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Final Report

K-12 Workforce Development Activities, The University of Alabama at Birmingham (Year 2)

Project UF-EIES-1200009-UAB TO10

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K-12 Workforce Development

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ABSTRACT

The University of Alabama at Birmingham (UAB) in collaboration with the UAB Institute of Transportation Engineers (UAB ITE) student chapter and the Society of Women Engineers (SWE) organized several workforce development events in 2014 aiming at introducing transportation engineering to K-12 students in the state of Alabama. This report summarizes two UAB K-12 workforce development initiavites sponsored by STRIDE and the Alabama Department of Transportation (ALDOT) that exposed elementary school students to transportation engineering and encouraged middle school girls to consider STEM related careers. These initiatives are a. the UAB Kids in Engineering Day, a Family Engineering event targeting 4th through 6th graders, and b. the UAB Girls in Science and Engineering Day, an all-female event promoting STEM careers with hands on workshops for introducing middle school girls to engineering. Both initiatives provided a variety of experiential learning opportunities that engaged students in planning, design, and problem solving, promoted student creativity and teamwork, and provided a fun and positive experience. The events were very successful and the feedback from the participants was overwhelmingly positive.The activities undertaken in this project can serve as a model that other Universities can replicate to empower young students in becoming engineers and pursuing transportation engineering as a career choice.

EXECUTIVE SUMMARY

The number of programs exposing children to engineering profession is growing but the majority of students still do not have sufficient exposure [Schunn, 2009]. Earlier research has established that high quality workshops and programs offered at K-12 can effectively promote engineering education [Cunningham, 2009] and have positive implications for the future of science, technology, engineering, and mathematics (STEM) education [Katehi et al., 2009]. Engineering education for K-12 students is greatly benefitial toward improving student learning and achievement in science and mathematics, increasing awareness of engineering and the work of engineers, boosting youth interest in pursuing engineering as a career, and increase the technological literacy of all students [National Academy of Engineering and National Research Council, 2009].

The choice of becoming a transportation engineer requires an understanding of what engineering is and what transportation engineers do. A 2004 article published in the ITE Journal states: "The next generation of transportation professionals is sitting in our classrooms today. It is not too early to consider what will affect their choices and how we need to support them in their development." [Tool and Martin, 2004]. Taking the necessary steps to promote transportation engineering careers at an early age is a priority for the US DOT, state DOTs, and the ITE.

Answering this call, the University of Alabama at Birmingham (UAB), in collaboration with the UAB Institute of Transportation Engineers (ITE) student chapter and the Society of Women Engineers (SWE), organized several events aiming at introducing transportation engineering to K-12 students in the state of Alabama. Providing career education through workshops and exposing the youth to transportation engineering in a fun and enjoyable way establishes positive associations and establishes student views about the discipline.

This report summarizes UAB K-12 workforce development initiavites sponsored by STRIDE and the Alabama Department of Transportation (ALDOT) that exposed young students in Alabama to transportation engineering and encouraged them to consider STEM related careers. The first initiative was the UAB Kids in Engineering Day, a Family Engineering event targeting 4th, 5th, and 6th graders in the Birmingham area. The half day-long event introduced student participants to engineering disciplines through presentations, and fun hands-on activities. The second intiative was the UAB Girls in Science and Engineering Day, an all-female event promoting STEM careers with hands-on workshops focusing on engineering and the sciences. The event aimed at helping girls to appreciate the many exciting opportunities that lie within the science and engineering fields and fighting stereotypes often associated with the low participation of women in engineering occupations.

Both UAB initiatives provided a variety of experiential learning opportunities that engaged students in planning, design, and problem solving, promoted student creativity and teamwork, and delivered a positive educational experience. The events were very successful and the feedback from the participants was extremely positive.The activities undertaken in this project can serve as a model for other Universities interested in empowering young students in becoming engineers and pursuing transportation engineering as their career choice.

