

Development and Implementation of the SWEET Outreach Program for Middle School Students: Successes, Challenges, and Lessons Learned (Evaluation)

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**PCEE Evaluation:
Development and Implementation of the S.W.E.E.T. Outreach
Program for Middle School Students: Successes, Challenges, and
Lessons Learned**

Abstract:

Deciding on a future career can be a daunting process for many students, influenced by personal interests, family expectations, and social or cultural factors. Research indicates that middle school is a pivotal stage in shaping career aspirations, as students at this age are naturally curious and open to exploring diverse disciplines. Early engaging exposure to engineering concepts can therefore play a critical role in fostering long-term interest and confidence in the engineering fields. Recognizing this opportunity, our team developed a hands-on engineering workshop designed to introduce middle school students to real-world problem solving, teamwork, and creative design through experiential learning. Led by Engineering faculty and assisted by members of the Society of Women Engineers (SWE) student Chapter, the goal of SWEET (Society of Women Engineers: Engineers in Training) is to provide an opportunity for middle school students (grades 6, 7, and 8) to be introduced to engineering as a potential future career. This paper presents the successes, challenges, and lessons learned from almost 4 years of the program. Since its inception, the workshop has achieved notable success, including repeated sponsorship, sold-out workshops each year, and several returning participants. Positive feedback from both parents and students highlights the program's engaging and inclusive learning environment. Over the years, some challenges have emerged, shaping the workshop's structure. Because the workshop relies on volunteer students, scheduling must accommodate their academic calendars; attendance also occasionally falls short due to last-minute cancellations. Additionally, balancing activity duration remains an ongoing improvement area to ensure consistent pacing across sessions, reducing idle time between activities or rushing through them towards the end, which can eventually lead to a loss of participant engagement. Through continuous feedback and iteration, we have refined the curriculum to offer fresh experiences for returning students and to showcase the breadth of engineering disciplines. Incorporating industry guest speakers and leveraging on-campus resources, such as the planetarium and innovative engineering laboratories, has significantly enhanced the workshop's educational impact and participant interest.

Introduction:

Throughout history, societies that prioritize advancements in science, technology, and innovation have consistently demonstrated superior growth and development compared to those that do not. In 1950, the United States founded the National Science Foundation, which intended to provide funding and opportunities for basic science development across all disciplines [1]. The United

States has propelled itself into the global leader in science and technology: faster advances in medicines and telecommunications, sending humans to the moon, and tremendously improving the human way of life. In recent decades, many countries have recognized this success and invested in developing their STEM (Science, Technology, Engineering, and Math) workforce. For the United States to remain the leader in science and technological feats, it must continue to build its STEM workforce, particularly in engineering, robustly as the world enters the digital and artificial intelligence era, when highly skilled and adaptable workers are even more needed [2-4].

For decades, the United States has successfully attracted talented and highly skilled scientists and engineers from both local and international sources. Although the importance of engineering workers is widely acknowledged, significant barriers remain to their recruitment. Attracting international talent is complicated by various visa programs. Meanwhile, local talent often faces inequitable access to quality education, particularly among underrepresented groups, including women, minorities, and individuals from marginalized communities [2, 4].

Middle school is considered one of the most critical stages in a student's K-12 education, particularly in shaping their future careers. While grades K-5 (Kindergarten to grade 5) introduce some basic science concepts, it is in middle school (grades 6-8) that students learn fundamental principles and engage in more hands-on, real-world projects. By the time they reach high school, many students have already solidified their career interests and choices.

Many outreach programs aimed at middle school students have demonstrated increases not only in their knowledge of science and engineering but also in their positive attitudes toward their technical abilities [5-7]. Taking inspiration from these successful initiatives, the Society of Women Engineers – Engineers in Training (SWEET) program has invested in developing workshops that introduce middle school students (grades 6-8) to engineering, showcasing the exciting opportunities available in these careers.

The goal of this paper is to discuss the development and implementation of an outreach program for middle school students, intended to introduce them to the field of engineering. The hope is that this exposure will inspire them to pursue engineering careers in the future. This paper highlights the organizers' experiences, detailing how challenges were addressed and the improvements that were made throughout the process.

About SWEET:

SWEET, or the Society of Women Engineers – Engineers in Training, is an engineering outreach program organized by several engineering faculty and assisted by members of the Society of Women Engineers (SWE) – student chapter. The SWEET program, hosted by Henry M. Rowan College of Engineering at Rowan University in Glassboro, New Jersey, United States, is designed to promote interest in engineering fields (e.g., Civil, Environmental, Mechanical,

Chemical, Biomedical, Electrical, among others) among middle school students. This program offers participants the opportunity to engage in hands-on activities led by engineering faculty, Society of Women Engineers (SWE) members, engineering student volunteers, and practicing engineers. The main goal of the program is to introduce students to engineering and potentially guide them toward a future career in this field.

