For the classroom

Classroom experiences using STEAM-infused PBL

These are highlights of my journey with second-grade students as we delved into the possibilities of STEAM-infused PBL to become creative tinkerers, cycling processors, curious and critical thinkers, clarifying content communicators and persistent refiners.

Creative Tinkerers

“What are all these fairy-tale characters having so many problems?” “Couldn’t they think through what was needed to be more successful?” These were the questions my students were having as we made our way through a fairy-tale literature study. I paused. These fairy-tale characters were real for the students. They wanted to help the characters be more successful. A STEAM-infused PBL unit was born!

Title: Fairy-tale STEAM-infused PBL
Entry Event: Fairy tales
Driving Question: How can we help these fairy-tale characters be more successful?

The students grouped themselves according to the fairy-tale character they wanted to help. They researched various versions of the story to determine what worked best to help the character and determined the problem that needed a solution. Next, each member of the group brainstormed four solutions to the problem and presented them to their peer group members. They discussed and negotiated a new design based on the best of all of their designs put together. After creating a detailed and labeled drawing of their design, they built a prototype. After building the prototype, the students tested it, critiqued it, redesigned it and retested it to improve and refine the product. When they finalized the prototype, the group determined the best way to present the character, the story and their product. They completed preparations for their presentation and practiced defending their choices. All groups set up their products in the PE room and awaited grade-level peers. As the first guests came in, the exhibitors were ready to explain, discuss and defend their products that would help the fairy-tale characters be more successful.

Cycling Processors

I loved how the students took charge of their own products and processes. They made significant gains in using the engineering design process. Numerous standards were met. However, there were some pieces missing from true STEAM-infused PBL, three of which were mathematics, authenticity and the reality of the products created. I wanted to take the students to the next level!
Title: Enhance My Own Life STEAM-infused PBL
Entry Event: Fairy-tale products
Driving Question: Can we develop products to help ourselves be more successful and market our ideas to others?

Students found challenges in their own lives to work on. Several students had similar difficulties, so they worked together to research the problem, came up with various solutions and negotiated the best (or a final) solution. Then they built, tested and refined a prototype. Next, they completed a simplified cost analysis of the item to determine approximately how much it would cost to build. Several students called shop owners or supply stores for prices of items needed. Based on how much it would cost, they determined what they would need to charge customers to make it worth building. They created and refined advertisement mock-ups to market their idea. All through the cycle, they critiqued both their own and their peers’ products, advertisements and cost analysis figures. They practiced explaining and defending their product. When exhibition day came, students were anxiously awaiting members of the community and school partners with exhibitor badges, ready to “sell” their products and ideas.

Curious and Critical Thinkers

Since we are a STEAM school, we adopted the Next Generation Science Standards (NGSS) as soon as they came out. Earth science content included a Disciplinary Core Idea that had not been present at second grade, and which would help students complete the performance expectation, as well as science and engineering practices and cross-cutting concepts. I was excited to get started!

Title: STEAM-infused PBL: Landforms
Entry Event: Landform song and landform video
Driving Question: What, where and why are landforms on Earth?

Students grouped themselves according to the landform they were most interested in. They researched the landform to answer what, where and why. They created a teaching poster. Since they were in groups, they had to negotiate meaning prior to placing information on the poster. They refined their drawings and information. Next, they selected one of the locations of the landform they researched and found out more information about that particular landform, including its size and its location. With that information in hand, they brought up their specific landform on Google Earth and created a two-dimensional model of the landform.

Working together, they determined what would be the best way to build a three-dimensional model of the landform given the information they learned, the poster they created, Google Earth’s model and their two-dimensional model. Although they did not have to build the model to scale, they had to figure out how to fit everything on a 6x6-inch base. Groups were provided with a 6x6-inch cookie as a base on which to build an edible three-dimensional model of their landform.
and its surroundings. When parents arrived, students were ready to discuss and teach using their poster, Google Earth, their two-dimensional model and their three-dimensional model.

**Clarifying Content Communicators**

After attending book study sessions about the book *Academic Conversations: Classroom Talk That Fosters Critical Thinking and Content Understandings*, I realized that we needed more clarifying content communication in my classroom. I was also taking a course in which we were writing and testing STEAM lessons that others could duplicate throughout the district. I developed an engaging PBL activity that would enable students to carry on deeper conversations about the content and that I could videotape for colleagues to critique for refinement of the lesson.

**Title:** Design a P Wave Model STEAM-infused PBL

**Entry Event:** *Earthquake Shake* book and earthquake video, human model of a P wave

**Driving Question:** How can we model a P wave so that we and others can understand it?

After viewing the earthquake video and reading the *Earthquake Shake* book, students actively participated in academic conversations about what they thought would happen with the human model of the P wave. Intense discussions took place all along the way through the human model and their own created models. Students were critiquing and making meaning as they demonstrated their models for each other in paired groups over and over again. By the time the weeklong investigations were completed, we all had a very clear picture of a P wave in an earthquake. The students wanted to make their own analogy model book about P waves to share with other students at the school who would be studying P waves. They thought it would be exciting for the students to try out their models and negotiate meaning just as they had.

**Persistent Refiners**

The journey continues. Below is another STEAM-infused PBL activity I have planned.

**Title:** Natural Disasters STEAM-infused PBL

**Entry Event:** Students’ ongoing excitement about the rock cycle, weathering, erosion, deposition, earthquakes and volcanoes

**Driving Question:** What natural disasters occur here in our area and how can we prepare for them?

Students will research natural disasters for our area to find out what Earth events we might expect in our area and whether they will occur quickly or slowly (NGSS). Students will use information from their research and from consulting local citizens and departments to engineer a way to prepare for the disasters. Their driving questions and projects could involve what citizens can do to avoid flooding issues, what citizens can do to prepare for flooding or what citizens can do to prepare for an earthquake. They might put together radio spots for public announcements or brochures for how to prepare for natural disasters in our area. They might create a coloring book that the flood commission could use for educating area citizens.