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A Teaching Unit Plan for Introducing Engineering in 1st-2nd Grade Classrooms

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Honors Thesis

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Abstract

The field of engineering, and specifically chemical engineering, is projected to increase significantly over the next 10 years. Engineering programs require students to have a strong foundation of math and science. Students in the United States are often underprepared to enter these programs, and the majority of high school students are not interested in pursuing a career in the STEM field at all. For this project, a unit teaching plan was created to introduce students to the field of engineering, providing a foundation for their upper-level STEM classes, and encouraging them to consider engineering as a career in the future. The unit plan is intended to be a single 30-minute to 1 hour presentation with an optional visual activity, that includes 3 learning objectives. The unit was presented at 4 elementary schools in Northwest Arkansas. Results from a teacher survey administered during the presentations indicated that the presentation was successful in implementing the learning objectives.

Introduction

Objectives

Some believe the economic future of our country depends on the quality of education we provide for our students. The National Center for Education Statistics states that a nation's economic productivity is directly related to the education level of its citizens (Decker et al., 1997). According to the National Science Foundation's Science and Engineering Indicators, while performance in STEM has improved since the late 20th century, still, less than half of elementary and middle school students in the United States were reaching a proficient level in math and science in 2011 (NSF, n.d.). Additionally, they found an obvious gap in performance between different demographic groups on the National Assessment of Educational Progress. Students from homes with low income or homes where the primary language spoken is not English scored lower than others. Interestingly, differences in scores between gender groups were minimal; however, boys were slightly favored. College level engineering courses require students to have a strong foundation of math and science, and the majority of students in the United States are not prepared to enter these programs.

Pre-college students' performance in math and science is reflected in engineering enrollment rates. There was an 11% drop in the number of Engineering degrees awarded in the United States from 2003-2008. This is especially concerning considering that the total number of bachelor's degrees awarded during this time rose significantly (Davis et al., 2012). Other developed countries have not followed the trend of declining enrollment. As manufacturing and engineering practices improve in other countries, more and more companies may start to move their practices abroad, damaging the United States economy. Additionally, the Bureau of Labor Statistics anticipates a 14% growth in chemical engineering employment by 2031, well over the average for all occupations (Bureau of Labor Statistics, 2022). Student enrollment in engineering programs needs to increase to keep up with this expected growth.

There is additional evidence that introducing K-12 students to engineering is important. As the earth continues to warm and more problems begin to face our society, many are becoming increasingly worried about the state of our world. A new term has arisen to describe this phenomenon: climate anxiety (Thompson, 2021). Experts warn that one of the symptoms of climate anxiety could be eco-paralysis, described as becoming hopeless about the state of the

world and giving up on trying to find solutions (Clayton, 2020). Children and young people are particularly vulnerable to climate anxiety, and therefore eco-paralysis (Larionow et al., 2022). One way to curb the effects of climate anxiety is to teach self-efficacy (Wortzel et al., 2022) (Clayton, 2020). Educating the next generation of engineers could be vital to helping curb the effects of climate change.

There have been initiatives in the past to engage students in fields like computer science. In 2016, Obama announced his Computer Science for All program when the need to fill and diversify computer science and data science job openings was realized. In 2015, there were thousands of tech jobs that were unfilled, and only 3% of tech jobs were filled by Black employees. Along with allocating billions of dollars for states and school districts to create and expand their K-12 computer science programs, the initiative also involved state leaders, CEOs, philanthropists, and educators to help expand access to CS education (Smith, 2016). Similar initiatives could be necessary to fill the need in engineering, and specifically chemical engineering roles.

The objective of this project is to create a single unit teaching plan to introduce lower elementary school students to engineering and encourage them to think about pursuing engineering as a career. A presentation was made to 4 elementary school classrooms in Northwest Arkansas to test the effectiveness of the unit. The unit can be adapted for classroom sizes and age levels, for any teacher wanting to introduce students to the concept of engineering. Ideally, the final unit and resources will be made publicly available for educators to access. The goal of the project is to encourage students in elementary school to pursue engineering in the future, as well as provide them with a basic foundation of engineering before they enter upper-level science, technology, engineering, and math (STEM) classes.

Pedagogy

Connecting learning objectives to stories can help young students absorb information better. Many children's picture books about engineering have been published. Some of these are biographies of famous engineers: Rosie Revere Engineer, The Great Skink. Others encourage readers to use their engineering skills, like the If I Built a… series (Kivi, 2021). Connecting science and engineering concepts to stories helps students remember facts better, while also keeping them engaged (Nisha & Prema, n.d.). This presentation created for this unit did not seek

to tell a story, but rather connect engineering to elements from media that the students were familiar with.

Many young students have never been exposed to engineering in the classroom and will not know the definition of engineering. Often when young students think about engineering, they think of material objects (“cars”, “trains”, “computers”) rather than the actions taken (“designing”, “improving”) (de Vries et al., 2016). The definition provided to students during the presentation is: “Engineers find ways to do cool new things.” This definition emphasizes that engineering is a process of finding answers to questions, while also exciting students to the possibilities.