A distinctive aspect of this workshop is the active engagement of the facilitators—faculty, volunteers, and practicing engineers—with the middle school participants. As these professionals share their stories and experiences in engineering, the students are inspired and motivated to consider pursuing a career in engineering.

The SWEET program began in 2021, conducting a series of one-day workshops between the summer of 2021 and 2022 [8], with a total of 123 participants across four workshop periods. Each workshop featured a variety of engineering activities, where middle school-aged students learned about career possibilities in engineering from the perspectives of faculty members, engineering students, and industry professionals.

Table 1, column 1, provides an overview of the workshop agenda for 2021-22 [8]. During these workshops, participants gained insights from current engineering students on (a) the role of engineers, (b) their societal impact, and (c) the various career opportunities in the field. Each workshop day included two interactive engineering activities, such as building hydraulic bridges, creating polymer bouncy balls, designing magnetic-levitation trains, developing water filtration systems and many more.

Table 1: Workshop Agendas Over Time [8]

SWEET 2021-22	SWEET 2023	SWEET 2024 (Day 1)	SWEET 2024 (Day 2)	SWEET 2025 (Day 1)	SWEET 2025 (Day 2)
Sign-In/Team Assignments	Registration	Registration	Registration & Breakfast	Registration	Registration
Introductions and Team Icebreaker Activity	Introduction of STEM and Lab Tour	Introduction and Ice breaker (Engg Gallery, Draw for me)	Introduction and Ice breaker (Engg Jigsaw Puzzle)	Introductions	Introduction and Ice breaker (Design your Superhero)
Overview of Engineering Disciplines Presentation	Activity 1 (Copper Circuit)	Activity 1 (Let's Make Ice Cream)	Activity 1 (DNA Extraction)	Activity 1 (Guess the Mystery Object)	Activity 1 (Protective Fashion - Beach Edition)
Activity 1	Activity 2 (Concrete Slab)	Guest Speaker	Break	Activity 2 (DaVinci Bridge)	Activity 2 (Earthquake Resistance Building Challenge)

Lunch/Engineering Facilities Tour	Lunch /Guest Speaker	Lunch	Guest Speaker	Activity 3 (Density Tower)	Lunch
Q&A with SWE Professional Members	Activity 3 (Wind Power)	Activity 2 (Bridge Project)	Lunch and break	Lunch	Activity 3 (Lab Demos)
Activity 2	Program Questionnaire	Activity 3 (Recycling Sorting Machine)	Activity 2 (Traffic Engineering)	Activity 4 (Planetarium Show – Mars Rover)	Activity 4 (Recycling Sorting Machine)
Wrap-Up/Thank You	Sign-Out/End of Workshop	Program questionnaire	Activity 3 (Wind Turbine)	Program questionnaire	Program questionnaire
Sign-Out/End of Workshop		Group Photos	Program questionnaire survey	Group Photos	Group Photos
		Sign-Out/End of Workshop	Group Photos	Sign-Out/End of Workshop	Sign-Out/End of Workshop
			Sign-Out/End of Workshop		

In 2023, the SWEET program held two one-day workshops (with the same agenda in both sessions), each attended by 30 students. Table 1, column 2, provides an overview of the workshop agenda. A significant improvement introduced in 2023 was the addition of more hands-on engineering activities. These activities included designing copper circuits, testing the load capacities of concrete slabs, and building wind turbines. The workshop's total duration was reduced by just 30 minutes, and the presentation/lecture time was cut to allow more time for hands-on experiences.

In 2024, the SWEET program organized two-day workshops with 36 participants per session. Table 1, columns 3 and 4, provide detailed agendas for both days. Unlike the workshops in 2023, the 2024 program introduced a unique set of activities for each day to enhance variety and engagement. The workshop was extended by 1 hour, allowing more time for transitions between activities and breaks. On Day 1, participants made ice cream using ice and liquid nitrogen, constructed truss bridges, and designed recycling machines. On Day 2, they extracted DNA from strawberries and bananas, installed roadway markings and signage, and built wind turbines.

In 2025, the workshop maintained its two-day format. We incorporated one additional activity into the agenda while keeping the same six-hour duration. For this, the guest speaker's participation was sacrificed in exchange for giving participants an alternative learning experience. On Day 1, our local planetarium was running a Mars Rover show, an ideal

opportunity for our participants. On Day 2, the standout experience was a tour of our engineering research laboratories.

The SWEET program has evolved over time to include broader engineering-focused activities, offering middle school students engaging opportunities to explore various related fields and career paths. The program connects students with a diverse group of mentors, including engineering faculty, students, and industry professionals. Moreover, it has successfully expanded its outreach, attracting more students and increasing participation since its inception.

