

Narrative Report

Camp Overview

Energizing Our World Camp took place on June 18 - 21, 2018 for local 46 middle school students who completed grades 6, 7, or 8. Camp attendees all came from the local West Michigan community. The camp, hosted by the Grand Valley State University Regional Math and Science Center (RMSC), achieved the originally outlined goals to inspire underrepresented students regarding renewable energy, sustainable practices and the science, technology, engineering, and mathematics (STEM) fields. The four-day camp highlighted a variety of aspects of renewable energy and sustainability in alignment with the missions of both the Michigan Space Grant Consortium (MSGC) and National Aeronautics and Space Administration (NASA).

Camp Activities

Grand Valley State University (GVSU) faculty facilitated all sessions on the Allendale Campus. The camp schedule was designed to optimize and build on learning objectives and outcomes (Final Camp Schedule, Appendix D). A major change to this year's camp schedule was the addition of the Design Thinking Process for students to create prototypes. The first day began with students utilizing the Design Thinking Process in order to build a team banner. This served as a way for students to get to know those in their groups as well gain familiarity with the process. In the afternoon, students began with their first two content sessions: Energy Exploration and the Sustainability Agriculture Project. Energy Exploration covered basic energy usage and foundational information on energy flow to prepare students for other sessions. Students compared amps used on various household devices including a refrigerator, hair dryer, laptop and television. At the Sustainable Agriculture Project (SAP), students learned about sustainable farming, its impact on the environment, and its relationship to renewable energy. The SAP staff provided students with a tour of the farm, drawing attention to crop diversification, pollination, and companion planting. Campers learned about the importance of fresh, locally grown food, the connection this has to our agricultural heritage, and the need to increase the amount of locally grown food served in school cafeterias.

On the second day of camp, students participated in a hydropower session and a wind power session in the morning. Students learned about the variables that impact hydropower and conducted a variety of experiments involving water and force both indoors and outdoors. The Wind Power session is one of the most stimulating sessions for students. They have the opportunity to design their own wind turbine and test the output. They learn about different variables that impact the output of a wind turbine. In the afternoon, students participated in their final content sessions: Solar Power and Batteries. The Solar Power session highlighted the functionality of solar panels in addition to exploring several variables that influence solar power. Batteries is an important component to renewable energy; students learned about storage methods and tested the ability of natural substances, such as a lemon, to store energy. After the final content session, students began their first iteration of the Design Thinking Process. They worked to define the problem and understand who their solutions would impact. Certain groups chose to consider large families while other groups considered a single elderly individual. They went home encouraged to continue to think about the problem they were solving: how might we make our homes more sustainable?

On the third day of camp, students took a trip to the Holland Energy Park. The Holland Energy Park is both an educational hub as well as a functioning electrical power plant. Students learned about how the plant works along with how the facility interacts with the community. The interactive educational modules help students to dig deeper into how energy works and how decisions we make at home impact power usage. In the afternoon, student returned to the GVSU campus to continue cycling through the Design Thinking Process. The students spent a lot of time ideating and prototyping. They worked in small groups to create their prototypes and

then received feedback from their peers. Upon receiving feedback, they continued to refine their prototypes. An important aspect of the Design Thinking Process is for students to understand that success happens through continuous iteration. We worked with students to expand their creativity, communication, and problem solving skills while working with a team. At the end of the day, students went home to explain their prototype to a family member. Upon returning to campus, students shared the feedback they received and continued to refine their prototypes.

On the afternoon of the final day of camp, students attended a career fair. Local businesses that work in the fields of renewable energy and sustainability came to GVSU in order to interact with students regarding their business. Students enjoyed learning more about local businesses and interacting with the business people during lunch. Following the career presentations and career fair, students displayed their prototypes. Guests were invited to provide students with feedback. At the end of the day, students met one last time in their small groups to discuss the feedback they received. The projects were a powerful display of student learning throughout the week.

