Science

Science+Technology=Creativity (and Fun!)

Scientists have a reputation for being linear thinkers, implicitly following a set of procedures or protocols that will allow them to investigate and solve problems. Given this traditional view of scientists, how do we encourage students to be creative and innovative? In order to break ranks from this stigma, science educators must employ the sub-skills described by the NETS•S. Labs and hands-on exercises help students identify trends. Online simulations and applets provide students with opportunities to investigate areas not easily seen in the visible world. Here's a three-step process that will help you encourage your students to be creative in their scientific endeavors:

Give them the tools. Students need opportunities to use the tools of scientific and creative inquiry. So get out the microphones, digital cameras, camcorders, and probeware. Introduce preliminary assignments that teach students how to use these devices in conjunction with clear laboratory or investigative expectations. One assignment might focus on using a microphone to make a podcast about the results of an experiment or demonstration. In this model, the students learn the basics of the hardware and software alongside the content. This allows the technology to seamlessly become a tool contained within their digital toolbox. The technology becomes invisible.

The next assignment in this scaffolded progression requires students to incorporate digital images that archive their experiences in an Excel or PowerPoint presentation. By providing both structure and clear expectations, these assignments build students' technical knowledge base. Once the students begin to see the tools as supportive, but ancillary, components of their learning, they will be on their way to choosing appropriate technology tools to complete their assignments.

As you progress through the year, you will need to facilitate the process by guiding students toward the proper hardware and software choices to match their creative and innovative needs. By the second semester, you will be able to challenge students with assignments that are both vague in procedural expectations and open-ended in product description. This type of assignment, combined with the first semester preparation, elicits innovative products that demonstrate a high degree of cognitive processing.

Give them the time. The transition to an open-ended approach requires more time to complete the process and more time to adequately explore each new technology or tool. Keep in mind that technology can also make this approach faster. For example, probes allow students to collect many samples in an experiment as well as conduct multiple trials. This gives students an opportunity for a more in-depth investigation, focusing on the trends and patterns of the data, instead of the collection process. As students become more proficient with the software and hardware tools, they will become faster and produce creative results without "losing" time from the curriculum.

Be vague. Once students have expanded their digital toolbox and are given the necessary time, be intentionally vague in describing the final product. Provide the required content, dictate the number of graphs and tables of results that you want, and describe the procedure. But don't be specific about the medium of their final product. This will encourage projects that are innovative and creative.

Consider what happened at our school when Ben Smith transformed a typical lab assignment that involved teaching students about waves using Slinkies and ripple tanks. Using the traditional model, he gave students detailed instructions and created tables for them to complete. Students answered questions and filled out forms when they finished their experiments.

To draw out creative thinking skills, he decided to try a different approach. He asked students to demonstrate how the ripple tank works and to offer some cautions on how to keep the Slinkies from becoming tangled. Instead of giving them handouts, he offered a list of areas for them to explore.

The final product was simple: Describe what waves do. Most students created PowerPoint presentations with pictures and descriptions. However, one group created a music video where students wrote the lyrics and performed the song themselves. They had, in fact, done exactly what the teacher had asked. In the context of their lyrics, they described what waves do. The result was a fantastic and creative project that was very personal to those students and their learning styles.

When other students saw this product, they questioned why they were not told that they could make a music video. A transformation was taking place among his students, both with

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the group that created the video and the  that did not.

With the next assignment, more groups found creative ways to communicate their work. During the annual physics field trip to our local amusement park, the students were assigned to become experts on one ride. One group used our class iPod along with a clip-on microphone to record themselves describing the physics of a roller coaster. Imagine yourself, hearing the click-clack of the track pulling the cart up the hill as the students are explaining how they are gaining potential energy. Now, as you hear the screams of the riders going down the first hill, they are describing how they are gaining kinetic energy.

This was the exact behavior that we are trying to elicit. The students were taking a tool and applying it in an innovative manner. We keep some of these examples online at www.edtechinnovators.com for future students to see, inspiring them to stretch toward more creative and innovative work. The key to facilitating instruction that elicits these types of assignments is to provide students with the tools, give them the time, and then get out of their way.

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