In their chapter on elementary engineering education in *Pre-University Engineering Education* (2016), de Vries et al. suggest that another characteristic of a good engineering curricula is that students are able to learn through hands-on activities. This unit encourages active engagement through a brainstorm activity and tested the potential of including a visual demonstration. For the brainstorm activity, students were able to share their ideas for potential engineering solutions. Emphasis was placed on having multiple solutions to the scenarios, which de Vries et al. also indicate is important.

Diversity and Inclusion

An important feature included in the presentation was the emphasis on diversity and inclusion. The presentation attempted to appeal to both genders equally by including a variety of characters and examples of engineering. Emphasis was placed on engineers of all colors, for example, by including a picture of multi-toned Band-Aids.

One improvement that could be made would be including characters of color as examples of engineers. The examples used in the presentation appealed to different genders and interests but were all white. This representation is especially important for multicultural classrooms. One of the classrooms that was visited had a large minority population. Including characters from multicultural shows and characters with diverse backgrounds would ensure that more students feel represented. One way to make sure that students engage in the presentation and see themselves represented in the examples would be to contact the teachers prior to the presentation

and ask what some of the students' biggest interests are. Characters or people from their favorite media would be used.

Other considerations for diversity and inclusion were made. There are many indicators towards choosing an engineering education and career. A study from the University of Washington Center for the Advancement of Engineering Education found that the main three motivators for students choosing to study engineering were intrinsic behavioral traits, intrinsic psychological traits, and social good. These traits concern thoughts like "I like to build stuff", "I think engineering is fun", and "engineers get to help people", respectively (Sheppard et al., n.d.). Another study found that building and inventing is a larger motivator for male students, while making a difference to the world is a larger motivator for females (Alpay et al., 2008). Focusing on multiple traits that make good engineers in elementary engineering can reach the broadest audience.

Much of the presentation was interactive, giving students a chance to speak up and share their ideas. At the beginning of the presentation, students were instructed to raise their hand if they wanted to share at any point. When selecting students to answer questions, emphasis was placed on choosing a diverse range of students. This included calling on students of both genders and all races, but also choosing students from different locations in the classroom and those with different levels of enthusiasm. Many students that chose to sit in the front row would be very excited to share their answers, jumping up and down when a question was asked. Others would raise their hands shyly. Choosing a balance encourages all students to continue sharing their ideas.

Methods

The choice to educate young elementary students was made to catch as many students as possible before they become disinterested and disengaged with STEM fields. Studies have shown that students, especially female and minority students, become disengaged with STEM before reaching high school (*Why Do Girls Lose Interest in STEM? New Research Has Some Answers — and What We Can Do about It - Stories*, n.d.), and only about 25% of students in high school indicate that they are interested in pursuing a career in the STEM field (*Many High Schoolers Giving Up on STEM*, n.d.). The most common reasons students choose not to pursue these fields is that they don't see themselves represented there, and they lack confidence in their

abilities (*Why Do Girls Lose Interest in STEM? New Research Has Some Answers — and What We Can Do about It - Stories*, n.d.).

There is also a lack of resources for lower elementary school teachers. In 2011, Arkansas adopted the Next Generation Science Standards for K-12 education. The Arkansas Department of Education has a list of resources for teaching STEM on its website, but the resources are lacking, focusing mostly on resources for standardized testing (Division of Elementary & Secondary Education, n.d.). Many educators indicate that they don't feel comfortable teaching engineering in their classrooms, and a significant portion are not confident teaching science and math. One study found that only 9 percent of elementary school teachers feel fairly well prepared or very well prepared to teach engineering (Banilower et al., 2013). If educators are not comfortable talking about engineering, students will never have the opportunity to be exposed to the field in their classroom. More resources need to be available for educators, to train them on engineering concepts. This unit attempts to fill that gap.

Learning Objectives

The learning objectives for the unit were created based on Bloom's taxonomy. Bloom's taxonomy provides a common language for educators to evaluate their students' learning progress and share goals (University of Central Florida, n.d.). It is used by K-12 educators, as well as at the college level. Bloom's taxonomy consists of a six-tiered hierarchy of action verbs, starting with the most basic knowledge, up to the most advanced (Figure 1). To reach the higher levels of learning, students must first have a grasp on the tiers that are below.

For this unit, only the first 2 levels of the hierarchy, remember and understand, were used to form learning objectives. These hierarchies were chosen based on the grade level of the audience. Students are not expected to be able to solve complex engineering problems at this age, but they need to be provided a foundation before they move on to upper-level STEM classes. Arkansas science standards for 1st-2nd grade also use only verbiage from the first 2 hierarchies (*Topic Arrangements of the NGSS | Next Generation Science Standards*, n.d.).