CHAPTER 1: INTRODUCTION

Background

Serving current and future needs of the transportation sector requires a skilled transportation workforce that is ready to address challenges and propose effective solutions. The National Highway Institute (NIH) estimated that 50% of the workforce responsible for planning, developing and managing the transportation system will be eligible to retire in the next five years. This creates an urgency to build a new transportation workforce that will bring excitement, experience, knowledge and skills to the work place. Taking the necessary steps to promote transportation engineering careers is a priority for the US DOT, state DOTs, and the public. This is in line with the recommendation from the National Research Council that stresses the need for K-12 science and engineering education that will capture students' interest and provide them with the necessary foundational knowledge in the field [National Research Council, 2012].

Recognizing these needs and under the sponsorship of STRIDE and ALDOT, UAB has undertaken several initiatives to introduce transportation engineering and STEM principles to K-12 students in Alabama. This is a great way to increase student awareness of engineering and the work of transportation engineers while engaging them in participatory, experiential learning activities. As students become familiar with technology and engineering principles early on and build an understanding of the important connections between engineering and everyday life, are expected be more likely to consider engineering as a career path and choose to pursue training in related fields in the future.

Objectives and Scope

The objective of this project was to introduce K-12 students in the State of Alabama to transportation engineering through interactive activities, presentations, and workshops. The ultimate goal was to educate students about the importance of engineering and ignite their interest in transportation engineering as a future career path.

The project involved planning and delivery of K-12 workforce development activities related to:

- UAB Kids in Engineering Day (3 events in the Birmingham, AL region in 2014), and
- UAB Girls in Science and Engineering Day (1 event in 2014).

The major focus of the events was on exposing school children to engineering through presentations and age appropriate hands-on activities that enabled experimentation and discovery of science and engineering facts and applications. Student members of the UAB ITE student chapter, SWE, and other engineering student volunteers helped to run the hands-on workshops

under the supervision of UAB faculty members. Students had opportunities to learn, think, brainstorm, experiment, measure, work in teams, practice communication skills and interact with engineering students and faculty. Moreover, the Project PI delivered presentations explaining the importance of transportation engineering and discussing with students the various aspects of transportion as a career field.

The project expanded K-12 engineering workforce development and outreach efforts at the University of Alabama at Birmingham (UAB) that introduce transportation engineering as a career to students and their families.

CHAPTER 2: PROJECT APPROACH

Overview

This STRIDE project enabled collaboration between various groups within the UAB campus and other organizations in an effort to support K-12 engineering workforce development and outreach. Members of the UAB SWE and ITE student chapters were instrumental in handling the event logistics and UAB undergrad students, graduate students, and faculty from across campus volunteered their time and provided enthousiastic support for the event.

A number of activities were undertaken as part of this project in order to:

a. Coordinate activities and prepare for the event (Pre-event);
b. Facilitate the program activities (Event delivery); and
c. Follow-up (Post-event)

Pre-event activities focused on pre-event logistics such as contacting local student groups and professional organizations and obtaining commitment for participation, meeting with professional organizations and student chapter representatives to plan activities, setting event dates and reserving space, developing materials for event advertisement and management of logistics, event advertising and participant registration, obtaining necessary materials for the hands-on workshops, and signing up volunteers (speakers and helpers).

Event delivery activities involved setting up for the event, training volunteers on their expected roles and responsibilities, welcoming participants, completing scheduled activities, dismissing participants and cleaning up.

Post event activities focused on sharing the experience from the planned event with others through poster presentations and newsletters and documenting activities undertaken in the project in a report according to STRIDE requirements.

CHAPTER 3: IMPLEMENTATION

UAB Kids in Engineering Days

In 2014 UAB hosted three Kids in Engineering Day events in Birmingham, Alabama targeting 4th, 5th, and 6th graders from Alabama schools. This event has many common elements as compared to the Family Engineering Nights with the main difference being bringing students from different schools together in one setting at UAB rather than delivering a program to select schools.