Funding

Michigan Space Grant Consortium funding was used to support student attendance at Energizing our World camp. The funds specifically paid for a portion of the van driver costs as well as camp counselor stipends. Transportation is a major barrier for students from underrepresented groups. Van drivers allow us to provide transportation to students that would otherwise not be able to attend camp. Counselors are GVSU students that chaperone middle school students to all of the sessions. They serve as small group mentors and assist with hands on activities. The additional fringe benefits required to support these staff members required us to find additional funds to support the supplies outside of the MSGC dollars.

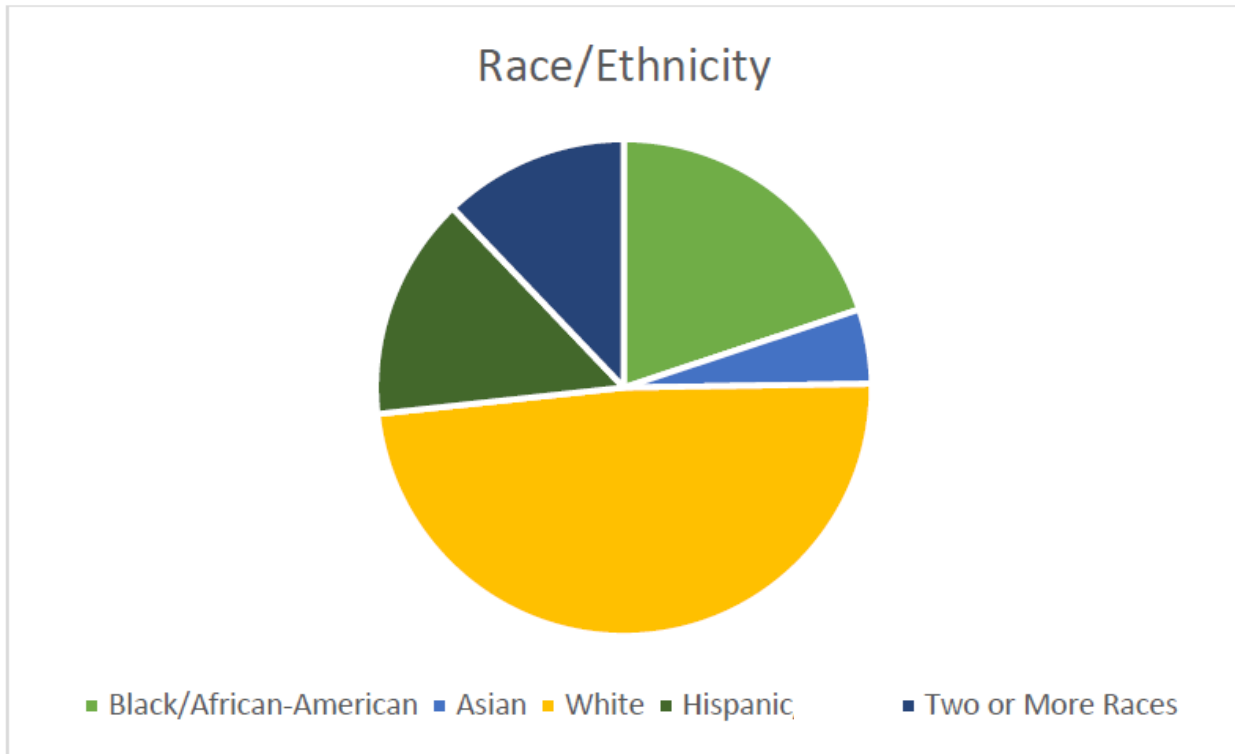
Cost sharing is provided through the Regional Math and Science Center staff who served as the camp director and secretarial support, as well as waived indirect costs. Grand Valley State University provides a breakdown of the spending and match.

