Lawrence Technological University

ROBOFEST 2022 ~ 2023 Annual Assessment Report

August 8, 2023

Contents

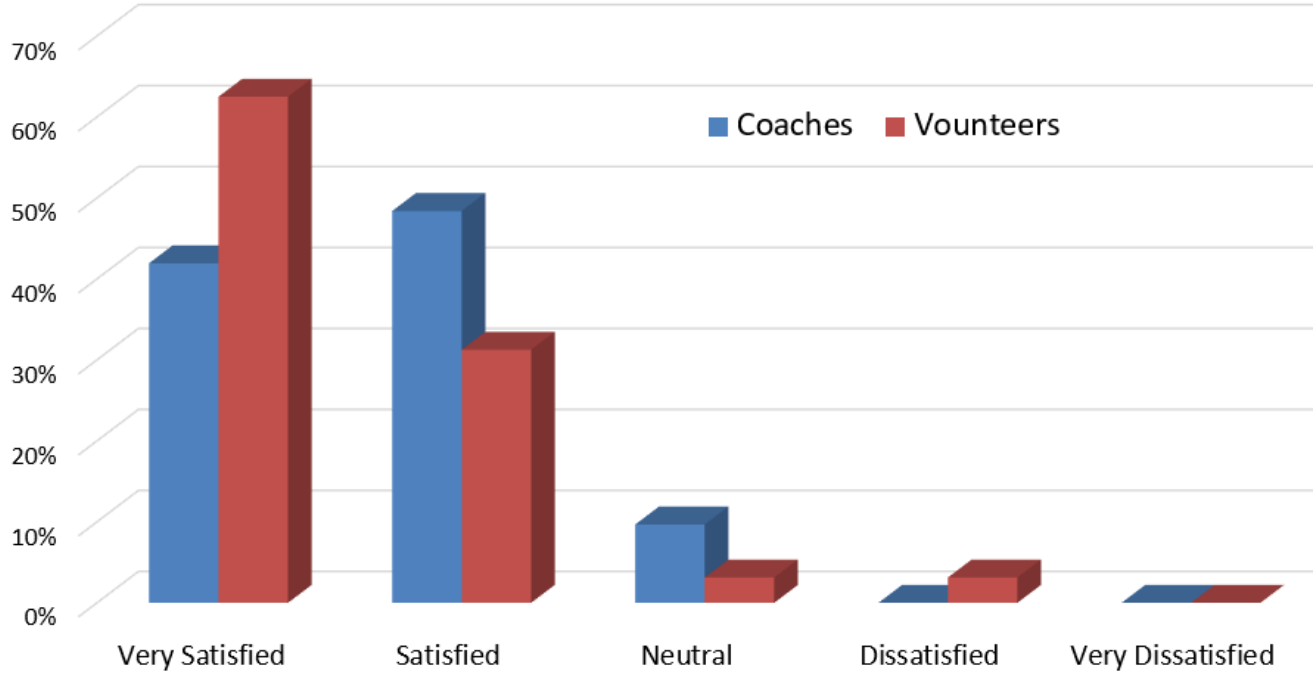
1. Robofest 2023 Coach & Volunteer Survey Results

Anonymous surveys were conducted after World Championship competitions in June 2023. 31 coaches, assistant coaches or team mentors participated in the coach survey. 32 volunteers, Local Judges, or Judges participated in the volunteer survey. Table 1 shows the satisfaction rate from each survey. Figure 1 displays the table data in a 3D bar graph. There was one “dissatisfied” response out of 63 this year.