Initially, one Kids in Engineering Day was planned (March 15th, 2014), but given the success of the event and the community's interest for the program, two more UAB Kids in Engineering Day events were scheduled and delived in the Fall 2014 (October 11th and 18th, 2014). Table 1 provides details about the events along with participation data. A total of 117 students from the surrounding Birmingham, AL metropolitan area as well as students from Montgomery, AL metropolitan area attended the events. In addition to presentations and hands-on activities, students were served snacks and lunch at each event at which times they had the opportunity to socialize with each other and participate in small group conversations with the engineers and engineering student volunteers.

Table 1. Participant Summary for UAB Kids in Engineering Day

Date	Event	Location	Participants
03/15/2014	Kids in Engineering Day	Birmingham, AL	45
10/11/2014	Kids in Engineering Day	Birmingham, AL	41
10/18/2014	Kids in Engineering Day	Birmingham, AL	31
		TOTAL	117

Kids in Engineering Day, March 15th, 2014

The first event took place on March 15th, 2014 from 9 AM to 3 PM and attracted 45 participants. Student members of the UAB ITE student chapter and SWE managed the activity stations and explained engineering concepts to student participants. Activity stations included Chocolate Asphalt; Slime and Gloop; Suspension Bridges; and Puff Mobile and introduced various areas of engineering such as transportation, structural, materials, and biomedical. For example, the "Chocolate Asphalt" workshop engaged participants in the design of asphalt using edible materials such as melted chocolate, M&M's, coconut, sprinkles etc. Children were asked to choose the materials determining chocolate asphalt strength (amount of M&M's vs. coconut), mix them, place on the wax paper and roll (Figure 1). After the asphalt dried, the products were tested and results were discussed. Each team's design was evaluated based on composition and overall strength of the asphalt produced. As part of the hands-on activity, the students were introduced to pavement design terms and transportation engineering.

Figure 1 UAB Kids in Engineering Day – Students Working on the Chocolate Asphalt Project

At the conclusion of the program, participants were asked to fill in an anonymous questionnaire survey providing feedback about the event. Fourty three out of the fourty five participants provided feedback.The questionnaire is available in Appendix A. The evaluations received from the participants were extremely positive and the responses are summarized in Table 1.

Table 2 2014 UAB Kids in Engineering Day Evaluation Survey Results

	YES	MAYBE	NO
I learned something new about Engineering today	43		
I enjoyed the activities	41	2	
The volunteers were nice	43		
I would attend this program again	40	3	
I would tell my friend to attend this program	42		1
	Great	Good	OK
The program was	41	2	1
	Rocks!	Is OK	Is Boring
I think that engineering	38	5	0

Kids in Engineering Day, October 11th, 2014

Nine to eleven year old students from Birmingham, AL and Montgomery, AL metropolitan areas were invited to the University of Alabama at Birmingham School of Engineering to participate in a day of engineering related activities. Upon arrival the students were divided into design teams of 6 to 7 students to carry out each of the activities. The activities entailed building water powered cars, water powered bottle rockets, hot air balloons, as well as casting a pendant for a necklace. In each of the session physics and engineering concepts that were related to the activities were explained and reviewed with the students for approximately 15 minutes.
Subsequent to the explanation to the student's teams were allotted approximately 20 minutes to design their car/rocket/ hot air balloon. Each design team tested their design, discussed options

for potential improvements and then used an additional 10 minutes for redesign. There were a total of 41 students that attended the event.

Kids in Engineering Day, October 18th, 2014

The October 18th, 2014 Kids in Engineering Day followed a similar format. The activities entailed building water powered cars, water powered bottle rockets, hot air balloons, engineering jeopardy, as well as a biomedical engineering simulation. In each of the sessions, student volunteers and faculty discussed engineering concepts related to the activities for approximately 15 minutes and then student's teams were allotted approximately 20 minutes to design their car/rocket/ hot air balloon. Each design team then tested their design, and was given 10 minutes for redesign. There were a total of 31 students that attended the event.

