

## MANY KIDS LOVE SCIENCE

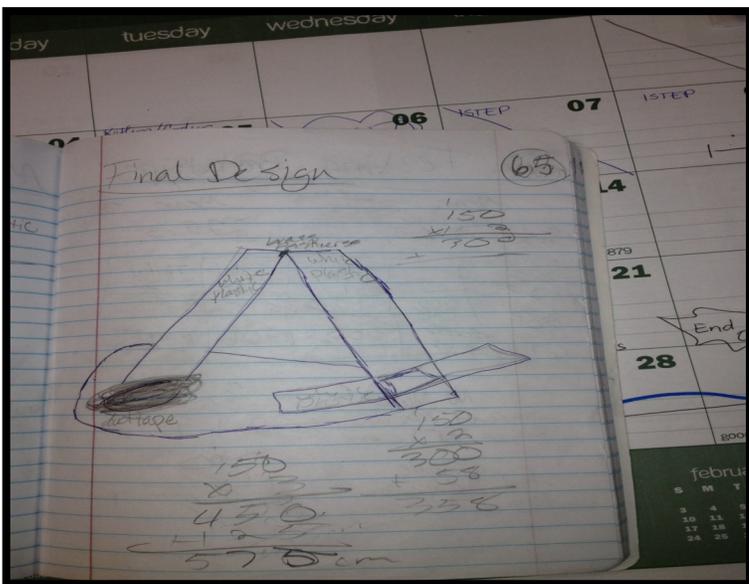
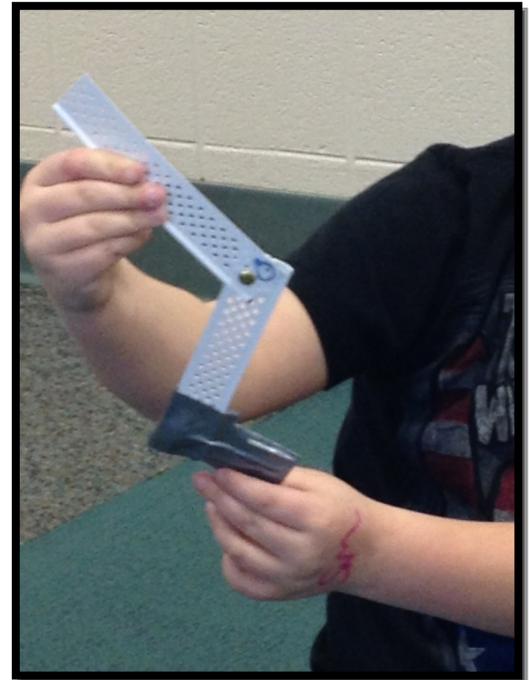
by: Nikki Rumpler

I have been teaching for 18 years. My first eleven years were spent in fourth grade at Webster Elementary in Plymouth. For the last 7 years, I've been a fifth grade teacher at Riverside Intermediate School. My current assignment is math and science.

I have implemented six SLED activities in my classroom over the last couple of years. If I had to choose my favorite, it would be the Prosthetic Leg task. I teach this unit using the FOSS kit: Human Body. This worked well because my students had background knowledge of joints and how a prosthetic leg would work. I used several YouTube videos to introduce the concept of the prosthetic leg. I also included math in this activity by attaching costs to all of the materials used in the designs. Students also completed three trials when kicking the "ball." They determined the mean, median, mode, and range of all of their data. They also created advertisements for their designs that included this information. The students were 100% engaged in this design task from beginning to end.

Individual and group design process was the best with this task. The students had great ideas and their cooperation to develop a group design was terrific. I also took a group of students to a school board meeting. They presented the task to the entire board. They explained the process and shared their prototypes. It was a GREAT success!

We want to hear from you! If your class is doing a project that we could highlight, student writing that we could publish, or pictures that show students using science learning in engineering design please email us at [wkim@purdue.edu](mailto:wkim@purdue.edu)



The SLED team welcomes grade 3-4 teachers to the project!

Need help? Visit the contacts page on SLEDhub to identify who you should call or e-mail for assistance.