Program Assessment:

The world will always need engineers. Many middle and high school students have the potential to become exceptional professionals in this field, but may not pursue related careers because they are unaware of what engineers do or of the various career opportunities available. The overall goal of the SWEET program is to help bridge this gap. Specifically, the program aims to (a) provide students with hands-on introductory engineering-related activities and (b) increase student awareness of potential engineering careers by connecting them with current students and professionals in the field.

To achieve its objectives, the program has intentionally developed a variety of activities that expose students to different fields of engineering. These fields include, but are not limited to, biomedical engineering, chemical engineering, civil engineering, electrical and computer engineering, and mechanical engineering. The program collects pre- and post-workshop surveys to assess participants' interest in each activity.

Tables 2 and 3 present the questions from the post-workshop surveys administered during the 2023 one-day workshops and the 2024 two-day workshop. Due to time constraints, only post-workshop surveys were collected in these workshops. In 2025, pre-surveys were incorporated to evaluate the impact of the workshops among participants. Table 4 presents the pre-workshop survey questions for 2025, while Table 5 presents the post-workshop survey for that year.

Table 2: SWEET Post-Workshop Survey Questions for the One-Day Workshop in 2023

Questions	Possible Answers
1. What did you think of the activities? ● Engineering Poster Gallery ● Copper Circuits ● Concrete Slab ● Wind Power ● Lab Tours	Great, Ok, Not interesting to me. Optional – Why was the project Great, OK or not interesting?

2. The SWEET Program increased my interest in engineering	Agree or Disagree
3. The SWEET Program gave me a better idea of what Engineers Do	Agree or Disagree
4. The SWEET student mentors assisted me with the projects	Agree or Disagree
5. I would recommend SWEET to other students	Agree or Disagree
6. Overall, the SWEET program was fun	Agree or Disagree
7. Where did you hear about the SWEET program?	Open -ended

Table 3: SWEET Post-Workshop Survey Questions for the Two-Day Workshop in 2024

Questions	Possible Answers
1. Questions administered on Day 1 only What did you think of the activities? • Engineering Poster Gallery • Draw for me • Let's Make Ice Cream • Bridge Project • Recycling Sorting Machine	Great, OK, Not interesting to me. Optional – Why was the project Great, OK or not interesting?
2. Questions administered on Day 2 only What did you think of the activities? • Engineering Jigsaw Puzzle • DNA Extraction of Strawberry, Banana or Tomato • Traffic Engineering • Wind Turbine for Electric Power • Guest Speaker - Talk	Great, OK, Not interesting to me. Optional – Why was the project Great, OK or not interesting?
3. Questions 3-8 – administered on both days The SWEET Program increased my interest in engineering	Agree or Disagree
4. The SWEET Program gave me a better idea of what Engineers Do	Agree or Disagree
5. The SWEET student mentors assisted me with the projects	Agree or Disagree
6. I would recommend SWEET to other students	Agree or Disagree
7. Overall, the SWEET program was fun	Agree or Disagree

8. Where did you hear about the SWEET program?	Open -ended
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Table 4: SWEET Pre-Workshop Survey Questions for the Two-Day Workshop in 2025

Questions	Possible Answers
1. How much do you know about STEM (Science, Technology, Engineering and Math)?	Nothing, A little, Some, A lot
2. How interested are you in engineering?	Not at all interested, Slightly interested, Moderately interested, Very interested
3. Do you see yourself pursuing a career in engineering or STEM in the future?	Yes, No, Maybe
4. What do you think engineers do?	Build things Design things Solve problems Use computers Work with machines Medicine and healthcare tools I don't know Other (write in)
5. What kind of things do you think you can create as an Engineer?	Robots Video games Bridges and Buildings New food products Fuels and chemicals Cars and airplanes Medical equipment Others
6. Which of the following engineering disciplines have you heard of or are interested in?	Aerospace Engineering Civil Engineering Biomedical Engineering Chemical Engineering Environmental Engineering Electrical Engineering Materials Engineering Computer Engineering

	Mechanical Engineering Others
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Table 5: SWEET Post-Workshop Survey Questions for the Two-Day Workshop in 2025

Questions	Possible Answers
1. After the workshop, how much do you feel you know about STEM?	Nothing, A little, Some, A lot
2. After this workshop, how interested are you in engineering?	Not at all interested Slightly interested Moderately interested Very interested
3. After the workshop, do you think you might be interested in having a job in a STEM or Engineering field in the future?	Not really, Maybe (I want to learn more, Yes (definitely))
4. Has your understanding of what engineers do change?	I learned they do more than I thought. I learned they do different things than I thought. My understanding stayed the same. I'm still not sure.
5. What do you think of the activities? Design your Superhero Protective Fashion: Beach Edition Earthquake Resistant Building 3d Printing Lab Demo Color Detection Lab Demo 3-point Bend Test Lab Demo Charge it Up Challenge Aerogel in Action	Great, Ok, Not Interesting
6. What was your favorite activity or part of the workshop?	
7. Do you think you would like to participate in more STEM activities or engineering workshops in the future?	Definitely not, Maybe not, Maybe, Definitely
8. Overall, the SWEET program was fun	Yes, Maybe, No

Evaluation Results:

From Tables 6 through 10, we collected information on the most popular activities as well as those that failed to engage students effectively. This information will help us plan future workshops. For SWEET 2023, the standout activity was Wind Power, in which students built their own wind turbines. The hands-on experience and the sense of accomplishment from completing this task had a positive impact on the students. In contrast, the least favorite activity was Copper Circuit, which involved constructing an electric circuit to light up a small bulb. This activity required careful adherence to instructions and allowed little room for error, which likely led to frustration for students who were unable to achieve the desired outcome.