All three UAB Kids in Engineering events were very well received by participating students and parents alike. The events allowed student participants to learn about the different types of work that engineers do and get an appreciation of the contributions of transportation engineers in the improvement of everyday life and the betterment of society.

Girls in Science and Engineering Day

The UAB Girls in Science and Engineering Day that took place on Saturday, April 12, 2014. Utilizing technology and classrooms at the UAB campus, the program successfully engaged middle school girls from Alabama schools in science, technology, engineering, and math (STEM) activities.

Nearly 150 females, including 6th, 7th and 8th grade girls representing more than 20 different Birmingham and Tuscaloosa area middle schools, participated in workshops focusing on engineering and science. Female UAB students and faculty volunteers led workshops exposing girls to sciences and engineering through exciting, hands-on activities. Examples include:

- ☐ Building and racing cars from edible materials
- ☐ Building and launching water rockets
- ☐ Dissecting sheep hearts
- ☐ Examining crime scene evidence
- ☐ Creating chemical reactions, and
- ☐ Acting out brain pathways.

The girls also had an opportunity to learn about women famous for their work and research, and to discuss the benefits and challenges of pursuing a career in engineering and sciences.
STRIDE served as a co-sponsor of the event and volunteers of the UAB ITE Student Chapter and SWE assisted with workshops and event logistics. The project PI, Dr. Sisiopiku, led 3

workshops that focused on transportation engineering and traffic safety. First, a presentation introduced the girls to essential concepts related to the transportation engineering field such as the importance of transportation in everyday life, different modes of transportation and their safety, cool facts about transportation and simulation tools as well as current research at UAB.

Following the presentation, the girls were asked to design and assemble edible cars using provided materials and let them slide down 3ft long ramp. This hands-on activity was adopted from a manual develped by Perez et al., 2011. Special instructions were given to guide the students through the process (see Appendix B). Details about the hands-on activity are available in Appendix C. The participants filled in a report where they stated their step by step design process and any challenges that they encountered, and calculated their car speed given time and distance. The cars were evaluated based on their design, durability and speed from a panel of judges (Figure 2). The evaluation form used is shown in Appendix D. The participants had an enjoyable, engaging, and rewarding learning experience.

Figure 2 UAB Girls in Engineering – Edible Car Contest- Student Winners and Judges

At the conclusion of the event, 90% of participants indicated an interest in a STEM-related career and 56% of participants indicated the the 2014 UAB Girls in Science and Engineering Day highlighted career opportunities unknown prior to the event.

Other Initiatives

In addition to the planned Kids in Engineering Day and Girls in Science and Engineering Day events, the project team engaged in several other workforce development and outreach activities promoting transportation engineering and traffic safety. For example, the PI and

transportation students volunteered at the UAB led "Teen Driving Safety Summit 2014" that took place on March 12th, 2014 in Bessemer, AL. This is an outreach event for students from local high schools with hands-on activities focusing on transportation safety and safe driving practices.The participants were educated on possible consequences of texting while driving, drinking while driving and other common driver's distractions. They were also allowed to test the driving simulator, try on special glasses simulating "vision of the world while being under the influence of alcohol" and participate in other activities such traffic safety jeopardy competition.

Figure 3 UAB ITE Student Chapter Volunteers at the 2014 Teen Driving Summit

The PI also volunteered at the "Trace Crossings University Career Fair" on May 1st, 2014. This half-day event introduced over 500 K-4th grade students at Trace Crossings Elementary in Hoover, AL to various professions. Dr. Sisiopiku interacted with students and explained what transportation engineers do and why transportation engineering is important to the society.

Also, on October 10th, 2014 the Project PI hosted a Career Information Session at UAB focusing on Transportation Engineering. Nineteen UAB engineering students attended her presentation and learned about the transportation engineering profession and its potential benefits as a career path choice.

