

*Engaging Islands of Unbridled Curiosity: Using Service Learning
to Motivate Creative Applications of Theoretical Understanding*

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How could it not be a good idea to challenge college students to roam about in a world of 5th grade curiosity in search of intimate, life-changing events? It didn't seem quite so bold at first. The idea was to break into groups, find an interesting project to share with a class of young kids who don't know the difference yet between learning standards and exposure to new things in the realm of discovery, and make it happen. But then something happened no one was expecting. It stopped being an instructional exercise and became a life-affirming experience. Ever wonder what it might be like to watch a swarm of 2nd graders descend on your experimental apparatus for testing the eruptive power of Mentos tablets dropped into 2-liter bottles of Diet Coke? Listen in for a moment and see what you think:

“In planning this experiment, I figured the kids would be energetic and excited, but I really underestimated how crazy kids can get. As we were setting up, I was told it was some kid's birthday and that they would be eating cupcakes before they came out to do the experiment. Which is great because nothing calms down kids like sugar and explosions.

“We set up the stations and the demonstration table outside on tables in the playground area. The station required distributing tiny bottles of sodas and the various reactants. The demonstration table required untangling fishing line from a little apparatus I concocted to make the Mentos reaction go smoothly. It was just a bottle cap with fishing line and a needle strung through a hole I punched through it. The idea was that I could poke all the Mentos on the needle and drop the whole thing by simply letting go of the string. We had eight of these things and they all got tangled on the way to the school. We were pretty strapped for time and we tried to get everything set up quickly but two obstacles arose: wind and 2nd graders. The wind blew every thing around and it was a real pain to get everything untangled in it. If that wasn't frustrating enough, we got ambushed. At first they came in a pack of

three. They were curious about what we were doing. They asked questions and I was happy to answer them. I explained to them that it was a science experiment and we were doing this with the 5th graders. Then more showed up. And then even more. We ended up with a pretty good size crowd of 2nd graders that surrounded us. My partners and I grew increasingly wary. We would pass nervous glances at each other knowing this situation was going to get out of hand very quickly.

“And it did. They started out asking for sodas. I told them no. Then in a coordinated maneuver they sprang onto the table and started grabbing 2-liters and Mentos. We frantically tried to get them off to save the experiment. I kept looking for a yard-duty or a teacher as I pushed kids off our needle filled table but none were in sight. I pictured them perched in a classroom joyfully watching through a window as the naive college students got devoured by a hungry pack of scavengers. It felt like we fighting off hungry badgers with bacon mitten while attending a heavy metal concert in a tornado. Then the school bell rang. Never has a school bell sounded so relieving. Our battle was over. We had made it and our experiment was still salvageable. I rushed to set up the demonstration while my partners unpacked all the sodas. At this moment Beth’s class came running out and they were all wearing trash bags....”

In the midst of pursuing his college education, Eddie had fallen for the grand temptation to explore volcanic chemical reactions with Beth Gorman’s fifth grade students at Rose Avenue School in Modesto:

“I chose this reaction [between Diet Coke and Mentos] because the reaction is very energetic and I thought the kids would love it. I also chose it because the reactants were not harmful in anyway to the kids. They could splash around and make a mess and there would be no adverse health consequences. The reactants were also edible and nontoxic.

“My goal was to introduce the kids to a new path to thinking scientifically. From my own elementary education, I remembered being taught the scientific method, but we never actually got our hands dirty doing an actual experiment. I wanted to show them that the scientific method was something that allowed them to do really cool and interesting stuff.

“The experiment’s aim was to determine the cause of the energetic reaction [between Diet Coke and Mentos]. We would test three hypotheses.

“The first hypothesis was that the reaction is caused by an acid/base reaction. We tested this by adding baking soda powder to Diet Coke, orange soda, sprite, and sparkling water.

“The second hypothesis was that the coarse, bumpy surface of the Mentos tablet allows the dissolved CO₂ to bubble out. All the bubbles would cause the pressure to rise, causing everything to jet out. We tested this by adding rock salt, which is very coarse.

“The third hypothesis was that the gum arabic found in Mentos tablets cause the reaction. We tested this by using a non-mint variation of Mentos containing this same ingredient.

“From these experiments we determined that all three reactants cause a reaction to occur in soda. We also saw that diet coke consistently produced a bigger reaction than the other sodas and sparkling water. We also discovered that sparkling water had the smallest reaction every time. All three reactants we tested produced a reaction, but not to the same extent as the original Mentos. Since the original Mentos utilized a combination of all three factors to produce a reaction, it was the most energetic. Diet Coke was observed to be the most reactive solution. This also explains why the combination of Diet Coke and original Mentos tablets are the optimal choice.”