In the 2024 workshops, on Day 1, the most popular activity was making ice cream with liquid nitrogen, where students could create their own. Conversely, the least favored activity was the Recycling Sorting Machine, in which students built their own recycling material separation machine. Although the steps for this last activity were easy to follow and the outcome was straightforward, it may have been too simple for the students, leading them to prefer more challenging tasks.

On Day 2, the most popular activity was DNA extraction, during which students had the opportunity to extract DNA from bananas and strawberries and observe it under a microscope. In contrast, the least popular activity was Traffic Engineering, in which students focused on designing traffic intersections according to specific requirements. However, this activity was hindered by a lack of time, preventing students from completing all the necessary tasks, which may have influenced their survey responses.

Table 6: Results from the Survey Records for the Two-Day Workshop in 2023

<i>SWEET 2023</i>	Great	OK	Not Interested	Total Responses
Icebreaker - Poster Session	17 (52%)	11 (33%)	5 (15%)	33
Copper Circuit	15 (45%)	17 (52%)	1 (3%)	33
Concrete Slab	18 (55%)	12 (36%)	3 (9%)	33
Wind Power	24 (73%)	7 (21%)	2 (6%)	33
Lab Tours	23 (70%)	6 (18%)	4 (12%)	33
<i>Overall (sum)</i>	<i>97 (59%)</i>	<i>53 (32%)</i>	<i>15 (9%)</i>	<i>165</i>
Mean	19.4 (59%)	10.6 (32%)	3 (9%)	-
Standard Deviation	3.9	4.4	1.6	-

Note: Percentages calculated by row.

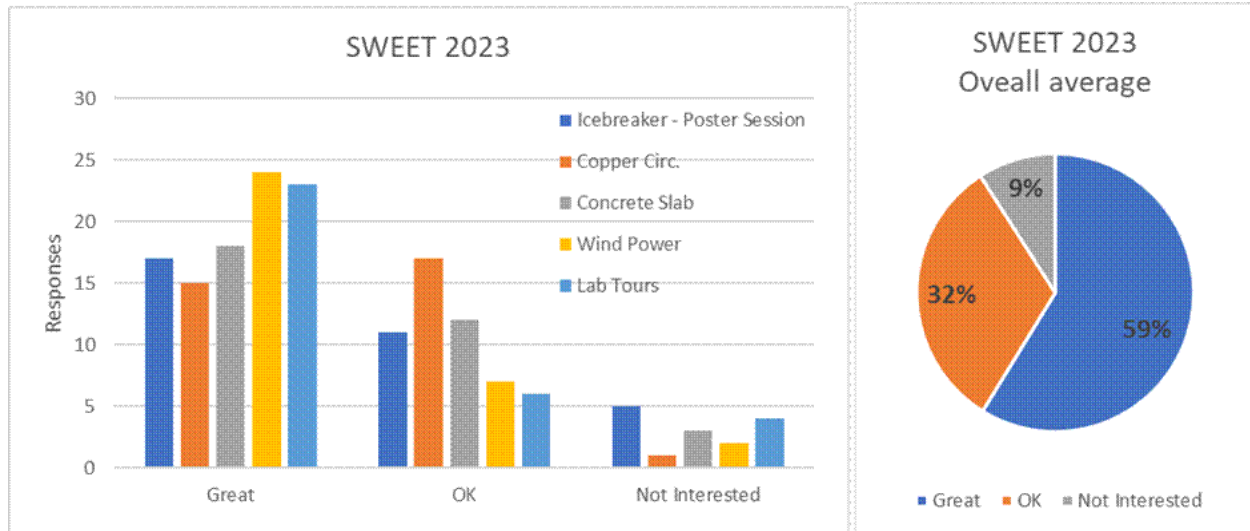


Figure 1. Results from the Survey Records for the Two-Day Workshop in 2023

Table 7: Results from the Survey Records for the Day 1 Workshop in 2024

<i>SWEET 2024 - Day 1</i>	Great	OK	Not Interested	Total Responses
Icebreaker - Engg Gallery	17 (55%)	13 (42%)	1 (3%)	31
Draw for Me	18 (58%)	12 (39%)	1 (3%)	31
Ice Cream	24 (77%)	7 (23%)	0 (0%)	31
Bridge	17 (55%)	11 (35%)	3 (10%)	31
Recycling	13 (42%)	14 (45%)	4 (13%)	31
<i>Overall</i>	<i>89 (57%)</i>	<i>57 (37%)</i>	<i>9 (6%)</i>	<i>155</i>
Mean	17.8 (57%)	11.4 (37%)	1.8 (6%)	-
Standard Deviation	4.0	2.7	1.6	-

Note: Percentages calculated by row.