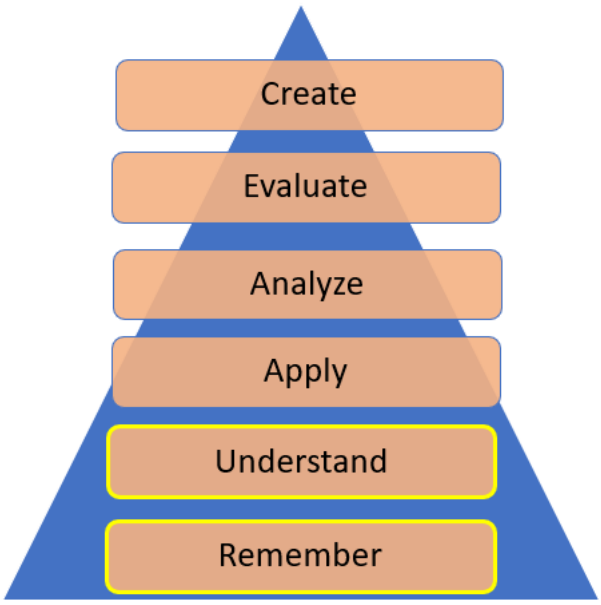

Figure 1. Bloom's taxonomy, with utilized tiers highlighted.

The learning objectives for this unit were chosen based on the Arkansas K-4 Science Standards. The Engineering, Technology and Applications of Science objectives for 1st grade state that students should be able to make observations and define problems, develop simple solutions, and compare different solutions (*Topic Arrangements of the NGSS | Next Generation Science Standards*, n.d.). The learning objectives are as follows:

After completion of the presentation, students will:

1. Believe in their ability to become engineers and solve engineering problems.
2. Define engineering and explain what an engineer does.
3. Discuss engineering solutions when presented with a problem.

Learning Objective 1 emphasizes the need to include all students. There are many different skills that make good engineers, and the reasons for pursuing engineering differ greatly by demographic group. The hope for introducing engineering to young elementary students is not only that they develop engineering and problem-solving skills, but that they realize how they can use their own strengths to become great engineers.

In the future, this learning objective will need to be altered. Bloom's taxonomy utilizes measurable verbs to assess student learning. After analyzing data from teacher surveys, the

realization was made that teachers do not have the capacity to accurately gauge a student's belief in themself. If the project was able to utilize a survey of the students, this learning objective may be easier to measure. However, to make this learning objective better fit Bloom's Taxonomy while also measuring the same educational goal, it could be altered to: "Recognize traits that make good engineers." 'Recognize' is easily measured verb commonly included in the first level of the hierarchy, 'remember.'

Learning objective 2 was added to differentiate the word "engineering" from "science." Engineering is the application of math and science to solve real world problems. Additionally, this learning objective was added to ensure students would focus on the correct definition of engineering, described using action verbs rather than objects. To ensure students meet this goal they were supplied with the simplified definition of engineering. The presentation also included a quote from engineer Theodore von Carmen, reading: "Scientists study the world as it is, engineers create the world that has never been." The goal of including this quote was first to emphasize the differences between the fields of science and engineering. Secondly, the quote inspires and excites students to the possibilities within engineering.

Learning objective 3 incorporates the Engineering, Technology and Applications of Science learning objectives from the Arkansas Science Standards. Students are expected to be able to come up with simple solutions based on data and their observations. This learning objective was achieved through a brainstorming session at the end of the presentation. Students were presented with simple engineering challenges, such as "how would you remove snow from the top of a skyscraper?" and given a chance to share their ideas.

Presentation Content

A 30-minute presentation was created in Microsoft PowerPoint to introduce the engineering unit to students and was presented at 4 different elementary schools in Northwest Arkansas. It included a definition of engineering, examples of characters that could be considered engineers, examples of real-life engineering, a list of traits and interests that engineers can have, and a brainstorming activity. A colorful theme was chosen for the background, and multiple font colors, animations, and pictures were included (Figure 2). The best practices for making a presentation for young kids are to include many visuals, use kid-

friendly themes and fonts, and have interaction throughout (*How to Make a Presentation for Children That Actually Keeps Their Attention*, 2023).