I suspect more than one of my students came into this Service Learning Practicum expecting to engage in what one of them termed “traditional hours-based community service.” I could see it in their faces. They had been down this service road before, volunteering their time, but not learning anything especially significant for the time they’d put in. But as they were soon to discover, the structure of this service learning experience would be very different. They would have to become problem-solvers, taking on the challenge of conceiving, designing, testing, reconfiguring and recasting their projects until it was time to engage with the unknown quantity of some thirty perceptual islands of unbridled curiosity. This is their story, so I will give free rein to their voices, as they speak in reflective assessments and shared enthusiasm for the learning engagements they made possible, as much for themselves as for those vibrant 5th graders at Rose Elementary. But first, a little history.

It all started with an intuition and a chance conversation several years prior, when a plan was hatched to interface my University Honors Program Service Learning project

with Beth Gorman's 6th grade students at John Muir Elementary during the spring semester in 2007. For several years, my colleague Helena Janes and I had been interfacing with a Project Citizen experiment sponsored by the Stanislaus County Office of Education, in which our sophomore Honors students worked in small "service learning" teams to facilitate civic discussions with junior high students participating in after-school programs. Those experiments had not gone especially well. Our students were good facilitators, and the "Civic Mission of Education" was a worthy ideal; but the project focus, to develop an issue the young students could actually address to effect desirable change in their lives, produced desires that went unheeded, and the resulting sense of lost accomplishment left many of them feeling less rather than more enthusiastic about civic engagement. In fact, everyone involved with the project seemed to come away with less enthusiasm than they had started with. So I trusted an intuition, shifted the focus of our service learning experiment to an elementary classroom, and turned our Honors students loose to develop team projects of their own to share with Beth's 6th graders. The result would be a series of encounters with improvisational learning practices, born from creative intuitions and the formative influence of their university coursework.

Instead of immersing our students in a scripted orientation to facilitate their classroom encounter (as we had done with the civic engagement experiment), we asked Beth to provide a compressed overview of the operative learning standards governing a 6th grade education and to model some activities that might stimulate creative thinking. Then we encouraged our students to develop team-based learning experiences for Beth's class that might promote a curiosity for learning unexpected things. Culminating in a series of

project-based visits, our students researched, organized and implemented science, social science and computer projects for the students in Beth's class, who later displayed the results of these activities at an open house for their parents. The computer-based Egyptian scavenger hunt was a big hit, as were the activities involving hieroglyphic writing. Our computer wizards designed a self-contained interactive webpage, several art students worked up the hieroglyphic project, and social science majors pulled together some fascinating content for the scavenger hunt. Beth helped our science students develop some experimental activities that dovetailed with her instructional goals. Tailoring these learning activities to what Beth's students were learning in class differed significantly from the more intrusive focus of the Project Citizen experiment, and the results were far more rewarding for everyone involved. Near the end of the semester, our students arranged a memorable tour of the CSU Stanislaus campus for Beth's class, hosting exhilarating visits to the physics lab, drama theatre, art studio, radio station and Bio-Ag garden. By the end of the semester, our students knew they had made an impact on Beth's students, sharing with them an intimate look inside the college experience, and conveying a sense for the value and excitement of learning new things. In the process, our students discovered joy in the practical side of learning, new strengths in the productive challenges of exercising leadership roles in an educational setting, and unexpected feelings of accomplishment fostering dynamic curiosity in the aspiring minds of young children.

I want to fast-forward now to our experimental efforts last spring, marking the fourth year of our interface with Beth Gorman's elementary classrooms, not just because things went even better by the fourth iteration, but also because our students reached an

especially meaningful level of reflective analysis last year, capturing the depth and excitement of our experiment in written narratives enriched by a series of bold, rewarding encounters with Beth's enthusiastic students.

We had twenty-two fully engaged students focusing on this project, with a broad range of academic interests, including music, art and poetry, chemistry, biology and zoology, astronomy, computer science, history, business economics, and teacher preparation. To provide some guiding structure, we invited our Service Learning Coordinator (*Feb. 24th*) to establish some parameters of responsibility and collective common sense regarding the personal connections they were about to make with Beth's 5th graders. We wanted to make sure everyone understood the boundaries and what to expect in response to the attention vectors they were about to synch up with eagerly awaiting kids half their age in scale and temperament. Beth came a week later and gave our students colored paper and decorating implements (*Mar. 3rd*) to set them in motion writing letters about themselves to send off to her students. We sent snapshots of our students along with the letters to personalize the engagement even further. Beth came back to class the following week bearing personal letters from her students to ours (*Mar. 10th*). She also shared a model lesson, with standards, objectives, hands-on instruction, end-result ideas, and questions for further study. She offered up a template for lesson planning, wrote out the science and social studies standards on our whiteboard, and made it clear how our students could access other pertinent standards along the way. This was important for two reasons: it gave structure and focus to the creative thinking our students brought to the project, and it synchronized their planning activity with pertinent learning objectives for Beth's students. As Danielle, our computer wizard, wrote in her personal

reflection, “Beth explained to us how preparation is key, vocabulary terms are a must, and visual representations will help out a lot.” The next week we brainstormed in class to open up ideas for projects. The students divided themselves into working groups according to their majors and interests. They settled on half a dozen small group projects to focus on and set out to develop some concrete plans for engaging Beth’s students in some spontaneous learning activities. It took them about six weeks to get their ducks in a row, and then the fun started unfolding in waves of excitement for everyone involved. Each group brought back an even more enthusiastic report than the last, and Beth’s email reports from the field echoed this enthusiasm:

“What a great day it was having Matt, Sandi and Rebekah here to teach us clay sculpture. Your students are fantastic.” (*Apr. 17th*)

“Every group of your Honors students can be commended for their ideas, preparation of lesson concepts, and delivery to students. Bravo! A class Act! We await the next group with excitement.” (*Apr. 27th*)

“Amazingly enough, every group that comes to present is just as good as the previous one....or better if that were possible. We so enjoyed the polyrhythms and they so rocked the classrooms that other teachers were able to hear the percussions through the walls. Their students loved it too. We can’t wait for the conflict between the North and South, [the Civil War] play, capture the flag, and truce signing. Matt, Sandy and Rebekah will have their hands full of glazing on Friday...and aaaalll that entails...Danielle’s website is really fine...the chemistry with mentos and sodas was so crazy I’m sure it should have been on YouTube. My students are really spoiled by all the attention and great teaching this year. I cannot believe it. Next Wednesday is our field trip to CSUS and we can’t wait...(*May 4th*)

Danielle was responsible for the website design. She had recently changed her major from Computer Science to Art to position her for pursuit of a Fine Arts degree in Graphic Design. Her personal connection with this project is evident in the following reflective comments, which speak to the interface between her own professional interests and the opportunities she discovered within the role she took on for our project:

“I run several websites and just love designing graphics and making and managing sites. It is by far my favorite pastime. So, it was an easy decision for me to make when I volunteered to design the website for our service project. The idea behind the website was to develop links to the Honors students’ projects for the 5th grade students and teachers. It would serve as a way for the 5th graders to learn more about each project and to get excited for the different lessons. The teachers could use it to show parents during the Open House, and Honors students could use it during their presentations.

“Designing the website was so much fun! I chose a layout that was mainly white, but yet incorporated bright yellow, blue, and green to make it appealing to the 5th graders. For the header, I wanted to join the two schools together. Thus, I made a graphic that combined the CSU Stanislaus Warriors logo with the Rose Avenue’s Mustangs logo. Next, I made the sidebar where links to both of the schools’ websites and the Honors site were included, along with important dates. I then created a separate page for each project. As soon as a group would send me information, I would add the links, videos, information, etc. that they sent me to the appropriate page. To finish up the homepage of the site, I made a giant graphic in the center that incorporated each group. To do this I made a collage of pictures to represent each group.

“The first group to send me what they wanted on the site was the Civil War Reenactment group. They sent information and links to sites they wanted incorporated. I spent a day transforming what they sent me into a kid-friendly website page. It was so much fun and helped me to relearn about the Civil War too! The group told me several times how much they loved what I did for their group’s page on the site. They said it really helped out with their project and that the 5th graders loved it. For instance, when students asked how they should dress for the Civil War skit, the group just directed them to check out the website. In fact they were the first to tell Beth and the teachers about the site. Beth emailed me to say how much she and the other teachers loved the site. The students got their first chance to explore all the Civil War information during their computer lab time on April 26th.

“The groups organizing the experiments with Diet Coke and Mentos, Economic Exchange, and Phase Changes each sent me several great links and supporting information, including some neat videos, PowerPoint presentations and graphics to help illustrate what they were going to be covering. For the four remaining projects (Lizards, Clay, Poetry, and Polyrythms), I researched each area myself and found interesting things to put on their pages.”

While Danielle had previous experience designing websites to serve specific needs and interests, her work on this website conjured a more rewarding sense of accomplishment

than she had anticipated. The enthusiasm with which students embraced her contribution brought rich meaning to her efforts, and she found something especially rewarding in the tapestry of information revealed to those who passed through her portals, which functioned “to help the students enjoy and learn a bit more about the projects.” She found this aspect of her work “extremely exciting.” In her closing reflection, she signaled “an even greater appreciation for teachers,” intertwined with memories she will relish of “the fun we had as a class working together on this project!”

www.roseavenue5thgrade.wordpress.com

Cal State Stanislaus
WARRIORS

Rose Avenue Elementary 5th Graders
&
CSU Stanislaus Honors Students

HOME PROJECTS

Go!

CSU Stanislaus Honors students work with Rose Avenue Elementary School 5th graders

Welcome!

All the pages for the projects are completed! Have fun exploring and learning.

Just click below to check out all the different topics:

- Diet Coke
- Cannon
- Books
- Boy with Cat
- Lizard
- Poetry
- Drum

Links

- Rose Avenue Elementary School
- Accelerated Reader
- CSU Stanislaus
- CSU Stanislaus Honors Program

Dates to remember

- May 12: CSUS campus tour
- May 13: Rose Avenue Open House

Website made by: Danielle J.