Technology Transfer

The PI collaborated with STRIDE colleagues from the University of Florida, Mississippi State University, Florida International University and North Carolina State University on a poster showcasing workforce development activities, including UAB activities funded by this project. The PI presented the poster at the 2nd Annual University Transportation Center (UTC) Conference for the Southeastern Region that took place in Atlanta, GA on March 24 and 25, 2014.

The 2014 UAB transportation workforce development activities were featured in the STRIDE Spring 2014 and Fall 2014 e-Newsletters and the ALSITE newsletters and highlighted in website postings.

CHAPTER 4: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The three 2014 Kids in Engineering Day events organized and hosted by UAB introduced 117 elementary school students from the Birmingham and Montgomery region to engineering disciplines, including transportation. Student participants learned about the importance of engineering and participated in fun hands-on activities. By exploring engineering concepts and engaging in interactive activities, participating children and their parents learned why engineering is important and what transportation engineers and their engineering colleagues do as part of their job in order to solve real-world problems.

The Girls in Science and Engineering Day event was designed to inspire and empower Birmingham-area middle school girls to learn about science and engineering subjects and fields and encourage them to pursue successful careers in engineering. The "female-only" event was organized by students and faculty women in engineering and sciences who served as role models to 150+ participants, providing proof that there should be no limitations for women when it comes to career choices.

All four events were very well received by participating students and their parents as evidenced by the overwhelmingly positive feedback received from student participants who responded to questionnaire surveys following the events and many positive anecdotal comments offered. Not only the events benefited the many Alabamian children who participated but also brought together undergraduate/graduate students, faculty, and local professionals who worked collaboratively to deliver the events in an efficient and seemless manner.

It should be noted that several workshops offered as part of these events actively engaged K-12 children in activities relating to transportation, thus meeting the transportation workforce development goal of the project. It is believed that when students become familiar with transportation engineering principles early on and develop an appreciation of the important connections between engineering and everyday life, they would be more likely to consider engineering as a career path, and choose to pursue training in transportation engineering in the future. This would further ensure that the U.S. will not fall short of a highly competitive transportation engineering workforce in the years to come.

The activities undertaken in this project can serve as a model that other Universities can replicate to empower young students in becoming engineers and pursuing transportation engineering as a career choice.

