Design Creativity!

By Phyllis Newbill and Liesl Baum

Want to inspire creativity in your students? Start by honing your own critical-thinking skills using this four-part process.

Technology is revolutionizing the way the world works, and there seems to be no end in sight. Information is everywhere and easy to find, so today's students will need to know what to do with it to be prepared for the overly stimulating, technology-driven, problem-riddled world they will soon face. That's why critical- and creative-thinking skills are vital.

Critical- and creative-thinking skills include idea generation, reflective judgment, self-regulation, and attitudes and dispositions. While many view these skills as intuitive, we present them as teachable.

By combining technology integration with thinking skills, educators can better prepare students for the world of industry and innovation. The question becomes how we can seamlessly integrate technology while teaching critical- and creative-thinking skills. One piece of the answer is to start at the top by developing teachers' critical- and creative-thinking skills. Second, educators must use technology products in surprising and creative ways to engage students.

Develop Teachers' Skills First

We are part of the Integrated Design + Education + Arts Studio (IDEA*Studio*) in the Institute for Creativity, Arts, and Technology at Virginia Tech, and we believe the best way to teach critical- and creative-thinking skills to students is to develop and exercise your own first. So we involved teachers in a process that helped them build their skills—and we got plenty of our own practice in the meantime.

The Virginia Tech–funded faculty projects, called Educational Enhancement Collaboration grants (see "Educational Enhancement Collaboration Projects" on page 18), were based on three criteria:

- They had instructional potential.
- They made creative use of technology.
- They included products of the arts.

First, teachers worked with faculty teams to define the direction of the projects and to design and develop instructional materials to support the products. We held two teachers' workshops—one focused on developing instructional materials and another on evaluation. Activities in each workshop emphasized the four components of critical and creative thinking:

Idea generation. This involves generating lots of ideas, expanding ideas, exploring new directions, and looking at ideas from various perspectives. We started by selecting a theme and posting it where everyone could see it, such as on a whiteboard or flipchart. Teachers then wrote ideas on sticky notes and attached them under the theme. Participants put up as many sticky notes as they had ideas, and they were encouraged to build on other ideas to spark new ones.

Reflective judgment. This is the process of analyzing, synthesizing, and evaluating the ideas resulting from the idea-generation phase. We encouraged teachers to rearrange the notes to sort ideas. Another strategy we used was based on Ed DeBono's book *Six Thinking Hats.* In this approach, you examine ideas from six perspectives:

- Examine ideas and gather facts
- Respond emotionally
- Identify flaws
- Identify positive attributes
- Generate new ideas
- Manage the process

This exercise stretched participants' critical-thinking skills beyond their comfort zones and generated many strong ideas.

Self-regulation. This involves managing time and resources. In our workshops, teachers first developed a plan for how to proceed with their challenge and presented it to the group. They monitored their progress and then reflected on the process and product after the project was complete.

Attitudes and dispositions. This is probably the most important element. One strategy we used in the teacher workshops was the "yes, and…" strategy, borrowed from improvisational theater. When someone presents an idea, others not only listen

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Educational Enhancement Collaboration Projects

Project Title	Description	Technology
Virtual Jamestown: Paspahegh Village	The virtual Paspahegh project is a 3D re-creation of a Native American village near Jamestown, Virginia, USA. The layout and artifacts of the village are entirely based on archaeological data, illustrations, and journals from the period. Younger learners explore natural resources and cultural differences. Older learners brainstorm and storyboard game scenarios set in the village.	Internet, free 3D game development program
Movement through Music and Visual Arts (MMUVA)	Using cameras and MMUVA software, students' movements are converted into visual and audio representations on an electronic canvas. As students interact with the technology, they create something unique and completely dependent on their personal motion. To understand the inspiration for the brush strokes, learners explore the history and context of Jackson Pollock's art.	Webcam, internet, speakers, projector (optional)
Sound Fields	This project teaches about sound and light using a field of soundflowers—virtual flowers that respond to a sound's direction, frequency, and intensity. Students develop an understanding of the characteristics of sound waves, magnetic fields, and light by exploring the field of soundflowers, a field of compasses, and even a football field.	Internet
Interactive Taiji	Interactive Taiji combines the physical and mental benefits of Taiji (tai chi) movements with the context of Chinese music. The program is delivered using the Wii Fit platform. Input from the platform drives the simulation by monitoring participant posture and movements. Learners explore the history of tai chi in the context of the history of China. They use data from Interactive Taiji to create graphs and track their progress.	Wii Fit board(s), computer, projector, OSCulator software license (available online)
Rhythmatical	This iPhone/iPod app is a game that uses music to learn math. Using the interactive capabilities of the iPod touch, students learn math in tactile and kinesthetic ways. Younger students will explore the process of game design while older students will learn game development, allowing for multilevel collaboration. Students not only play the games, but also take part in the design and development process.	iPhone or iPod touch, free Rhythmatical app from iTunes
Prototyping in Architectural Robotics for Technology-enriched Education (PARTeE)	This project combines the use of robotic technology and responsive architecture to illustrate how robotics can be used to create environments that respond to human and natural interaction. Through the use of basic robotics, sensors, and prototypes of building designs, students explore how changing variables affect the architectural design/environment. Students learn the costs, benefits, and environmental implications of energy-saving architectural designs.	FLOWer kit with sensors (available through IDEAS)
Merging Arts and Engineering via Rapid Prototyping	Rapid prototyping is used in engineering to do cost-effective testing of products before mass production. This project illustrates the bridge between the arts and engineering, showing students with strong artistic skills their role in the field of engineering. Learners explore how simple machines are used in combination to make the rapid prototyping machine work. They also design objects to be created by the machine.	3D printer, free computer modeling software, videos of prototype machine in action

What can you do with a computer, an internet connection, a webcam,

and consider, but also add to the idea. In this approach, ideas are not ignored or immediately thrown out.

Use Tech to Build Thinking Skills

As we worked through the process discussed above, teachers, faculty, and our team developed products that make surprising uses of everyday, affordable technologies. Using technology such as the internet, webcams, speakers, computers, smartphones, Wii Fit boards, and projectors, students and teachers built their own critical- and creative-thinking skills.

What can you do with a computer, an internet connection, a webcam, and some speakers? Imagine letting your students move in front of the camera as their movements generate brush strokes on the screen and music through the speakers. The brush strokes, inspired by Jackson Pollock, are part of a lesson about the Great Depression and Pollock's art. (Find more project examples in "Educational Enhancement Collaboration Projects" on page 18).

Educators can use technology for word processing, drill and practice, and presentations, but these applications typically won't do much to build students' critical- and creative-thinking skills. Creative uses of technology will plant the seeds for creative solutions.

It's the Process, Not the Product

At the inception of the IDEA*Studio*, we were charged with using products of the arts to teach content to PK–12 students while developing critical- and creative-thinking skills. We began with the understanding that simply developing products—such as those listed in the table on page 18—and handing them to teachers would accomplish this. We have since come to understand that the process is infinitely more important than the product. As such, we encourage you to engage your students in the process of critical and creative thinking and consider products as a bonus.

To do this, we suggest you start by building your own skills. Get involved in a design project or collaborate with teachers of other disciplines with a common goal in mind. If possible, involve your students while you are working on the project. Take action to develop and practice your own critical and creative thinking so that you will be at ease teaching the skills and process to your students.

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and some speakers?

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