A click on the image took students to a page full of icons reflecting the eight designated projects, each with its own embedded links, drawing Beth's students into a variety of contacts with background terms and information, illustrative imagery, explanatory diagrams and video snippets pertinent to the projects they would be experiencing over the course of the next few weeks. The idea was to build anticipation in Beth's students and set them on the path to unexpected understanding. If you click on the following link you can explore for yourself: www.roseavenue5thgrade.wordpress.com.

Reflective comments permeated the personal assessments written up by our students and help to illustrate the rich involvement they had with their projects. By turning to some of these comments, we can gain a sense for how the focus of these projects emerged, how the facilitation of the experiments unfolded, what our students observed about the impact they were having on Beth's students, the impression this made on them, and what they took away from the project to digest over the long term.

Heather commented that her participation in the Civil War skit project "was a beneficial experience for me because I am a Liberal Studies student and everything I learned I will be able to employ in my future career." Her partner Johana had a different take on the experience: "The most important thing I learned from this experience was that I definitely do not want to be an elementary teacher." But she shared the same respect for what she witnessed in Beth's classroom, in particular the way teachers like Beth "control and motivate their classes."

"The play was our groups modest attempt at summarizing some of the most important events of the Civil War. We wanted to give the kids a different way to learn about history by assigning characters and getting them involved in the process of acting and putting on the play.

“The kids surprised me because they really got involved. They did research and they memorized their lines even though we told them they didn’t have to. The kids who played main characters printed out pictures of the real people and they studied more about them. The kids invited their parents to come watch them perform, and some of them even dressed up for their part. It was actually a really good experience, way better than I thought it would be.”

In contrast, Heather’s attention was drawn more to things she learned about teaching, particularly about the unanticipated challenge of managing the temporal dimension of a learning environment. She digested her recognition of things that would have improved the experience, like “allotting more time to practice,” and “producing a longer lesson plan.” But she also recognized how the students managed “quite well on their own and in class...to learn much of what we would have taught them.” This served to diminish the significance she attached to flaws in the group’s plan, and she began to focus on how well her team had managed to improvise and work effectively within the actual unfolding dynamic of the learning activity. This yielded a constructive reflective distance from her efforts that served to open the space for a critical discovery on her part:

“Part of the shortage on time was because I did not factor students’ questions into the allotted time for each class and it ended up being a major factor. However, I learned how to better handle situations in which students ask questions that do not pertain to the subject as well as how to attend to questions that do have significance.”

Heather’s comments grew even more reflective as she thought about how valuable this experience had been for her, “working with the students in a hands-on setting such as this, in which I was able to address the class as a whole.” She found herself “able to interact with a class like an actual teacher would,” gaining experience that “reinforced how much I enjoy this occupation.” She morphed from a student reflecting on the role of teaching into the role itself and through her participation in the group dynamic found her

way to “a more thorough and tranquil presentation” than she could have imagined producing on her own initiative.

“I enjoyed and feel I gained more from this project than I do in tutoring one student or purely observing a classroom. Although observing a classroom and its teacher are important, I think more needs to be done and the sooner one can be in front of a classroom the better. By being in a situation where I was quite similar to the teacher I had to think on my feet, be flexible, and address many situations that I had not considered. As a result, I learned a great deal. This experience and the information I gained were priceless to me and I am quite thankful for the opportunity.”

The third member’s reflections focused more on the environment in which the project unfolded. Christina’s defining recognition came from a conversation she had with another teacher who was sharing her previous experiences as a student of theatre:

“Because my group was putting together a civil war skit, she told us that she has always wanted to do this project for her fifth grade class but never had the time to do so. After she mentioned this to our group, I really started to reflect upon those teachers I met at this particular elementary school, especially Beth Gorman. She has her own class, her own lesson plans to create and make interesting for the children, and on top of everything, she coordinates with our schedules to make sure we give the fifth grade classes and ourselves the best experience possible. Over the past four to five weeks we have been emailing her and making sure that we coordinate with her. She has responded to us even in her free time at her lunch or on her weekends. She was a tremendous help to us at all times, and I can only imagine how much time she must dedicate to her students nine months out of the year.

“From a college student’s perspective, becoming a teacher to these students to perform the skit we put together, was incredibly exciting and also stressful; However, the children throughout the entire process of making the skit become a reality were very supportive and listened to us with open minds. They respected us and since I was the scene designer for the play, they also inspired me to create a design that might capture the essence of the civil war and the facts about the Appomattox Courthouse battle and surrender. I wanted to make sure they were part of the process of making the play come to life. I think that allowing the children to make the scenes of Congress (scene 1) and the Courthouse (scene 3) gave them a sense of accomplishment when they performed the skit. They were so excited to get the scenes posted on the board so that when the play was

recorded they could show and remember all of their work and be proud of it. That is the one thing that I truly appreciated about this project, the fact that these children truly do want to become involved!”

Christina also became cognizant of her role as a “model” college student: “I feel we showed the students how a college student functions,” and that you really can study History or Theatre Arts if you want to:

“We told them that if they had a dream to do any of these things they could make them a reality in college. I felt they were inspired by the whole experience. I would not change anything about that... Everything came together like we expected, but I never expected to gain so much from the actual presentation and time with the children.”