Target Audience

A core value of the Energizing our World Camp is to offer hands-on STEM experiences to an audience who might not have these opportunities. In the STEM fields, women and racial/ethnic minorities are underrepresented groups. In order to target this population, local school districts receive targeted advertising. Schools with a high percentage of students receiving free and reduced lunch were targeted along with schools that have a high percentage of students of color. Through our various partnerships, an emphasis was made that girls are also part of the target population.

Upon receipt of applications, we prioritize girls and students of color. The camp was a majority students of color, a success given that West Michigan is approximately sixty nine percent white. The breakdown of student demographics by Race/Ethnicity is available in Table 1 below.

Table 1



Kristofer Pachla, Director of the RMSC, presented at the Michigan Space Grant Consortium Conference on November 11, 2017.

Collaborations

Collaboration makes Energizing our World camp a valuable experience for student attendees. This camp requires the collaborative effort of a variety of on campus departments as well as industry partners and students. In order to provide middle school students a high quality experience, experts in various fields were recruited to provide content sessions to students. Multiple faculty from the GVSU departments of geology, physics, chemistry, and sustainability created sessions to engage students. The camp would not have been a success without the support of GVSU students. GVSU students served as guides, mentors, and counselors for the middle school students while they were on campus. They were able to share their stories and encourage students throughout camp. Finally, industry partners were integral to the success of the camp. Consumers Energy provided both financial support and personnel to attend the career fair. AccenTek provided financial support. The Holland Energy Park hosted the camp for an off campus experience at a functioning power plant and attended the career fair. Also, Blue Oceans Concepts, Chart House, COCOA Corporation, Green Giftz, and Steelcase presented at the career fair to engage with students. Energizing our World camp is a success due to the high quality partnerships that enrich the student attendee experience.

Appendix A:

Press Release

GVSU camp to teach students about benefits of renewable energy

For immediate release

June 14, 2018

Contact: Matthew Makowski, University Communications, Grand Valley State University, (616) 331-2221

ALLENDALE, Mich. — Fifty students from 28 local middle schools will learn about the benefits of renewable energy and how that form of energy impacts the environment during Grand Valley State University's Energizing Our World summer camp. The three-day, interactive outreach camp will take place on the Allendale Campus June 18-21.

During the camp, presented by Grand Valley's Regional Math and Science Center (RMSC), students will participate in various sessions where they will engage in hands-on STEM activities to learn about solar, wind and hydro power. The lessons highlight the benefits of renewable energy, best sustainable practices and the applications of renewable energy in various fields of study.

"This camp allows students to see how multiple pieces fit together into the bigger puzzle of solutions to authentic problems," said Chelsea Ridge, RMSC mathematics program coordinator. "We are working with a generation of students that may actually see 100 percent renewable energy, and a generation that cares deeply about sustainability. To connect them to an experience this rich is to provide them a window into their future."

This year, students will also be answering the question: "How might we make our homes more energy independent?" During multiple interactive sessions, students will utilize the design thinking process through guidance from Grand Valley faculty and advisors from the Design Thinking Academy to frame possible solutions to that question. Campers will then develop and test prototypes that they will showcase in the Kirkhof Center's Grand River Room from 1:30-3:15 p.m. on Thursday, June 21.

New to this year's camp, students will also have the opportunity to visit the Holland Energy Park on Wednesday, June 20, from 8:40-11 a.m.