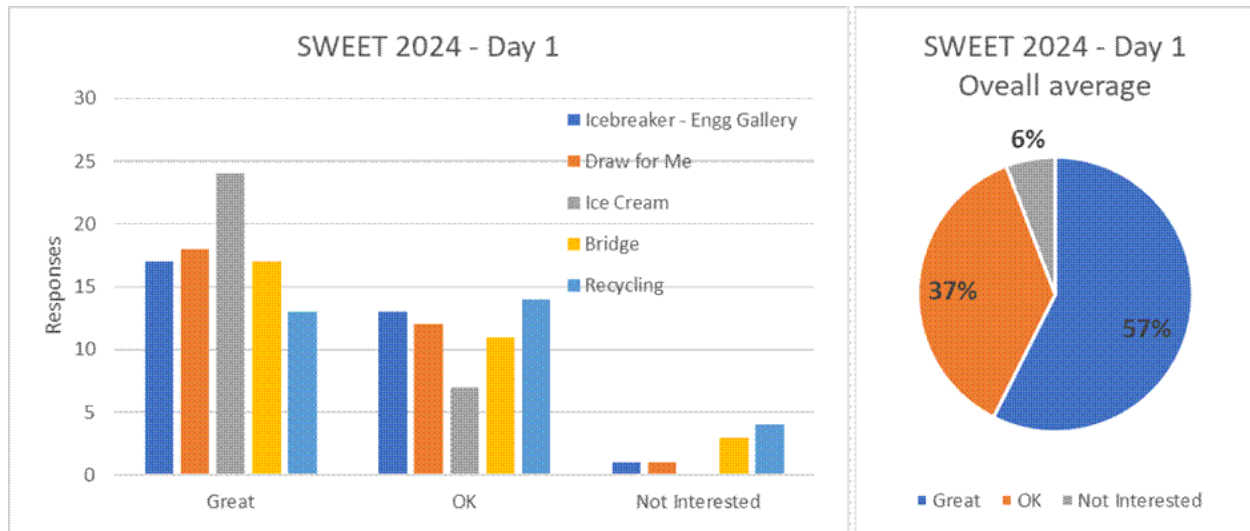


Figure 2. Results from the Survey Records for the Day 1 Workshop in 2024

Table 8: Results from the Survey Records for the Day 2 Workshop in 2024

<i>SWEET 2024 - Day 2</i>	Great	OK	Not Interested	Total Responses
Icebreaker - Jigsaw	18 (67%)	6 (22%)	3 (11%)	27
DNA Extraction	25 (93%)	2 (7%)	0 (0%)	27
Traffic	8 (30%)	8 (30%)	11 (40%)	27
Wind Turbine	11 (41%)	12 (44%)	4 (15%)	27
Guest Speaker	11 (41%)	11 (41%)	5 (18%)	27
<i>Overall</i>	<i>73 (54%)</i>	<i>39 (29%)</i>	<i>23 (17%)</i>	<i>135</i>
Mean	14.6 (54%)	7.8 (29%)	4.6 (17%)	-
Standard Deviation	6.9	4.0	4.0	-

Note: Percentages calculated by row.