Beth’s students were also introduced to the artistic side of working with clay. Clay Day was the brainchild of the Fine Arts students in our class, and consisted of a short overview of “the history of clay, its place in society, the science behind ceramics and, of course, its artistic and creative applications.” The group settled on this project because it would allow them “to teach a topic in an area where [they] had both experience and interest.” The following description of their process reveals a careful, methodical effort to set up context, establish some key background understanding, and draw Beth’s students into artistic relations with simple lumps of clay:

“First of all, the group gathered in order to plan out and create a lesson guide. A PowerPoint presentation was created in order to teach the standards to the children. The group could have developed a long lecture full of in-depth explanations to the many facets of clay, but after some considerable thought, we decided against such a presentation. The way we figured, children, regardless of topic, are prone to expanded periods of attention and, knowing the children would be sitting with a hunk of tempting clay right in front of them, we figured after a certain length, more excess information would go unheard, regardless of importance. The alternative was the development of a PowerPoint presentation with very limited words and more pictures. For the sections on history, uses and processes, the children seemed to be paying attention, and by asking them occasional questions, we were sure they were engaged. It was only when we began talking about the science that three children grew impatient.”

The group conducted this experiment with three different classes at the school. In the process, they learned something important about iterative design and stepwise refinement. They learned to improvise on their script in response to environmental feedback, which they could respond to only because they were receptive to subtle clues more easily lost in the flow of actual practice. This resulted in some unscripted corrective maneuvers to make their information more accessible and meaningful for Beth's students.

“During the first class, Sandi explained the vitrification process in depth and most of the children seemed more interested in playing with the clay. During the second class, Sandi's explanation was a little shorter and the children seemed more willing to listen. By the time the last class came in, Sandi's explanation was shorter and almost entirely in laymen's terms. The children didn't seem to care for or remember highly technical terms and vocabulary, but they seemed interested in the actual processes and how the vitrification process worked. At first, the informational segment lasted 10 minutes; this was cut to just under 5 minutes by the final class.”

As the artistic activity commenced, creative encouragement was carefully entwined with relevant considerations to increase the artist's attention to detail while building on relevant scientific context:

“Once our information was given out, the children were allowed to explore. A small demonstration was given of the basic techniques (pinching, coiling and attaching), but most of the learning was one-on-one. Several children would have an idea in mind and we would show which of the basic techniques to use. They in turn would be asked questions by other children and were more than happy to share their newfound knowledge. During this phase of the activity, Sandi and Rebekah interjected a lesson in thermal dynamics. The children were warned to avoid air pockets because the air would expand in the kiln and explode. This made the children careful and they repeated the advice to each other. It should be noted that while the children did not like the idea of their ceramic items exploding, they seemed to like the idea of explosions. We suspect any science experiments relating to things exploding would hold their interest. The day ended with the clay being left out to dry before being taken to the kiln. For “clay day,” Sandi and Rebekah were the instructors and Matthew assisted with keeping the peace in the class.

“Rebekah decided to do a follow-up to the first “clay day” a little over a week later: “glaze day” followed the same template as “clay day,” but the

process of conveying background information was simpler the second time around. The newly fired objects were returned to the students so that glaze could be applied. The glaze is a clumpy gray in its unfired state, giving the children a state of curiosity on just how their items would turn out. The science behind glazing had been covered during the first clay day, and so during “glaze day” the process was explained again verbally. This seemed to be a fine arrangement since the children seemed much more interested in being able to apply the glaze.

“In the final step of the project, a tour of the university campus was given to the children and when they arrived at the Art Department, they were shown the kilns and given their fully glazed ceramic objects. The children were definitely excited to see just how their once gray items looked after spending time in an incredibly hot kiln.

“This project was an extreme success overall. The children loved the chance to play with their hands and they actually did learn about air expansion in heat and about the vitrification process. They learned problem solving by having an idea in mind, but then having to figure out how to sculpt that dog or pinch pot. At the end of the day, what was most important to us was that the children enjoyed themselves and seemed to be genuinely more enthusiastic about eventually going to college and learning more about art and science.”

The Phase Changes experiment ratcheted up the level of scientific engagement, and not just for Beth’s students. Phase change became something of a metaphor for this project-development team. Facing wave after wave of disappointment, they encountered more roadblocks to progress than the rest of the groups combined. But in the end, they persevered for sheer lack of a willingness to fail. Meaghan’s reflective comments convey the spirit of this perseverance by reference to her groups evolving collective efforts to coax a workable project from an engaging idea. She started in two groups, one focused on the experimental realm of musical composition before morphing to explore the diversity of poetical forms, and the other focused on the experimental realm of chemical phases. She stuck with her chemical phasing team through thick and thin, facing an unstable beachhead in the realm of chemical electrolytes before retreating to the more familiar realm of solids, liquids and gasses. Along the way, Meaghan’s teams tried to

build a shoebox guitar, PVC flute and lemon battery, before finally discovering the experimental efficacy of producing a gaseous volume to dance quarters on the lips of soda bottles. “I have always been that person who clearly lives under the jurisdiction of the fabled Murphy’s Law, but even for me this project was a challenge,” wrote Meaghan. “The requirements of the class were simple enough, and the kids were amazing, but of the four projects I attempted only one turned out successfully.” In the end, she wrote, “this gave me a greater appreciation for all of the preparatory work that must be done for successful demonstrations.” She had always been “a firm-believer in hands-on learning experiences,” but through her experiences with this project she came to understand why experimental immersion is so frequently missing from the operational elements of a learning activity. A lot can go wrong on the path to success.