<https://stemedhub.org/groups/sled/contacts>

# THE FIRST DESIGN OF LIFEGUARD CHAIR

by: Alicia Waitkoff

I teach 4<sup>th</sup> grade at Glen Acres Elementary School. My school is part of Lafayette School Corporation and serves a multicultural population. About 43 percent of students are White, 37 percent are Hispanic, 12

percent are Black, 1 percent are Asian, and the other percentages fall into multiracial categories. Many of the Hispanic students are bilingual and receive ELL interventions during the week. Also, our school is considered a Title I school. This means that we receive extra funding in order to help improve the academic achievement of the disadvantaged or lower income populations.

Since we are still in the first quarter of school, I have been instructing a few introductory activities related to SLED. The first activity was to have students draw a picture of an engineer and describe what they thought an engineer did. Most students drew pictures related to mechanics or car occupations. I only had two students who knew exactly what they did. After this activity, I had Chell Nyquist, a Purdue Engineer, come to our school to define what engineers really do. He showed a PowerPoint displaying images that previous engineers had designed in order to help people around the world. The students began to better understand how math and science were an integral part of what engineers did. Also, Chell showed the students the cycle of the design process. Afterwards, he answered many student questions to help address some of the misconceptions that my students had previously.



The second activity that my class completed was the Lifeguard Chair. The purpose of this task was to walk through the design process in a meaningful way and pretend to be “real” engineers. The students were always so excited when science came at the end of each school day. We started off with reviewing the design process steps. Then, the students received the assignment, and we defined all necessary components in their SLED journals. Some of the components included the problem, user, constraints, materials, time, etc. When we discussed these parts, it was difficult for students to understand why we had to take the time to discuss these items. They wanted to dive right in and start the project. We had to reflect on why we should understand the design task before we start building anything. The next day, in morning art class, the art teacher did an introductory lesson on sketching. He modeled to them how to sketch top, side, front, and back views. He also explained how to add dimensions to the sketches. Later on that afternoon, the students completed their first individual design of the Lifeguard Chair. Most students were able to go right to work and complete at least two viewpoints. I was very impressed with their sketches. Many of them forgot to add dimensions, so I had to explain that their design would not receive approval until that was added. I had a few students with IEP’s (Individual Education Plans) find the sketching frustrating, so I had to give them some extra support without telling them how to design their chair. All kids were successful by the end of the science lesson. The following day, students were assigned partners to complete the team design. Students accepted their partners and began discussing their individual designs and compromising on how they would form their final plan. I tried to pair higher ability students with lower ability in order to limit some student frustration. It seemed to work because all students finished and received approval. I did have to help a few groups begin their conversations, but overall the team designs were completed. The BIG DAY came and the students built their designs. All teams used their journals to construct their chairs. They worked well together and made supportive comments. In the beginning of the build, many students took turns doing a job such as taping or folding the index cards, but I had to stop the class and explain that they would not be able to meet the time constraint if one person was watching and the other was building. Even though they got better at working at the same time, they did not meet the time constraints that Purdue set for this project. I had to double the time, and many teams did not finish the height of their structures. My suggestion for next time is to give the students more time to start with and only make the height constraint the size of a ruler. It was too complicated to expect the kids to keep adding their measurements. It took away from the time to build. Overall, all but one group completed something that looked like a lifeguard chair. In the end, the students presented their projects. Many students were eager to explain their efforts and show off their chairs. Many of the chairs did support 20 seconds to hold the stuffed toys. However, I did have to lecture my kids and become stern at the end of the presentations because many students did not respect the presenters and only cared about their designs. I think that this was a learning process for me and the kids. The students are not used to learning science in a hands-on manner, and I felt a bit overwhelmed at fitting in all of the presentations in our 30 minute science slot. I hope that the next time we will all be better at this part of the design process. Unfortunately, we did not have time to improve our designs, but we were able to discuss what would be changed in the chairs if they were to complete the redesign. Since then, the students are still excited about science and can’t wait for the next design task.

# LIFEGUARD CHAIR AT KLONDIKE

by: Dona Thomas

I am a 4th grade teacher at Klondike Elementary School. I teach math and science in the morning. In the afternoon, I also teach distance learning advanced 6th grade math and advanced 7th grade math (pre-algebra) to 4th and 5th grade students in our county. I have held various teaching positions for approximating 20 years.