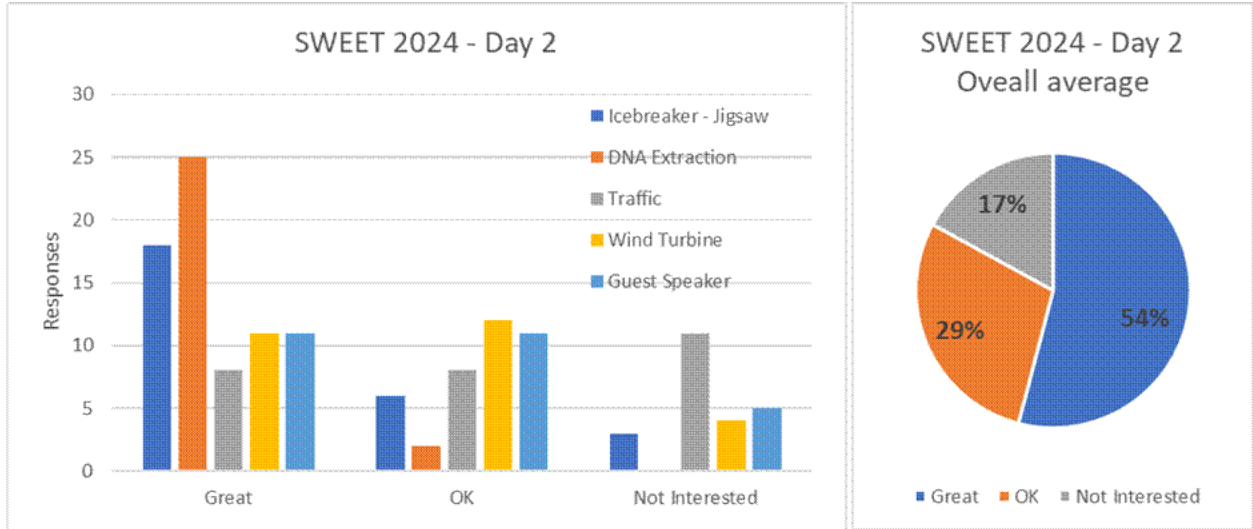


Figure 3. Results from the Survey Records for the Day 2 Workshop in 2024

Table 9: Results from the Survey Records for the Day 1 Workshop in 2025

<i>SWEET 2025 - Day 1</i>	Great	OK	Not Interested	Total Responses
Mystery Object	9 (35%)	15 (58%)	2 (7%)	26
DaVinci Bridge	21 (81%)	5 (19%)	0	26
Density Tower	17 (65%)	8 (31%)	1 (4%)	26
Planetarium	21 (81%)	4 (15%)	1 (4%)	26
Mars Rover Exhibit	15 (58%)	10 (38%)	1 (4%)	26
<i>Overall</i>	<i>83 (64%)</i>	<i>42 (32%)</i>	<i>5 (4%)</i>	<i>130</i>
Mean	16.6 (64%)	8.4 (32%)	1 (4%)	-
Standard Deviation	5.0	4.4	0.7	-

Note: Percentages calculated by row.

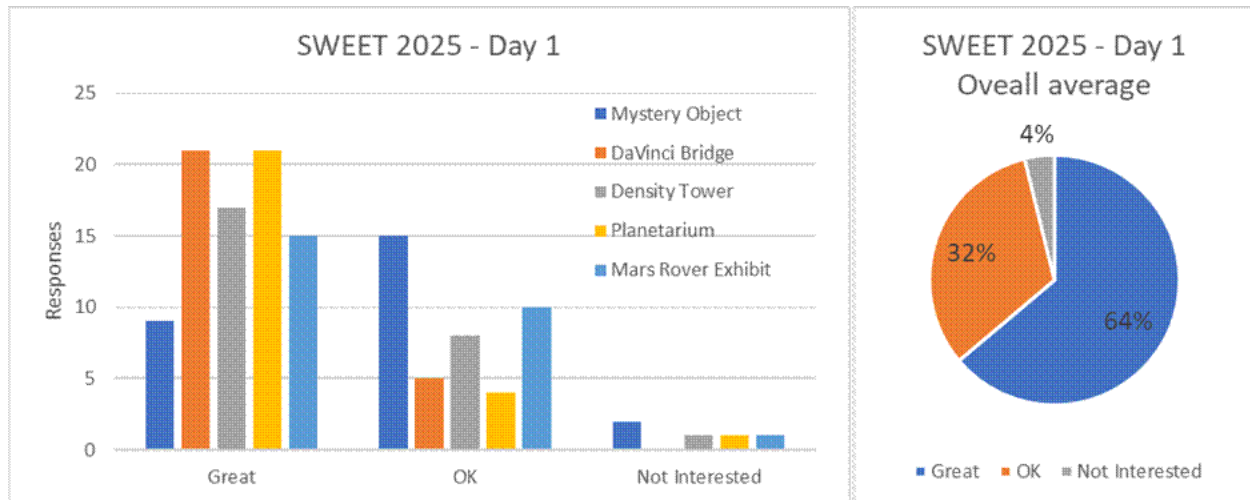


Figure 4. Results from the Survey Records for the Day 1 Workshop in 2025

Table 10: Results from the Survey Records for the Day 2 Workshop in 2025

<i>SWEET 2025 - Day 2</i>	Great	OK	Not Interested	Total Responses
Icebreaker – Design Superhero	13 (54%)	11 (46%)	0 (0%)	24
Protective Fashion – Beach Edition	11 (46%)	9 (37%)	4 (17%)	24
Earthquake Resistance Building Challenge	20 (83%)	3 (13%)	1 (4%)	24
Lab Demos	37 (52%)	29 (41%)	5 (7%)	71
Charge it up Challenge	14 (58%)	9 (38%)	1 (4%)	24
Aerogel in Action	19 (79%)	4 (17%)	1 (4%)	24
<i>Overall</i>	114 (60%)	65 (34%)	12 (6%)	191
Mean	19 (59%)	11 (34%)	2 (7%)	-
Standard Deviation	9.5	9.4	2.0	-

Note: Percentages calculated by row.