“At first I was going to be a member of two teams, one for science, because I am a biology major, and one for music, because I have a strong background in music and think it’s sad how little it is taught in schools today. Martin, Kyle and I had hoped to teach the kids the very basics of music theory and then have them compose a song. At first we thought we would barrow some keyboards and the kids could learn on those. Unfortunately we were only able to barrow two and for a class of 20+ that just wasn’t enough. So we abandoned this idea and decided we would have the kids build their own instrument and then teach them to play a tune on it. At first we tried making the shoebox guitar, but we soon discovered that they sounded allot better to us when we were kids. They sounded tinny and it was impossible to tune them, so it would be impossible to teach the kids a song. Next we tried making flutes out of PVC. My Native-American grandfather had taught me how to make flutes out of wood and bone when I was very young, so I figured it couldn’t be too hard to make flutes out of PVC, especially having instructions from a music education website. I was wrong. We built the first exactly as instructions said, but it would not sound. After several unsuccessful modifications we decided to abandon the music project. They went on to do poetry and I went on to greater misadventures.”

It took the science team a while to decide what they wanted to do. Initially, they debated whether to focus their project on demonstrating how lungs work or try to

facilitate an exploration of chemical properties. Eventually they discovered the infamous lemon battery experiment.

“It seemed perfect. It would be easy to transport, it matched up with the learning standards, and the kids would love to see lemons make enough electricity to light up a light bulb. The lemon would work as a fuel cell, copper and zinc nails would create the positive and negative poles, and the acid within the lemon would be an electrolyte (making electrons come off of the metal). Based on our knowledge of chemistry, it should’ve worked, but we were not getting a strong enough electrical current from the lemons; so we tried modifying the experiment. We took lemon juice and added vinegar (another acid) and salt (which dissolves into positively and negatively charged particles) to try to boost the strength of the battery. It helped, just not enough. Even with a series of six fuel cells we could not generate enough electricity to light a LED bulb. At this point Kary, Zoe and I accepted defeat.

“We then decided to teach the children about phase changes and how the phase relates to temperature, pressure, and volume. It was simple and we knew some pretty interesting demonstrations for the phase changes. Kary would cover the transition from solid to liquid and demonstrate it by having the kids melt an ice cube in their hands. Zoe would demonstrate liquid to gas and the reverse. She would demonstrate this by boiling water in a bottle covered by a balloon so that the water vapor would be trapped in the balloon. She would then cool the balloon so that the water would condense and fall back into the bottle. I would demonstrate the effect of heat on the volume of gas. I would demonstrate this by placing a wet quarter in the top of a cool bottle and having one of the kids hold the bottle so that as the gas inside was warmed and expanded the quarter would jump. I would also take an empty soda can and heat it on a burner then quickly stick the open end in ice water making the can crush as the gases inside condensed.

“Having learned our lesson from the previous experiments, we all tested our demonstrations at home. They all worked beautifully. However, as Murphy’s Law would predict, this was not the case at the school. Five out of our six demonstrations worked beautifully. One of the demonstrations I had prepared was designed to show how gasses contract when the temperature drops, using a soda can demonstration. The can was supposed to implode, showing how the volume of the gas had decreased. This did not happen the first day we made our presentation. My teammates and I hypothesized this may have happened because our portable hot plate didn’t get as hot as my stove. We purchased a portable electric burner and the demonstration worked for the next two classes. We also were able to go back to the class it hadn’t worked for and show them. The kids loved it and that made the entire struggle up to that point worthwhile.”

Karolyn offered some supplementing observations. She emphasized the importance of connecting up through portals of familiarity. “In order to help Beth’s students understand and relate to what we were talking about, our demonstrations utilized things they could find around their houses.” Her teammate Zoe “used the examples of steam from hot chocolate and the sweat on the outside of a glass of cold lemonade on a hot day to relate the concepts of evaporation and condensation to the students:

“Then, for a physical demonstration, Zoe started by placing a glass bottle with a balloon on the top on a hot plate. As the water in the bottle heated up and converted to gas, the balloon expanded, giving the students a visual of where the water was going. Afterwards, Zoe dipped the balloon in ice water, converting the gas back to liquid, demonstrating condensation, and the students could see it as the water ran back into the bottle. The last portion was Meaghan’s, and her demonstration of the properties of gas was similar to Zoe’s last experiment. Meaghan heated up some aluminum cans on a hot plate then dipped them in ice water, the gas inside contracting as it cooled, causing the can to crush itself. To demonstrate the reverse, she cooled some glass bottles, wet the rims, and placed quarters on the tops, then had the students hold the bottles. The heat from their hands heated up the air in the bottles, making the quarters “dance” as the gas escaped. This was also made into a game by seeing who could get their quarter to dance more.”