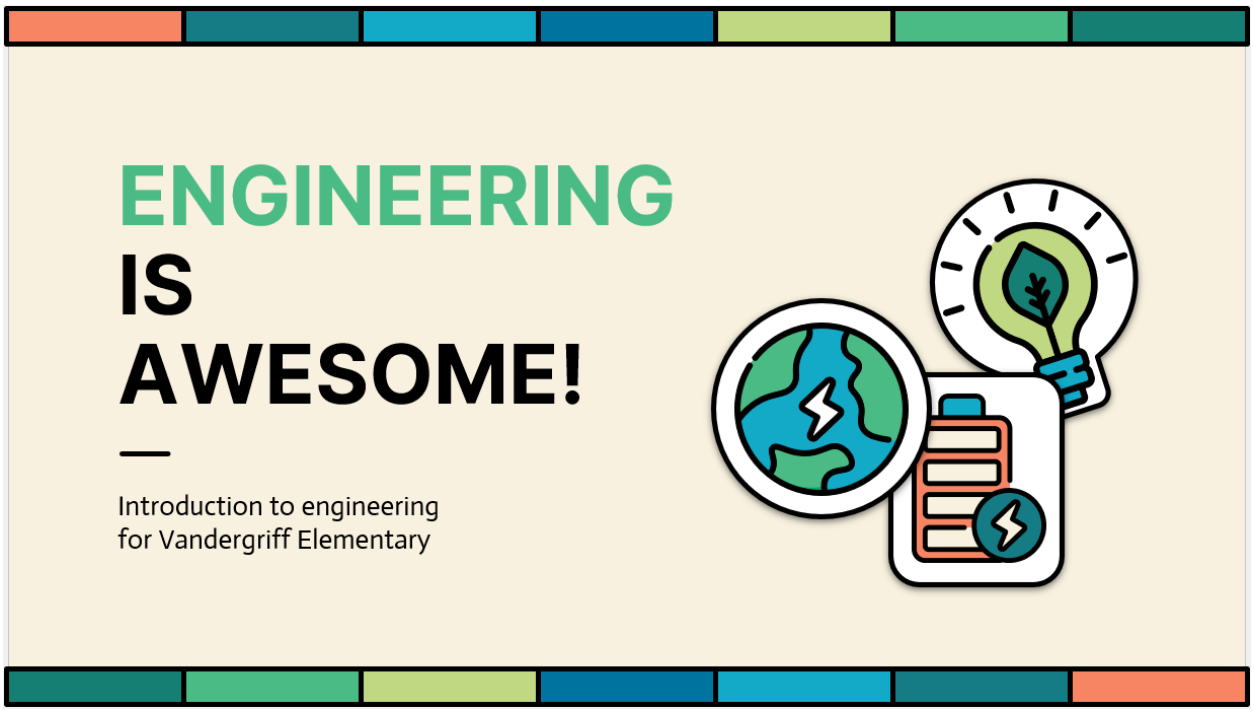

Figure 2. Introduction slide from the presentation to Vandergriff Elementary

The definition shared with students stated: engineers find ways to do cool new things. This moves students away from the object-oriented definition of engineering and is more action oriented. The slide also stated that engineers make things "better, faster, and easier." This definition of engineering covers all of the reasons that students choose to pursue engineering, ensuring that all students interests are represented.

Examples of engineering were shown through characters that can be considered engineers, as well as different processes and items that require engineering. Examples of characters were Iron Man, Elsa, and Dr. Doofenshmirtz. These characters were chosen because they are age appropriate and appeal to a variety of interests. If done again, it would be beneficial to include characters of color, especially at schools with high minority populations. Communication with the instructor before the presentation to gain insight into what the students' interests are would help with engagement.

Examples of things engineers can do started with transportation, including space travel and a discussion of electric cars. Next, examples of how engineers are involved in water treatment and water supply. Additionally, new technology for treating water in places with less infrastructure was shown. Also shown were examples of how engineers work in the medical field, including prosthetics and hearing-aids. Finally, examples that could be considered more 'fun' for students were shown. This included roller coasters, video game consoles, makeup, and art supplies. Providing a variety of topics that engineers can focus on will help engage more students by appealing to their interests.

Students were informed of the many skills that can make great engineers. One skill was building, which was connected to students interests in LEGOs and the videogame Minecraft. Additional skills included being interested in numbers and math, nature and science, and liking computers. A strong foundation of math and science are required for engineers, and computers are continuously becoming more necessary in the world of engineering. Throughout the presentation, creativity was also emphasized as an important skill for engineering.

The brain break was implemented after feedback from the first of the four presentations. This allowed students to get some of their energy out and refocus their attention. During the brain break students were instructed to stand up and perform actions that engineers may do, like swinging a hammer or turning a valve. Then they were instructed to pretend to be robots. The action lasted for about 3 minutes. After this, students were asked to talk to their neighbors about their weekend plans or discuss engineering. The brain break seemed to be effective at refocusing the attention of the students.

For brainstorming, students were given an engineering problem (e.g. How would you remove snow from the top of a skyscraper?) and asked to discuss. The first iteration of the presentation at Vandergriff Elementary had all brainstorming questions on a single slide without visual aids. Based on instructor feedback, the brainstorm session was split into multiple slides with visual aids were added "so students can visualize the problem." Additionally, after the first iteration, an introduction to brainstorming was added to guide students in their problem solving (Figure 3).