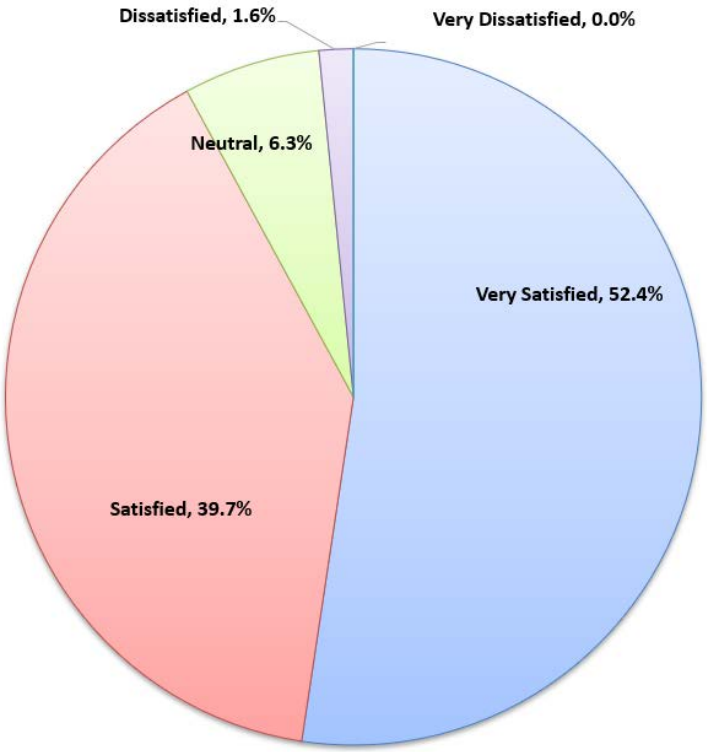
	# Coaches	# Volunteers	Weighted Average %
Very Satisfied	13	20	**52.4%**
Satisfied	15	10	**39.7%**
Neutral	3	1	**6.3%**
Dissatisfied	0	1	**1.6%**
Very Dissatisfied	0	0	**0.0%**

(Table 1) 2023 Satisfaction rate from each of 2 surveys

Figure 2 shows average satisfaction rate from the 2 surveys. 92.1% (52.4%+39.7%) were satisfied or very satisfied. Considering that, Robofest 2023 was yet another successful year. Figure 3 shows overall coach/volunteer satisfaction rate changes since 2013. It does not show neutral cases.