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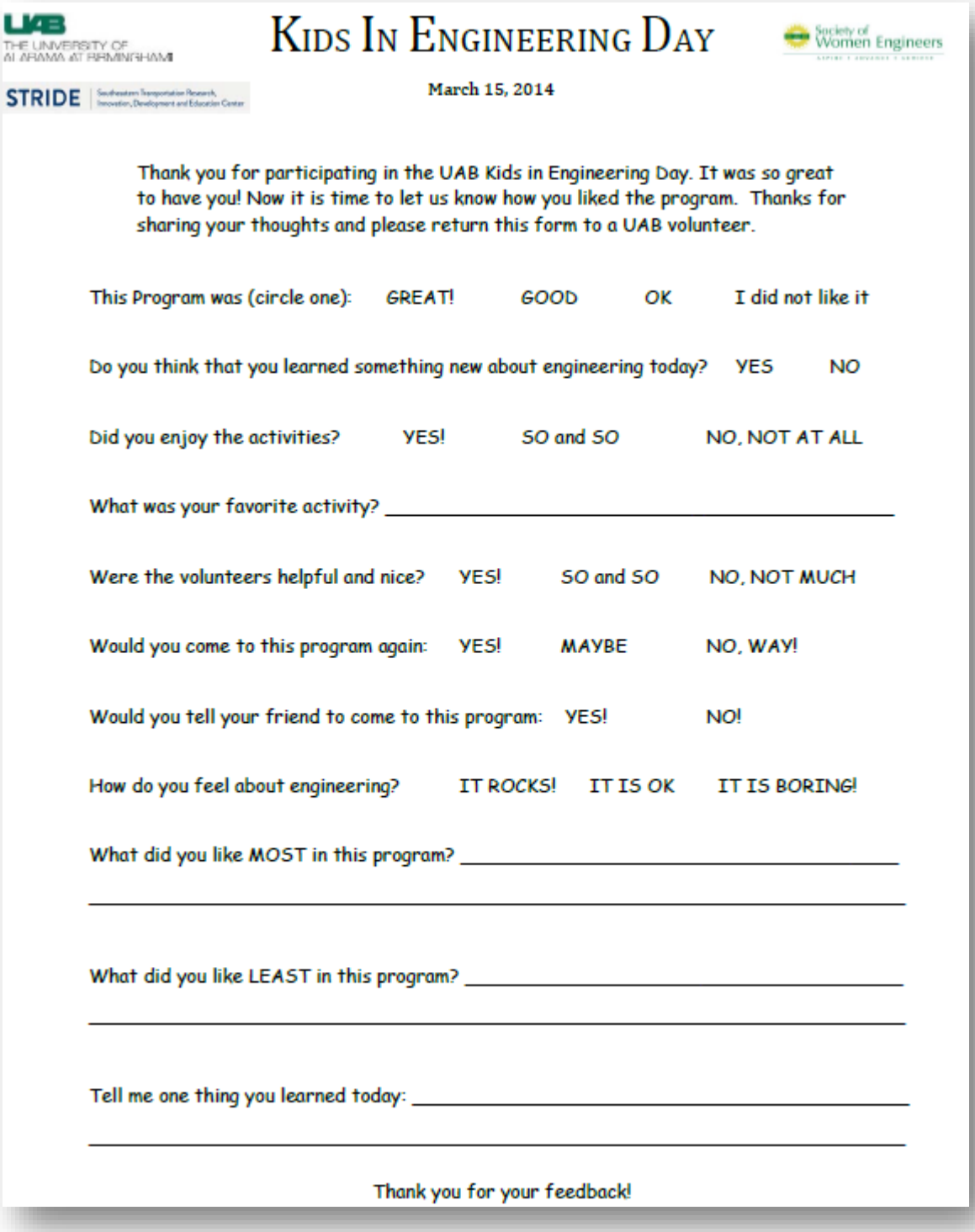
APPENDIX A: KIDS IN ENGINEERING DAY EVALUATION FORM



THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

STRIDE Southeastern Transportation Research, Innovation, Development and Education Center

KIDS IN ENGINEERING DAY

Society of Women Engineers

March 15, 2014

Thank you for participating in the UAB Kids in Engineering Day. It was so great to have you! Now it is time to let us know how you liked the program. Thanks for sharing your thoughts and please return this form to a UAB volunteer.

This Program was (circle one): GREAT! GOOD OK I did not like it

Do you think that you learned something new about engineering today? YES NO

Did you enjoy the activities? YES! SO and SO NO, NOT AT ALL

What was your favorite activity? _____

Were the volunteers helpful and nice? YES! SO and SO NO, NOT MUCH

Would you come to this program again: YES! MAYBE NO, WAY!

Would you tell your friend to come to this program: YES! NO!

How do you feel about engineering? IT ROCKS! IT IS OK IT IS BORING!

What did you like MOST in this program? _____

_____

What did you like LEAST in this program? _____

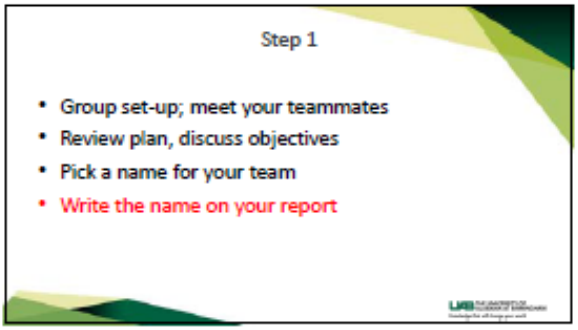
_____

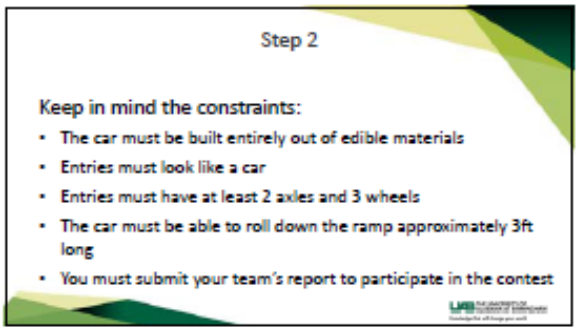
Tell me one thing you learned today: _____

