.

Doris B. Chin and Kristen P. Blair of the H-STAR Institute at Stanford GSE led the research.

"The overall takeaway is that we were able, through instruction, to change the way students were able to approach problems," said Chin. "The strategies we thought would be good are in fact good, and the kids are choosing to transfer them from classroom instruction to a different environment."

Introducing two design-thinking strategies

The study involved almost 200 sixth-graders at Hillview Middle School, a public school in Menlo Park, Calif., that has partnered with Stanford GSE on multiple research projects.

"Design thinking has received a great deal of attention by a number of fields, including education," said Erik Burmeister, superintendent of the Menlo Park City School District, who served as school principal at

Hillview at the time of the study. "Our schools implement strategies that appear to have merit, but we don't always know how to measure the impact of those efforts. We know that inquiry-based learning has value, but what exactly is that value?"

The study entailed both classroom teaching and a novel assessment program after the classwork was over. In the classroom portion of the study, teachers coached students on one of two specific learning strategies and assigned projects where the students would apply them.

The first strategy was to seek out constructive criticism, which many educators believe is crucial in helping people objectively evaluate and refine their ideas. The second strategy was to consciously explore and test multiple different answers to a single challenge.

Both strategies aim to prevent what Chin and Blair call "early closure," the tendency to rush toward the quickest and easiest answer to a problem.

Roughly half the students were coached only about constructive criticism, and the other half were coached only on exploring alternative answers. The teachers then encouraged the students to apply the strategy they had learned to several different projects.

In math classes, for example, students were told to design a house or a novel candy box. In social studies, students were told to design a process for making classroom and school decisions more fair.

The researchers' big question was whether the classroom coaching made students more likely to apply the strategies to different problems, without anyone prompting them. To test this transfer, the researchers gave students online assessments after all their classroom work was completed. These assessments resembled online games and represented

entirely new problems, to see if students would choose to apply the strategy they had learned to these new projects.

To measure their openness to constructive criticism, for example, the students were asked to design posters for a school fair and were given a palette of images, phrases and fonts. After completing an initial poster design, the students were taken to a viewing room with a "focus group" of animal characters. The students were asked to choose whether they wanted positive or negative feedback. (Both positive and negative were designed to be equally informative. Positive feedback might be "It's good you told them what day the fair is!" The negative feedback, or constructive criticism, might be "You need to tell them what day it is.")

The students could then revise their original posters, and the computer would evaluate their quality based on a list of graphic design principles.

The results were striking. For one thing, students who asked for constructive criticism tended to revise their posters more and produce better poster designs. On top of that, they were also more likely to do better on a post-test about graphic design principles.

Greatest impact on lower-achieving students

At the study's outset, standardized test scores revealed that lower-achieving students lagged well behind their higher-achieving peers in seeking out constructive criticism and exploring multiple possibilities. After the classroom coaching, however, the gap almost disappeared.

The researchers say their results indicate that the classroom instruction seems to have made the difference. The students who were taught only about constructive criticism became more open to negative feedback, but they did not become more willing to explore alternative answers. The reverse was true for students who were only coached on exploring

multiple alternatives.

It isn't clear why the impact was bigger among lower-achieving students, but the researchers say the finding defies what may be conventional wisdom among educators.

"In talking to teachers and administrators beforehand, many had thought this would likely benefit higher-achieving kids the most," said Blair. "The opposite was true. To me, it's important that people realize that this kind of enriching activity should not be limited to higher-achieving kids."

More information: Doris B. Chin et al. Educating and Measuring Choice: A Test of the Transfer of Design Thinking in Problem Solving and Learning, *Journal of the Learning Sciences* (2019). DOI: 10.1080/10508406.2019.1570933

Provided by Stanford University