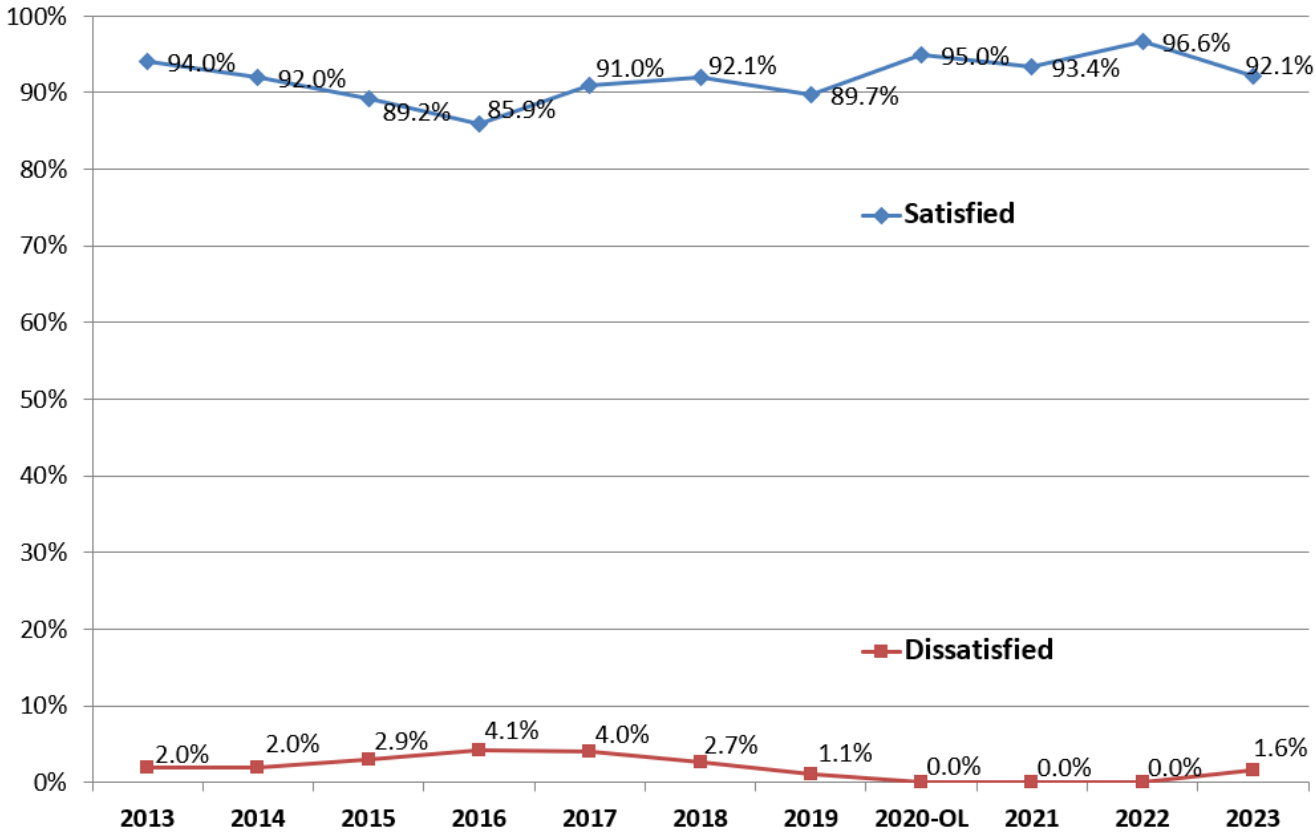


(Figure 1) Satisfaction rate from each of 2 surveys in 2023



52.4 + 39.7 = 92.1%

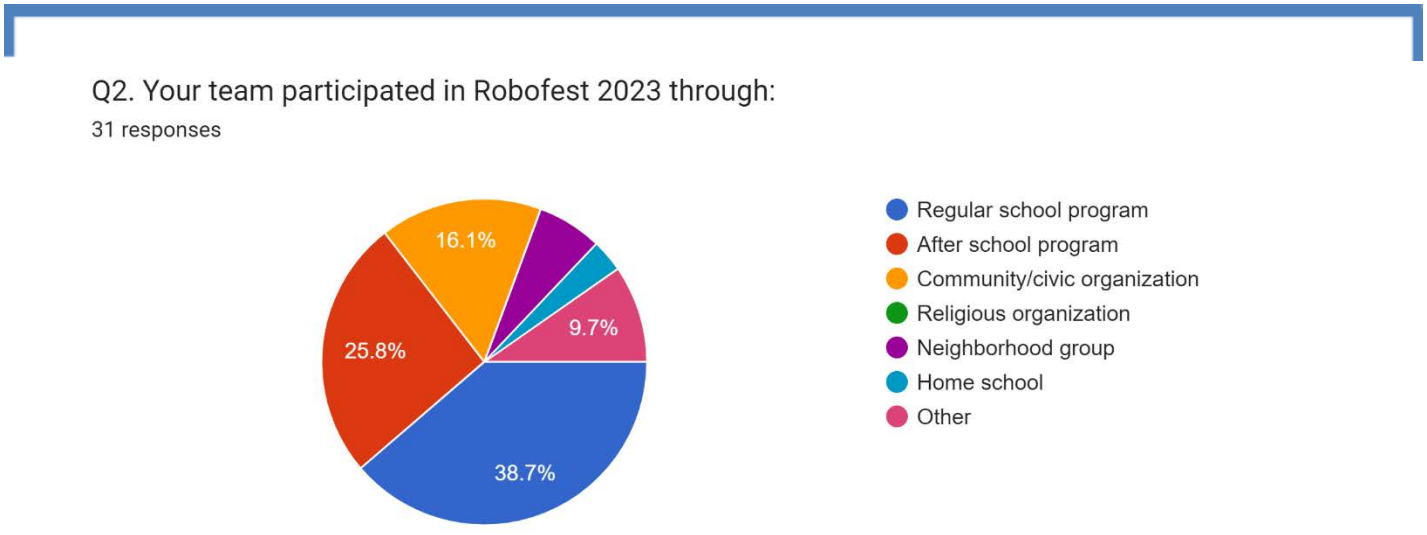
(Figure 2) 2023 Coach/Volunteer averaged satisfaction rates