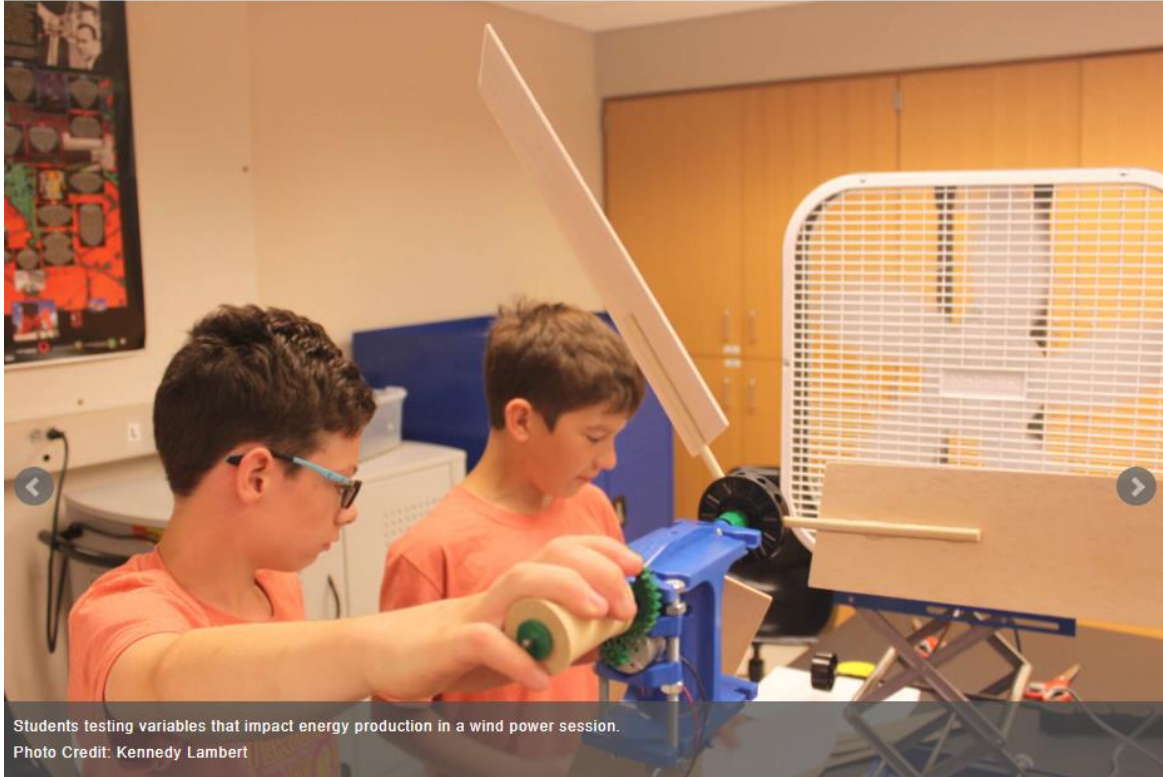
Sponsors for this year's camp include the Michigan Space Grant Consortium, Consumers Energy and AccenTek.

For more information, contact Chelsea Ridge, Regional Math and Science Center math program coordinator, at (616) 331-3172 or ridgec@gvsu.edu. Check-in for media will be in the Grand River Room of the Kirkhof Center.

Appendix B:

GVNow Article

GVSU camp teaches students about benefits of renewable energy



Posted on June 25, 2018

Fifty students from 28 local middle schools learned about the benefits of renewable energy and how that form of energy impacts the environment during Grand Valley's Energizing Our World summer camp. The three-day, interactive outreach camp took place on the Allendale Campus June 18-21.

During the camp, facilitated by Grand Valley's Regional Math and Science Center (RMSC), students participated in various sessions where they engaged in hands-on STEM activities to learn about solar, wind and hydropower. The lessons highlighted the benefits of renewable energy, best sustainable practices and the applications of renewable energy in various fields of study.

"This camp allows students to see how multiple pieces fit together into the bigger puzzle of solutions to authentic problems," said Chelsea Ridge, RMSC mathematics program coordinator. "We are working with a generation of students who may actually see 100 percent renewable energy, and a generation that cares deeply about sustainability. To connect them to an experience this rich is to provide them a window into their future."

This year, students also worked together to answer the question: “How might we make our homes more energy independent?” During multiple interactive sessions, students utilized the design thinking process through guidance from Grand Valley faculty and advisors from the Design Thinking Academy to frame possible solutions to that question. Campers then developed and tested prototypes that were showcased in the Kirkhof Center on the final day of the camp.