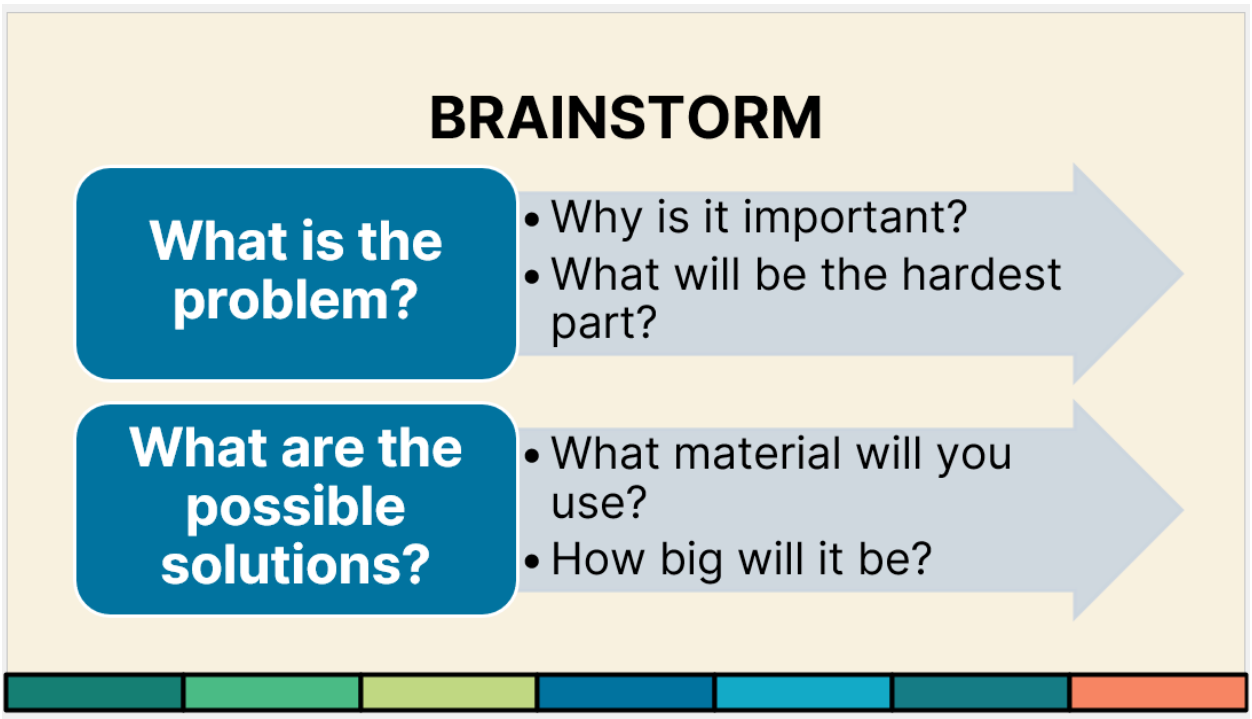

Figure 3. Introduction for brainstorming, added after first iteration.

Classroom Visits

A series of presentations at multiple elementary schools in Northwest Arkansas was done for this project. Each subsequent presentation incorporated feedback from the previous school. Presentations ranged from 30 minutes to an hour, and audiences ranged from classrooms with 20 students to auditoriums with 100 students. The choice of schools was based solely on the availability of the educators to accommodate a visit to their classroom. Table 1 shows the schedule of classroom visits, along with a description of the presentation setting, and school demographics.

Table 1. Description of classroom visits, including demographics of each school.

Presentation Date	**School**	**Description**	**Minority Enrollment**	**Economically Disadvantaged**
March 7, 2023	Vandergriff	30-minute presentation, 100 1st grade students,	16%	10%

		seated on auditorium floor		
March 14, 2023	Knapp	Two 30-minute presentations, 30 1st grade students each session, seated in classroom desks or on floor	89%	87%
March 17, 2023	Leverett	1 hour presentation including visual demonstration, 20 2nd grade students, seated in classroom desks	42%	58%
March 31, 2023	Washington	30-minute presentation, 45 1st grade students, seated in classroom desks or on floor	45%	57%

(*Vandergriff Elementary School*, n.d.) (*Linda Childers Knapp Elementary School*, n.d.) (*Leverett Elementary School*, n.d.) (*Washington Elementary School*, n.d.)

Visual Demonstration

A short visual demonstration was executed during the classroom visit to Leverett Elementary. The demonstration was adapted from Yeast Science Experiment for Kids from Scholastic (*Yeast Science Experiment for Kids*, n.d.). It was chosen because it is acceptable for a large range of ages and can be directly connected to concepts in chemical engineering. It is a variation of the classic vinegar and baking soda experiment and uses materials that are safe to have in an elementary school classroom.

Instructions for the demonstration are as follows:

Materials:

- 2 jars or bottles

- 2 balloons or rubber gloves
- Warm water
- Dry active yeast
- Sugar
- Different colored rubber bands or markers

Procedure:

1. In each jar, add ½ cup of warm water and a teaspoon of yeast. Stir.
2. Add 1 teaspoon of sugar to one mixture, and 2 teaspoons to the other.
3. Place balloon or glove over the top of the jar, securing with rubber band if necessary.
4. Differentiate the jars by numbering or marking with different colors.
5. Set the jars in a spot in the classroom where they are visible to the students.
6. Wait 15-30 minutes, then have students guess which jar had more sugar. One balloon should have much more gas in it.
7. Discuss how the yeast creates gas, and connect this to the many different types of reactions the engineers use.

During the classroom visit, the demonstration was set up while students had a brain break. Since this presentation was an hour, the students were allowed a longer brain break where they could get up and move as well as talk to their neighbors. After the brain break, the experiment was explained to students, and the jars were set in a visible location for the brainstorm.

One of the balloons had more gas in it at the end of the experiment, and students guessed correctly that that one had been given more sugar. An explanation of the reaction between yeast and sugar was explained and connected to bread making. A simple connection to mass balances was made as well: more sugar makes more gas, like how more feed creates more product. Additionally, there was a discussion of how engineers can use reactions, like the one between yeast and sugar, to make useful products.