Currently we have only completed the Lifeguard Chair. While taking the SLED course this summer, my best activity was the 'Slow Boat'. I think it will become my 4th graders favorite also. (They will enjoy the idea of boats and water, but will probably prefer acceleration to the idea of 'slow' boat.) I enjoyed this activity because it was fun, it was the opposite of what most want to do with a boat, and because it was a great idea for the skills we teach.

In my 4th grade classroom, the best part has been the independent designing and group designing. The students really wanted to draw an example of what they would like to build. After their group planning, the actual building of their prototype was somewhat confusing for them.

They need more practice for them to be able to build prototypes that follow constraints and criteria in order for them to get to a point of enjoyment for that step in the process.

My students so far have learned the introduction to the engineering design process. They are beginning to understand and identify the key components - client, end-user, criteria, constraints, goal, problem, etc. With the first design of the lifeguard chair, some students worked together well and were able to complete their plan. Others really just couldn't follow through. They need more practice in building. It is evident, they do not 'play' build at home, they probably just virtually build which is definitely not the same thing!



The students enthusiasm was evident when they were engaged in the independent planning and the group planning. When the execution of their plan was expected, some students had great difficulty in following through to the end. They really did not have any idea of how to make it work. Some students depended on the others in their group to do it all. And others continued to enthusiastically follow through and build a prototype that met most of the criteria and constraints. I think the students need more time to execute their plan. With that said, students have to begin somewhere...and my students exhibited that. Confidence will build as we continue to design and build prototypes.

# Water Filtration at Wea Ridge

by: Kelly Myers

I have been a teacher for eleven years, and six of those years have been at Wea Ridge Elementary School, teaching 5<sup>th</sup> grade. During the past two years, I have been an active participant in Science Learning through Engineer Design (SLED) methods and have loved the results.



My students excelled at the water filtration lessons, and enjoyed creating their own water filters to clean “yucky water”. We spent a few weeks before the activity studying ecosystems and pollution, and creating a water filter was our culminating activity for the unit. The students enjoyed working in groups and sharing their ideas. I enjoyed watching my students become independent thinkers. They were full of creative ideas to create their water filters, but had misconceptions about what materials would clean the water and what materials would make the water dirtier.

Throughout the activity the students learned how to sketch designs, they learned how to work together in teams, they learned about problem solving, and they also learned how to redesign. The students were engaged throughout the entire design process.

## My SLED

by: Madeline Rupp

I am currently working on my master's in science education with a concentration in chemistry education. Since my first semester in graduate school, I have been working on the SLED project as a research assistant with Dr. Capobianco and Chelsey Dankenbring. My major role on the project is data collection and analysis related to the participating teachers. I am responsible for conducting classroom observations of design tasks and interviews and collecting implementation plans from the summer institute and the reflections on the hub.

My favorite part of my research on SLED is the classroom observations of design tasks. I really enjoy being in the schools frequently and seeing firsthand what the teachers and students experience when they implement engineering design tasks. I believe observing the SLED classrooms on a regular basis has greatly informed my perspective on the teachers' implementation. When I graduate with my master's, I would like to work as a chemistry teacher, so doing research on the teacher's experiences is especially helpful. Through my work with the teachers, I have learned a lot about what it means to integrate new teaching strategies. Also, I have decided to write my thesis on some of the teachers who have worked with us on SLED. My classroom observations and interviews will be used to form case studies of teachers describing how they orient themselves to teaching science through engineering design. I am looking specifically at what goals they set for the classroom and how these goals inform their instructional practices.

### Upcoming Event

#### Grade 3-4 SLED Teacher Follow-Up Session

When: Saturday, November 9, 9:30–11:30 a.m.

Where: Purdue University - Hall for Discovery and Learning Research

Purpose: Progress reporting and sharing related to SLED activities implementation

RSVP Chell ([nyquist@purdue.edu](mailto:nyquist@purdue.edu)) if you plan to attend, so we can get a count for parking passes and for lunches.