New to this year’s camp, students also visited the Holland Energy Park and participated in a career fair where local business leaders shared how they incorporate renewable energy into their work. Businesses showcased during the career fair included Grand Valley's Office of Sustainability, Blue Ocean Concepts, Chart House Energy, Cocoa, Consumers Energy, Green Giftz, Steelcase and Holland Energy Park.

Sponsors for this year’s camp included the Michigan Space Grant Consortium, Consumers Energy and AcenTek.

For more information about the Regional Math and Science Center, visit gvsu.edu/rmsc.
For More Information Contact: [Matthew Makowski](#) in [University Communications](#) - [616-331-2228](#)

Appendix C:

Timetable

November

- **MI Space Grant Due**
- Contact van drivers
- Recruit faculty to support sessions

December

- Review online registration form
- Review web content

January

- Finalize promotional materials & begin collecting registrations

March

- Recruit Counselors
- Confirm Drivers and begin contract/temporary employee process
- Preliminary food meeting

April

- **Registration Deadline**
- Faculty material requests due
- Reserve Space
- Counselor Interviews
- Distribute counselor contracts

May

- Mail out participant packets
- Confirm classroom and lab space reservations
- Confirm van driver contracts
- Complete and distribute work order
- Finalize supply orders

June

- **Camp**
 - Counselor Training
 - Confirm with participants on transportation

Post Event

- Thank you
- Debrief
- Evaluation & Final Reports: Consumers and MSGC

Appendix D:

Final Camp Schedule

2018 Energizing Our World Camp Schedule				
	Monday, June 18	Tuesday, June 19	Wednesday, June 20	Thursday, June 21
Morning	(8:30-9:15am) Welcome & Pre-Test Loutit 101	(8:30-8:40am) Start-up PAD 107/109	(8:30-8:40am) Start-up PAD 107/109	(8:30-8:40am) Start-up PAD 107/109
	(9:20-11:20am) Design Thinking Lab Honors Classrooms*	(8:50-9:55am) Hydropower PAD 107	(8:40 - 11:00 am) Field Trip to Holland Energy Park	(8:40-10:00) Design Thinking Lab PAD 107
	(9:20-11:20am) Design Thinking Lab Honors Classrooms*	(8:50-9:55am) Wind Power PAD 205		(8:40 - 10:00) Design Thinking Lab PAD 109
		Break 9:55 - 10:05am		Break 10:00 - 10:10pm
	(10:05-11:10am) Wind Power PAD 205	(10:10 - 10:30) Post Test and Evaluation PAD 107/109		
	(10:05-11:10am) Hydropower PAD 107	(10:45 - 11:45) Career Fair: Speakers Grand River Room, KC		
	11:30am - 12:10pm Lunch Fresh Food Company	11:20am - 12:00pm Lunch Fresh Food Company	11:00 - 11:45 am Lunch Fresh Food Company	11:45-12:30 Lunch Grand River Room
Afternoon	(12:15-1:30pm) Energy Exploration PAD 206	(12:05-1:10pm) Solar Power PAD 206	(12:00-3:15pm) Design Thinking Lab PAD 107*	(12:30- 1:15) Career Exhibit Grand River Room, KC
	(12:15-1:30pm) Sustainability Agriculture Project	(12:05am-1:10pm) Batteries PAD 376	(1:30 - 3:15pm) Testing of Ideas Grand River Room, KC	
	Break 1:30 - 1:45pm	Break 1:10 - 1:20pm		
	(1:45-3:00pm) Sustainability Agriculture Project	(1:20-2:30pm) Batteries PAD 376	(3:15 - 3:30pm) Design Thinking Lab PAD 109*	
	(1:45-3:00pm) Energy Exploration PAD 206	(1:20-2:30pm) Solar Power PAD 206		
	(3:15 - 3:30pm) Wrap up and Dismiss Loutit 101	(2:40 - 3:30pm) Design Thinking, Wrap up and Dismiss PAD 107/109	(3:15 - 3:30pm) Wrap up and Dismiss PAD 107/109	(3:15 - 3:30pm) Dismiss