Variations in this experiment could include more jars with different amounts of sugar, different feeds (e.g. salt, flour, honey, no feed), or different water temperatures. This would allow for further discussion of mass balances, reactions, and reaction conditions. This

experiment can be made simpler or more advanced if educators needed to adapt it for the age or knowledge level of their students.

Teacher Survey

For data collection, a teacher survey was administered during the presentation and collected after completion. The survey consisted of 6 Likert scale questions, 2 yes/no questions, and one open ended feedback question. The goal of the survey was to collect information about previous engineering experience in the classroom and evaluate the content of the presentation from the point of view of an elementary school instructor.

Results

The results from the survey given to teachers to fill out during the presentation are shown below (Table 2). The full survey is included in the appendix. All questions except 1 and 5 were Likert scale questions based on 5 points, and average scores are presented. No instructor surveys were received from Washington Elementary, and only 1 survey was received from Leverett Elementary. Data from Vandergriff and Knapp Elementary Schools will be used for further analysis.

Table 2. Results from educator survey.

		Survey Question								
School	N	1		2	3	4	5		6	7	8
		Yes	No				Yes	No			
Vandergriff	5	5	0	4.6	5	5	5	0	5	3.8	4.8
Knapp	4	1	3	4.3	4.7	4.8	4	0	4.3	3.8	4.5
Leverett	1	1	0	5	5	5	1	0	5	4	5

Based on the results of the survey, it is evident that elementary school students are interested in learning about engineering. The average response gauging students' interest in engineering was 4.5, with 5 being "very interested" in engineering topics. Interestingly, although students from both Vandergriff and Knapp Elementary were interested in engineering, only the teachers at Vandergriff had covered engineering topics in their classrooms. At Vandergriff, 100% of instructors indicated that they had covered engineering topics, compared to only 25% at Knapp. This is concerning, especially considering the demographic differences between the 2 schools. One teacher at Knapp mentioned during the classroom visit that over half of the students

in her 1st grade class were considered English language learners (ELL), which means that the primary language spoken in their home is not English. U.S News Report also indicates that Knapp Elementary has a minority enrollment of 89%, and 87% of their students are economically disadvantaged (*Linda Childers Knapp Elementary School*, n.d.), while Vandergriff has a 16% and 10% minority and economically disadvantaged enrollment, respectively (*Vandergriff Elementary School*, n.d.). There is an obvious gap in accessibility to engineering education between these different demographic groups. This unit will be shared with educators, in an attempt to make engineering education resources more accessible to all students. Results from the survey show that it is important to distribute to all schools, especially those with high minority populations, who are currently lacking access.

The survey results also indicated that the content of the presentation and the learning objectives were effective. Additionally, the learning objectives were met according to the survey results. Ideally in the future, the unit would include a student survey to evaluate the extent that the learning objectives were actually met. A teacher survey is based only on the opinions of instructors to evaluate if the learning objectives were met. A survey or assessment of students would be able to accurately measure which learning objectives students are able to perform. On the survey, teachers also indicated that the presentation was adequately engaging but could be shorter.

The survey also allowed for instructor feedback. Feedback from the first iteration of the presentation at Vandergriff elementary school suggested that smaller groups may be more effective for younger students. The large group made it hard for students to keep focused, especially during the brainstorming portion of the presentation, when feedback was required. Smaller groups would allow for a better chance for all students to be called on and share their ideas. Another solution to this problem would be to have students discuss their ideas with their neighbors, giving students a chance to get their words out and allowing for a more controlled opportunity to share.

Feedback also suggested that a “brain break” featuring engineering pictures and songs would help to keep students engaged. Studies suggest that a student’s attention span can range anywhere from their age + 1 minute, 10-15, or up to 30 minutes (Cicekci & Sadik, 2019) (*Normal Attention Span Expectations By Age*, n.d.) . For a half hour presentation, a short break to allow students to get their energy out and refocus their attention could be effective. Brain breaks

have been shown to improve student performance and behavior during instruction (Stipes, 2021). This feature was added to subsequent presentations.

Another educator from the Vandergriff group suggested that pictures would be helpful during the brainstorming portion of the presentation, to give students a better idea of the "problem" they are given. Initially, the brainstorm activity was a single slide with six questions numbered and listed. The students seemed to be overwhelmed at the number of questions on the screen at one time and had trouble focusing on practical solutions to the problem. For example, the question "how would you remove snow from the top of a skyscraper?" gave responses that would make sense in the context of removing snow from the ground but did not consider the specific challenges of the tall structure. When the slide was adapted to show a picture of a skyscraper, more ideas were considered about the process of reaching the top of the building, and the safety concerns of having workers and machinery at such a great height.