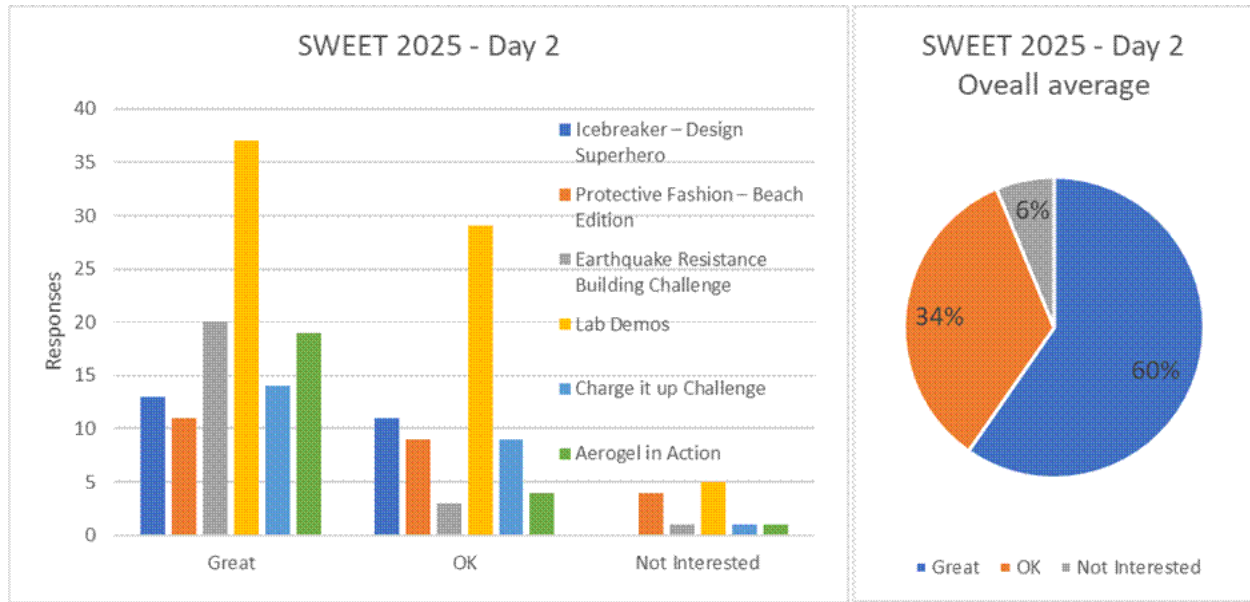


Figure 5. Results from the Survey Records for the Day 2 Workshop in 2025

Table 11 summarizes the findings regarding students' experiences in the workshop. The feedback was predominantly positive, with "Yes" and "Maybe" responses comprising the majority. These results indicate that the workshop effectively enhanced students' knowledge in Engineering, increased their interest in the field, and was overall enjoyable. Over 90% of participants expressed positive feedback across all categories, highlighting the effectiveness of the SWEET program in engaging students with Engineering. It is important to note that some attendees left early, which slightly decreased the number of completed surveys compared to total attendance.

Table 11: Results General Survey Questions

	The program increased my interest in Engineering	The program gave me a better idea of what Engineers do	The SWEET mentor assisted me with the projects	I would recommend SWEET to others	Overall, the SWEET program was fun
<i>SWEET 2023</i>					
Yes	30 (90.9%)	31 (91.2%)	31 (93.9%)	31 (93.9%)	33 (100%)
No	3 (9.1%)	3 (8.8%)	2 (6.1%)	2 (6.1%)	0 (0%)
<i>SWEET 2024 Day 1</i>					
Yes	28 (93.3%)	27 (87.1%)	29 (93.5%)	29 (93.5%)	31 (100%)
No	2 (6.7%)	4 (12.9%)	2 (6.5%)	2 (6.5%)	0 (0%)
<i>SWEET 2024 Day 2</i>					
Yes	24 (88.9%)	27 (100%)	27 (100%)	26 (96.3%)	27 (100%)

No	3 (11.1%)	0 (0%)	0 (0%)	1 (3.7%)	0 (0%)
<i>SWEET 2025 Day 1</i>					
Yes	14 (54%)	15 (58%)	-	16 (61%)	25 (96%)
Maybe	10 (38%)	10 (39%)	-	9 (35%)	0
No	2 (8%)	1 (4%)	-	1 (4%)	1 (4%)
<i>SWEET 2025 Day 2</i>					
Yes	11 (46%)	13 (54%)	-	11 (46%)	22 (92%)
Maybe	12 (50%)	10 (42%)	-	12 (50%)	0
No	1 (4%)	1 (4%)	-	1 (4%)	2 (8%)

Note: Percentages calculated by column, per workshop date.