Updated 6/4/18

*Break as needed

Appendix E:

Camp Photographs



Figure 1 Students measuring energy usage of household items

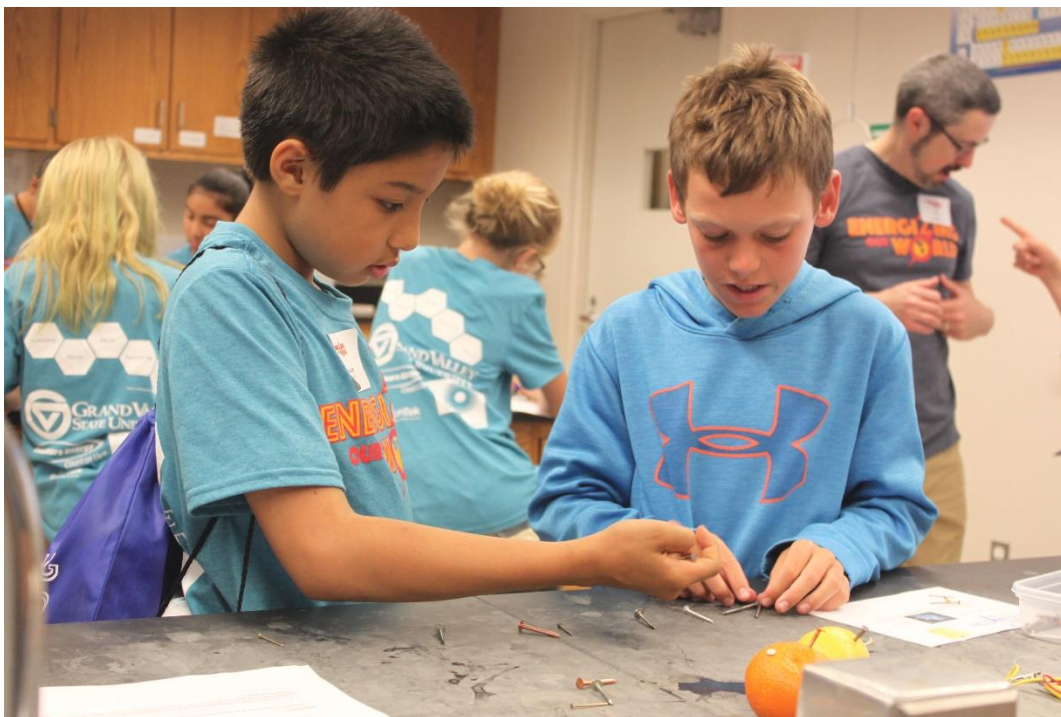


Figure 2 Campers measure the impact of various materials on the flow of energy in the Batteries session.



Figure 3 Campers measure the power of falling water in the hydropower session.