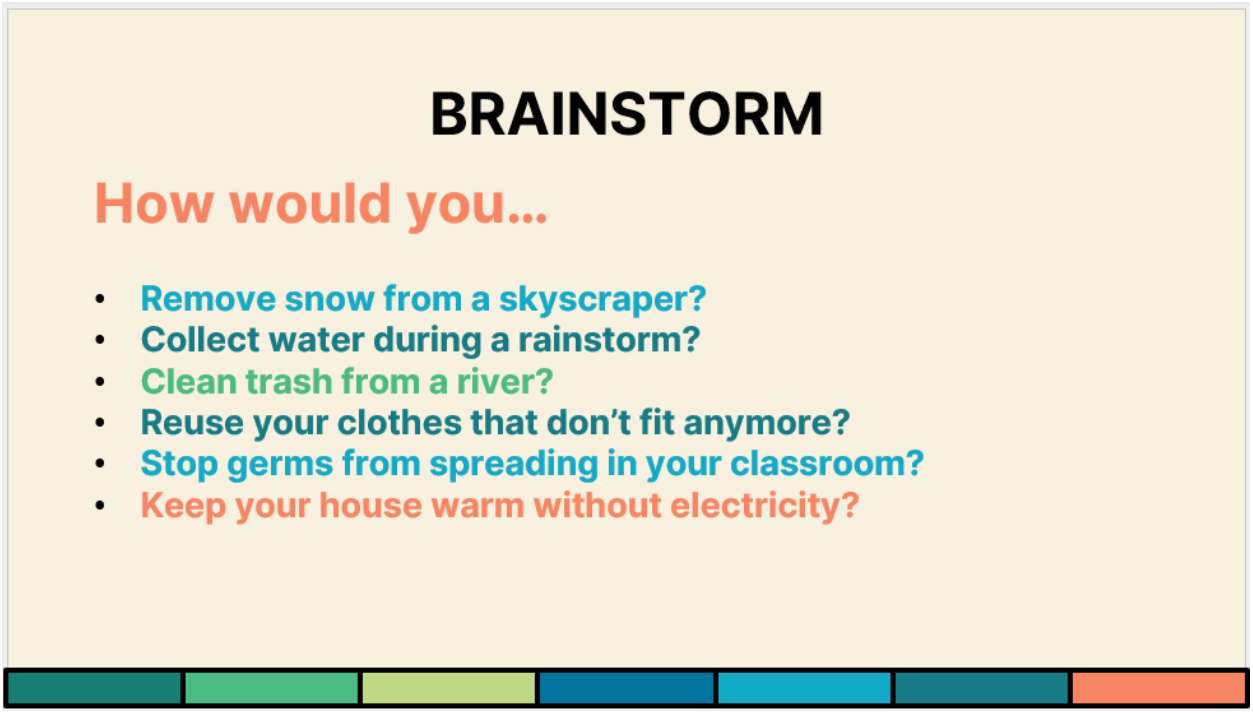

Figure 4. Original brainstorm slide from presentation at Vandergriff Elementary

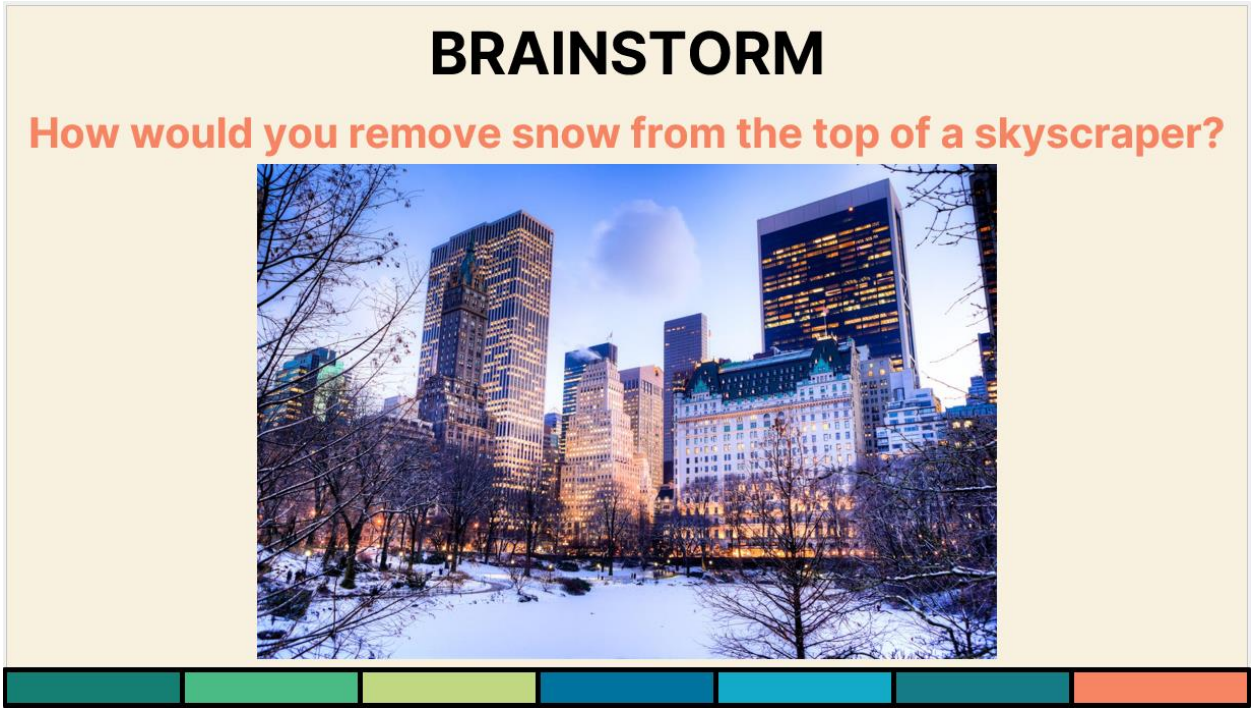

Figure 5. Revised version of brainstorm slide

Positive feedback from the first iteration of the presentation focused on the variety of pictures and examples of engineering. Appealing to a broad audience and the many different interests of students was a goal when making the presentation. The interactivity of the presentation was also praised, with one comment saying, “lightbulbs were going off in their eyes when they connect real life to learning.” Emphasizing the creativity required in engineering and giving them opportunities for active engagement was successful.

For the second iteration at Knapp Elementary, one suggestion for improvement was that the presentation could be shorter. By the end of the 30-minutes, students were obviously less engaged. Two classes of 1st graders were brought into one room at this school. Especially in a classroom with more than the usual number of students, it is difficult to keep students engaged. In the future, it should be considered how to shorten the length of the presentation for larger and younger audiences. The interactive brainstorm activity, where students are allowed to “practice” being engineers is important and should not be removed. Some of the examples of characters and real-life examples of engineering could be taken out to use less time.

Discussion

Overall, the unit that was created was effective in providing students a foundation of engineering and encouraging them to pursue engineering in the future. At the end of the presentation, students were asked to raise their hand if they thought they may want to be an engineer when they grow up. In each classroom, the majority of students raised their hands. In the future, the unit could be improved by adding more consideration to diversity. If done again, the unit should be adapted to include characters that represent a larger variety of cultures.

One factor in introducing engineering to elementary school students that was not considered at first but became obviously important after the completion of the project was classroom management. As someone with no classroom or education training, this was something that I did think about, but is important for future students if they are considering pursuing a similar project. Being able to re-focus students when their attention wanders, especially after the brain breaks, is a skill that many educators will have learned. Any engineer considering a project like this should have a strategy for re-engaging students beforehand.

To expand access to engineering instruction for elementary school students and provide resources for teachers to use in their classrooms, the unit that was created, including the learning objectives, presentation, and visual activity instruction could be made available. There are many ways to share these resources, especially with access to the internet. A video recording of the presentation could be made and posted to YouTube. This would be especially useful for teachers who do not feel confident in their engineering teaching abilities, because it would not require them to have any knowledge of the subject to introduce it to their students.