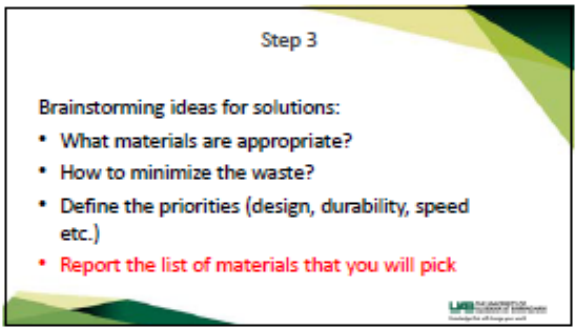
_____

Thank you for your feedback!

APPENDIX B: EDIBLE CAR CHALLENGE INSTRUCTIONS







Step 6

Testing:

- Calculate speed
  S_i= distance/travel time
- Race your car up to 3 times (3 trials) and calculate speeds
- Calculate Average Speed based on x trials:
  Avg S= $(S_1+...+S_x)/x$

Report your testing results

Step 7

Prototype evaluation based on its performance/design:

- Creativity (and good looks!)
- Utilization of the resources
- Efficiency (Speed down the ramp)
- Durability
- Reporting

Step 8

Presentation of the results:

- Were the goals achieved?
- What could have been done better?
- Were appropriate materials selected?
- What have failed? Identify the weakest point in your design.

Step 9

How could you redesign your car to improve its performance?

Step 10

Submit your report and celebrate!

Awesome teamwork girls!

APPENDIX C: EDIBLE CAR CHALLENGE PLAN

Introduction

This activity was adopted from a manual develped by Dorene Perez, Jim Gibson, Sue Caley Opsal and Rose Marie Lynch at Illinois Valley Community College and supported by National Science Foundation Grant #0802505. Details are available at http://www2.ivcc.edu/mimic/nsf/Resources%20for%20Teachers/Manual.pdf

Overview

Participants will have fun employing the engineering design cycle to build an edible car. They will work in small groups and have the opportunity to hone their communication and teamwork skills. After constructing their edible car, they will race the cars down a ramp and calculate the average velocity. In conclusion, they will reflect upon the iterative nature of the design process and propose ways to improve the car design through best practices.

Category: Math, Engineering

Learning Goals

- Discuss and employ the engineering design cycle
- Practice communication and teamwork skills
- Practice problem-solving skills
- Demonstrate an understanding of scientific principles underlying the design
- Calculate average velocity

Location

The activity can be conducted indoors or outdoors.

Participants

The activity can be conducted with almost any number of participants and one session leader.

Materials

Car Materials:

- Body Materials (e.g. rice crispy bars, cucumbers, bananas, loaves of hard bread, hot dogs, ice cream cones, celery, Twinkies)
- Wheels (e.g. mini chocolate donuts, cookies, fruit loops, gummy rings, pinwheel pasta, life savers)
- Axles (pretzel rods, pretzel sticks)
- Adhesives and Adornments (gum drops, mini marshmallows, marshmallows, thin licorice rope, cake icing, sprinkles)

Construction Tools and Other Supplementals

- Plastic knives
- Paper towels or wipes for clean-up

- Additional Materials
- Ramp, 3ft in length (e.g. board, inclined table)
- Masking tape
- Plastic garbage bags
- Spatula
- Measuring device (e.g. ruler, yard stick, tape measure)
- Timing device
- Calculator

Optional

- Camera for documentary purposes

Prizes can be given for various categories (e.g. speed, design, creativity, detail, nutritional value, etc.). Can utilize computer generated certificates.