Successes:

The SWEET program was piloted during the summer of 2021 to 2022, featuring a series of one-day workshops designed for middle school students. A local non-profit organization generously provided a small grant to pilot this program. SWEET was a free event that attracted many middle school students from the nearby school district. During the pilot years, the program successfully hosted 9 workshop days with a total of 123 participants.

In 2023, SWEET hosted two one-day workshops at the end of summer, attracting 35 participants, despite having 60 registered. The organizers reassessed the timing of the workshops and found that hosting them in the summer presented challenges for many middle school students, as families typically travel and many students participate in various summer camps. Additionally, it was difficult for SWE members to participate, as many had returned to their hometowns when classes were not in session.

In 2024, the organizers relaunched SWEET as a two-day spring workshop, enabling improved outreach and recruitment from local school districts. Since most SWE members are on campus during the spring semester, it was easier for them to volunteer for the program. This change in schedule had a significant positive impact on feedback from SWE members and workshop participants.

Moreover, organizers provided each participant with a take-home kit that included a SWEET T-shirt and promotional items to enhance the program's visibility. During the spring semester, limited outreach activities made the SWEET program a highly anticipated event for middle school students in the local area.

However, in 2024, the organizers still noticed several “no shows” among registered participants. To address this, in 2025 SWEET implemented a \$10 registration fee, which fostered a sense of commitment among participants and their parents. This also encouraged parents to notify the

organizers if their child could not attend the event. This strategy proved to be very successful, allowing the organizers to offer canceled spots to those on the waitlist.

Over the years, the non-profit organization sponsor provided positive feedback and expressed satisfaction with SWEET's impact on the local middle school community. As a result, they generously continued to fund the program every year thereafter.

Challenges:

The SWEET outreach program relies heavily on undergraduate student volunteers and SWE student members, which creates scheduling challenges when aligning the workshop timeline with their academic calendars. Ensuring sufficient volunteer coverage for both days of the workshop can be difficult, especially during busy academic periods. Additionally, organizing and conducting training meetings prior to the workshop requires careful planning, as these sessions must fit around the volunteers' class schedules, exams, and other academic obligations.

Another challenge encountered throughout the program has been participant absenteeism. During the 2023 workshop, approximately 40% of registered students did not attend, which impacted group organization. To improve attendance, a registration fee was introduced for the 2025 workshop. While this change helped reduce no-show rates, the workshop still experienced a 10–15% absence rate due to last-minute cancellations, despite reaching full enrollment.

Finally, maintaining appropriate timing and pacing across hands-on activities remains an ongoing challenge for both the SWEET organizers and the participant groups. From the organizers' perspective, accurately estimating activity durations and coordinating smooth transitions across multiple groups requires careful planning and real-time adjustments during the workshop. From the participants' perspective, differences in group dynamics, prior exposure to engineering concepts, and levels of engagement can lead to variability in how quickly activities are completed. As a result, some groups may rush through activities while others experience idle time, which can affect overall engagement and learning outcomes. Recognizing these shared challenges has informed iterative refinements to activity design and scheduling flexibility throughout the workshop.

Lesson Learned:

Over the past several years, the SWEET program has evolved significantly, and several clear lessons have emerged from its continual refinement.

1. Regularly updating activities based on student surveys and facilitator observations kept the program fresh and engaging. Offering new challenges each year encouraged returning participation and helped sustain long-term interest in engineering.

2. Across all workshop years, activities that allowed students to create something tangible or observe an immediate result, such as wind turbines, ice cream with liquid nitrogen, DNA extraction, and engineering design builds, consistently received the highest ratings. Well-paced, interactive sessions were more effective than lecture-heavy segments.
3. Introducing students to a wide range of engineering disciplines helped them understand the diversity of the field and recognize that engineering includes many pathways. The inclusion of faculty, SWE student mentors, and industry professionals further strengthened these connections.
4. Campus tours, laboratory demos, and the planetarium visit demonstrated the value of situating learning in real engineering spaces. These experiences were especially meaningful when guest speakers were not available, showing that multiple approaches can support real-world relevance.
5. Shifting from summer to spring programming improved volunteer availability and increased student participation. Implementing a modest registration fee reduced no-shows and allowed better use of limited workshop spaces.
6. Transitioning from post-only surveys to pre/post assessments provided clearer insight into changes in student interest and understanding. These evaluations helped refine activity design and confirmed the program's positive impact on student perceptions of engineering.

Future Plans:

Since its launch in 2021, the program has received numerous positive responses from participants, schools, and the community. We have seen a noticeable increase in interest, with more middle school students returning each year, indicating strong potential for continued success. Additionally, the SWEET program has attracted interest from many local school districts, and the organizers have been receiving requests to collaborate with them to expand the program. Recently, SWEET hosted an outreach event where students from a local school district visited the university campus. The middle school students participated in short, hands-on engineering activities and engaged with engineering student volunteers. The event was very successful, and teacher feedback was overwhelmingly positive. We look forward to the day when our participants will become students in our engineering program.

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