What Meaghan took away from these experiences will stay with her a long while.

“In this class we were asked to teach fifth graders, but I think we learned just as much as they did. I learned that kids are much more forgiving of our mistakes than we might think. Even when my demonstration failed, they were just grateful that we had tried to show them something “cool”. I learned that kids can figure just about anything out if you give them real-world hints. For example, I asked the kids whether cold air or hot air weighed more, and they were stumped. As soon as I told them to think about hot air balloons half of their hands shot up. I learned to test my demonstrations under the EXACT conditions they would be run under. I learned that demonstrations are difficult to pull off, but completely worth it. The kids loved watching the phase changes and particularly loved the demonstrations they got to take part in. I’m very grateful for this experience – we taught them, but they taught us more.”

Meaghan’s teammates were no less enthusiastic about the fruits of their rough ride.

“As I saw it,” Karolyn observed, “the students responded the most to things that they could get directly involved in, such as racing to make the ice melt or coming up to the front of the class to make the quarters on the bottles dance.” There was a disadvantage in

this, however; for it quickly became apparent time constraints would simply not allow “every student to participate in every activity.” Even so, it was clear the students were “also really responding when there was a significant reaction for them to see, particularly when the can crushed itself and when a large bubble came up during the expanding balloon demonstration, making the balloon very suddenly expand.” So, regarding future classes, she concluded, “I would recommend trying to incorporate interactivity into the projects to get the students involved and caring about what’s going on.” But when things go wrong, it helps if the group operates in a planning mode with positive attitudes:

“Trying to make batteries out of lemons was a complete failure. Nothing went right, and we’re still not entirely sure why. Luckily, because we planned a test-run of the project over a month before the actual scheduled demonstration, we had time to both try to figure out what went wrong, and when we couldn’t, still enough time to put together another project. The rest of the problems came up during the demonstrations to the classes. One was that during the race to melt the ice cubes, some of the bags ripped. Fortunately, there was not much water in them because the ice cubes were small, so it didn’t cause a mess. The other problems occurred in the demonstrations involving the hot plate. Because different heating sources were used for the test run, we had a hard time getting the hot plate to a high enough temperature in the classroom to make the balloon expand rapidly enough to make the air in the can hot enough to make the can implode. Fortunately, we had two different demonstration days, and between the first and second we were able to get a better hot plate. So the experiments worked on the second day.

“For dealing with things going wrong, my main advice would be to start early and do test runs to make sure things will work the way you plan them to; have back up plans; and keep a good attitude if things go wrong on your presentation day. I got the feeling that what the students wanted from us was less to be educated and more to be entertained; so if something goes wrong and you need time to transition, you can keep their attention in the mean time by being upbeat and interactive.”

Zoe added an important observation of her own: she found that incorporating everyday elements “made it easier for them to understand and relate [what they were learning] to their everyday lives; many questions came from the applications, which made them

curious.” In crystallizing her fundamental intuition, she made a pivotal point: ”I feel that a scientist appears when curiosity emerges.” Her concluding reflection reveals just how deeply she resonated with this project:

“Demonstrating science was not as easy as we thought it would be. Kary, Meaghan, and I are all Biological Science majors, so we thought sticking to our field of study would be relatively easy. However, numerous environmental factors can affect an experiment drastically.... Three crucial ideas from this are to always test your experiment, use teamwork to plan your demonstrations, and make science fun. My teammates were and are wonderful comrades. We all broke the sections up and the cohesion of the experiment was executed very well. We met up throughout the semester and took our experiment seriously. In addition, we showed that observing the natural world and being curious about how things work can make a scientist. Hopefully, we inspired the children to aspire to choose a science career like we did. I have a newfound respect for Liberal Arts majors. Working with kids may seem an easy task, but it definitely is not. There are countless factors one has to be alert about. For instance, how to keep the students interested, be able to teach without losing your temper, understanding how to discipline students productively, and figuring out how to make learning fun for them.”

Every project undertaken by our students required creative construction, a willingness to improvisation, and attention to critical feedback loops. Through a practice of stepwise refinement, each group was able to pull together a functional learning activity using iterative loop-back design strategies and a willingness to recalibrate their measures of effectiveness on the fly. Each group had to consciously consider the ear of their other, find a voice of inflection, capture another’s attention with active learning practices, and find a way to be relevant, to become a portal to discovery. While we can say they used “service learning activities” to motivate creative applications of theoretical understanding, the truth if the matter is, they used their own ingenuity to produce these portals to curious engagement with the undiscovered world of our unfolding lives. Danielle’s Economic Transactions team recognized the challenge early on:

“We really had to learn how to teach and explain concepts in a way that would be interesting and a positive learning experience to a group of people outside our field/level of study. We had to make the presentation understandable and relatable to fifth grade classes, who were definitely not economic experts. In addition, the fact that it was a fifth grade class made it an even better learning possibility because we did not know their level of knowledge or interest in the subject.