Activity

Suggested time: minimum of 60 minutes.

Setup

- Incline a board or table about 3ft in length to form a ramp.
- Use masking tape to mark the start and stop points along the table.
- Place garbage bags at the bottom of the ramp to collect any mess that may result from racing the cars.

Introductory Discussion

What do we need to think about when designing an edible car? (e.g. constraints, materials availability, etc.)

One possible engineering design process includes the following iterative steps:

- State the problem, including any constraints
- Brainstorm ideas for a solution, based upon constraints
- Select a solution
- Identify and collect materials
- Construct a prototype
- Evaluate the prototype
- Present the results
- Redesign the solution to improve the prototype

Inform participants whether they will provide their own food to construct their vehicles or if the materials will be provided.

Constraints for the Edible Cars

- The cars must be built entirely from food items edible to humans. Entries must look like cars.
- Entries must have at least two axles and at least three wheels, all edible to
- humans.

- To be eligible for a speed prize, the entry must roll down a ramp approximately three feet long.

Planning: Design the Edible Cars
Arrange participants into small groups to for teams. Each team should come up with a name for their team or their car.

Participants should brainstorm ideas for their edible car design, based upon the constraints, and select a design.

After selecting a design, participants should identify and collect the needed materials.

Construction: Build the Edible Cars
Once planning is complete, participants are ready to construct their vehicles.

Have participants identify challenges encountered during the construction of the prototype.

Evaluation: Race the Edible Cars
Discuss velocity:

- Why are there speed limit signs along streets and roads?
- How do you know if you are within the speed limit when driving or riding in a car?
- If the speed limit is 55 mph, what does "mph" stand for?
- How do you calculate the average speed (or velocity)? r = d/t
- So, if **I** could walk three miles in one hour, what is my speed? 3mph

To calculate the speed of the edible cars, the distance traveled is needed. Measure

and record the distance between the start and stop tape lines on the ramp.

Race the cars:

Two people are needed to record race times: a racer and a timekeeper.

The racer should hold the car on the ramp at the start line using the spatula. When

ready, the timekeeper shall announce "Go!", at which time the racer shall release the car. It is the timekeeper's responsibility to start the timing device when the car is released and stop the timing device when the car passes the stop line on the ramp.

Each team should record the amount of time it took their car to traverse the ramp and then calculate the car's average velocity on their report.

Edible Car Contest Report

Team/Car Name:

1. List all materials used to construct your prototype car:

2. List all materials that you picked but did not use

3. As you build the prototype for your car, identify any challenges that you encounter and how you overcome them.

4. What was the average speed of your edible car? _____

5. How many times did your car successfully make it down the ramp?

0____ 1____ 2____ 3_____

6. How would you change the design of your car to make it better?

APPENDIX D: EDIBLE CAR CHALLENGE JUDGE'S EVALUATION FORM

Edible Car Contest- JUDGE'S EVALUATION FORM

GRADE ON THE BASIS OF THE FOLLOWING FACTORS:

- Creativity (Name, Materials used) (3 MAX)
- Sustainability (Materials wasted) (2 MAX)
  - WASTED>0.5 OF OBTAINED: 1 PT; WASTED<0.5 OF OBTAINED: 2 PT
- Efficiency (Speed) (2 MAX)
  - ABOVE AVG: 2PT; BELOW AVG: 1 PT
- Design (Durability) (1 MAX)
  - RACED MORE THAN ONCE: 1 PT
- Reporting (2 MAX)
  - ANSWERED BOTH Q3 AND 6: 2 PT; ANSWERED ONE Q3 OR 6: 1 PT

TEAM	CREATIVITY	SUSTAINABILITY	EFFICIENCY	DESIGN	REPORTING	TOTAL