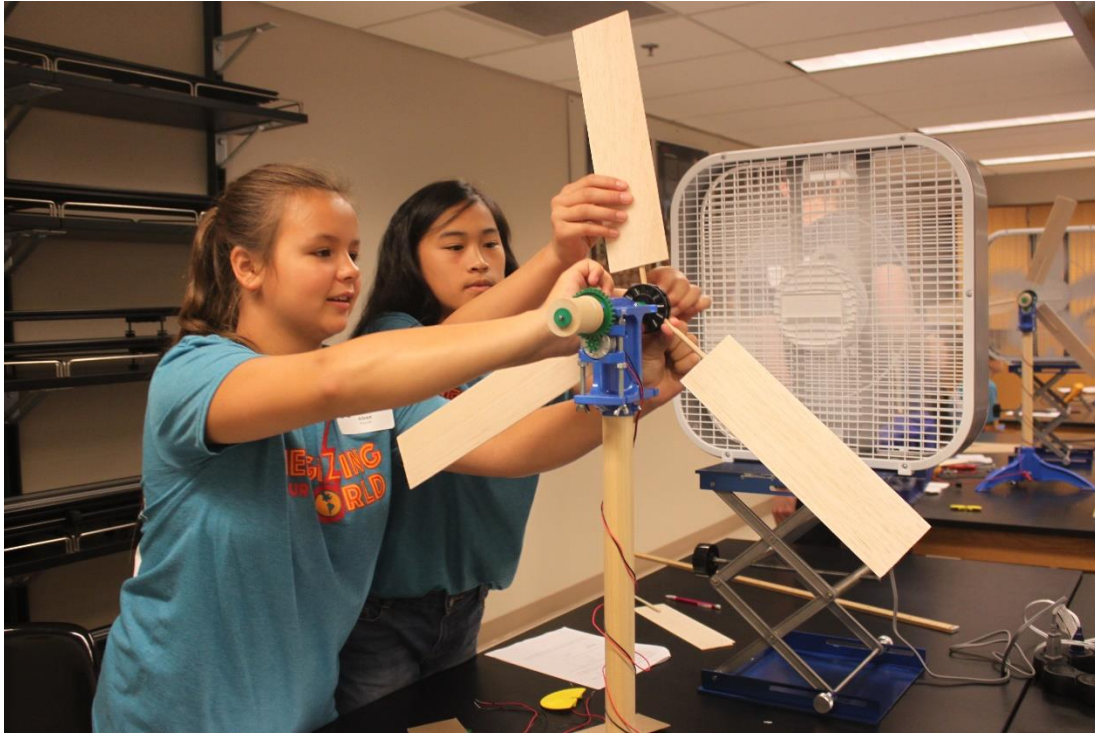


Figure 4 Students adjust a wind turbine to increase efficacy.



Figure 5 Students enhance their prototype

Appendix F:

Assessment Data

In order to determine the effectiveness of camp, direct and indirect observations of students learning were collected. A major display of student learning was available during the final project display. Students also completed a pre/post assessment regarding the content. Finally, students completed a post survey asking them to reflect on their experience as well as the impact of camp in their lives.

On the last day of camp, local businesses along with parents and family member were welcomed to campus for students to share their prototypes. During the week, students completed two design cycles in order to create a prototype that would display how they could make their homes more sustainable. Throughout the creation of student prototypes, learning was visible in the design and integration of topics covered during the week of camp. Students used what they learned to enhance their prototypes. For example, students utilized solar panels and wind turbines in effective ways that demonstrated their understanding of the content. The projects covered a broad range of topics from house modifications to solar cars. Overall, it was an impressive display.

The students completed a pre- and post-assessment regarding the content covered in each of the session. Faculty submitted questions that related to their session. Forty five students completed the pre- and post-assessment, which contained sixteen questions. The mean scores were compared and the growth between the pre and post tests were statistically significant. Areas of the assessment that showed particularly significant growth were in relation to battery types, electrical power usage, and variable impact on wind turbines.

Goals of Energizing our World camp were much broader than content. In order to capture additional areas of student growth, students completed a post camp survey in order to highlight the impact of camp. Overall, students surveyed reported a high level of interest in STEM, but a neutral level of interest in pursuing a STEM career. In future camps, this area will be explored and more STEM careers will be displayed in order to encourage more students to pursue a career in STEM. In the survey, students highlighted the impact of hands on activities, the prototype development and making new friends as highlights of camp. In the area for improvement, students requested that camp would be longer so that they could have more time to work on their prototypes.

Overall, the results of the various evaluation methods were positive. The assessments indicate growth of students' content knowledge in the areas of renewable energy. Students also highlighted an importance of and interest in STEM through not only their survey results, but their request for more time. The results of these assessments will be incorporated into improving the Energizing our World program moving forward. Plans to evaluate with normed and validated assessment tools are underway to use in years forward.