The University of Arkansas College of Engineering and the Ralph E. Martin Department of Chemical Engineering also have an opportunity to help expand access to engineering resources for elementary educators. A website could be created with resources for teachers, including the presentation, the video recording of the presentation, and other content created for the unit. Additionally, the website could include links to other resources from the University, including engineering summer camps, STEM education courses, professional development opportunities, and outreach opportunities. This could all be easily accessible and searchable from the main University website.

Another way to distribute the unit to elementary educators is through the website Teachers Pay Teachers. This is a website that allows instructors to sell their original lesson plans to other teachers. Any instructor is able to make an account and search for lesson plans that they could use in their classrooms. Teachers Pay Teachers is a popular website among educators, so selling the unit on this platform would reach more people than creating a website. However, educators would be required to pay for the content, making it harder for teachers with less funding to access the unit.

Conclusion

Enrollment in engineering programs needs to increase to keep up with the expected growth in engineering fields. For this project, a unit was created to introduce lower elementary school students to engineering, providing them a foundation of the field of engineering, and encouraging them to pursue engineering as a career in the future. The unit included a presentation, which was shown at 4 elementary schools in Northwest Arkansas. The presentation provided a definition of engineering, examples of engineering in media and real life, skills that make good engineers, and a brainstorming activity. Active engagement was encouraged throughout the presentation. Based on results from the teacher survey that was administered, the presentation content was successful in teaching the learning objectives. To increase access to elementary level engineering instruction resources, the unit will be made available to educators through the internet.

Appendix

Survey:

1. Have you covered engineering topics in your classroom before?
   Yes No Comments:

2. Do your students show interest in engineering topics?
   No interest…1….2….3….4….5…Very interested

3. How effective was the content of the presentation?
   Not effective….1….2….3….4….5….Very effective

4. How effective are the learning objectives?
   Not effective….1….2….3….4….5….Very effective

5. Do you feel like the learning objectives were met?
   Yes No Comments:

6. How effective was the length of the presentation?
   Not effective….1….2….3….4….5….Very effective

7. How was the depth of the presentation?
   Too general….1….2….3….4….5….Too advanced

8. Was the presentation engaging?
   Not engaging at all….1…..2…..3…..4…..5…..Very engaging

9. Do you have any feedback about the presentation? How could it be improved?

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