“Our presentation on the history of economies went really well with the two fifth grade classes we presented to. The students actively participated and were excited to apply the concepts in the interactive simulation of the economies that followed our presentation. There were a few components of our lesson we believe really made our project a success among the students and for us. It helped to choose a topic related to our current coursework, and to make that topic understandable and relatable to the students we were teaching. It also helped that we took the time to develop alternative ideas and work through the entire lesson plan/presentation to find any problems or underdeveloped areas in advance of the actual presentation day. We insured that we met and worked as a group to look over each part of the lesson, and made sure everything was complete and would contribute to the value of the project as a whole. Lastly, it helped that we assigned specific responsibilities and collaborated on all parts, each contributing different and various ideas during brainstorm sessions and throughout the project...

“A final component that added to the student’s learning (and also gave us time to complete preparations for our next step in the lesson) was a worksheet we created. Beth’s students had to demonstrate that they had learned the economic concepts of the presentation by accurately completing the worksheet. When they had done so, the classroom teacher approved their work and they were able to begin the interactive activity. Because the students had to individually complete the worksheet correctly, they joined into the interactive activity at a slower pace, instead of in one large unit. The additional preparation/transition time after the slideshow presentation allowed us to evaluate the students’ personalities and possible level of involvement, so as to prepare ourselves and make any last minute alterations to our activity so it would best resonate with and engage the students. The interactive component involved the students in applying the concepts. They were taught to exchange different monies; to buy, but also to barter for prizes that related to the different time periods discussed. This excited the students and gave them a stronger appreciation of the time periods, as well as motivation to really try to apply the concepts we had taught them. Overall, the entire lesson went really well!”

We’re happy to report the lizards didn’t escape to all corners of the classroom but made it safely home to their native environment; the polyrhythmic pulses didn’t dissolve all boundaries between neighboring learning communities; and the soda/mentos eruptions

modeled our natural thirst for adventure in learning. Seldom do we find such a steady stream of joy in meeting the challenges posed by the experience of unforeseen obstacles in the midst of quickly morphing opportunities. On the day our students took those 90 Rose Avenue students for an exploration of our campus, a letter from the Principal of Rose Avenue School materialized on my desk, inscribed at the bottom with their campus mission, “Respecting Our Student’s Education: Achieving and Valuing Excellence in a Nurturing and Unifying Environment.” I leave Diane’s words with you in closing because they say what we need to hear, and what we need to embrace as a value in service learning experiences: “I wanted to let you know how much I appreciate you working so closely with Beth Gorman to provide the Rose students with such a wonderful learning experience. Your students were absolutely inspiring to our children.” She then offered this revealing assessment of our experiment:

“I enjoyed seeing your students entering the office prior to delivering their lessons. They were always polite and yet I could see a little apprehension in their eyes. However, once they entered the fifth grade classrooms they came to life. They taught, they connected, they inspired. Our students loved the hands-on, standard-based lessons. Seeing the children gain knowledge through music, poetry, art, and drama was a real joy. Listening to your students after they taught was equally thrilling for me. They were so excited about the experience, telling the next group of college students how much fun it was. Their commitment to their own learning and sharing their excitement with young children was outstanding.

“Thank you for allowing this incredible experience to our students. I know they will remember their fifth grade year forever, thanks to you. I’m sure many of those children will be enrolling at California State University, Stanislaus or some other university eight years from now, because of the experience they had this year. Truly that is the ultimate goal.”

These are the connections that matter, like the lightning quick connections in our brain serving to link and network our perceptions, thoughts and feelings. These are the sparks that make a fire. This service-learning project produced value through an interplay of

creativity and persistence, openness to improvisational impulses, and critical attunement to environmental feedback. Work of the mind became work of the heart, and no one expected they would gain so much from the possibilities.¹

¹ I wish to thank in particular the following individuals for sharing such vivid and compelling accounts of their experiences with this service learning project: Eddie Campbell, Beth Gorman, Danielle Jespersen, Heather Crume, Johana Shea, Christina Mudrick, Sandi Lavito, Rebekah Nelson, Meaghan Kingsley-Teem, Karolyn Hamlin, Zoila Estrada, Danielle Fletcher and Diana Scott. Others participating in this project included Mathew Parker, Lindsey West, Christa Brooks, Alyssa Larsen, Richard Gilbert, Jason Barnett, Martin Bocanegra, Bryan King, Eilroma Ovrahim, Kyle Wheaton, Kenny Sarisky, and all the 5th grade teachers and students we worked with at Rose Avenue School during the memorable spring of 2010. Thanks also to Helena Janes for carrying the torch for this and several other service learning projects over the years.