(Figure 3) Overall coach/volunteer satisfaction rate changes since 2013 (2014 year contains only coach data)

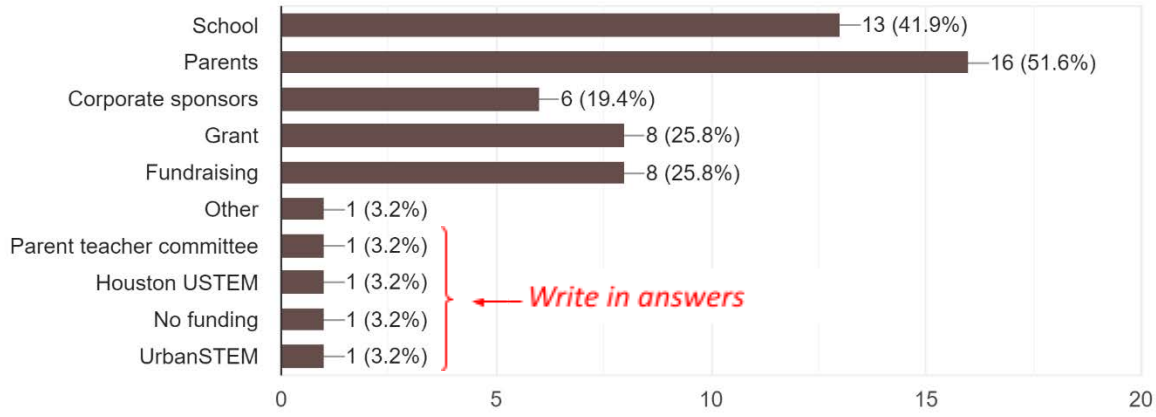
1.1 Coach Survey Results

The following (Figure 4) shows some results of 2023 coach surveys.



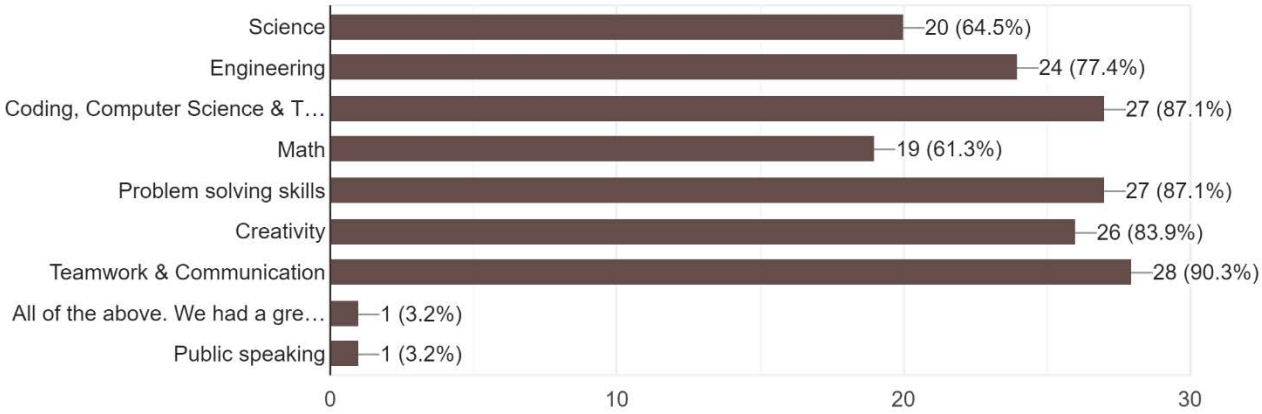
Q3. From whom did your team receive funding?

31 responses



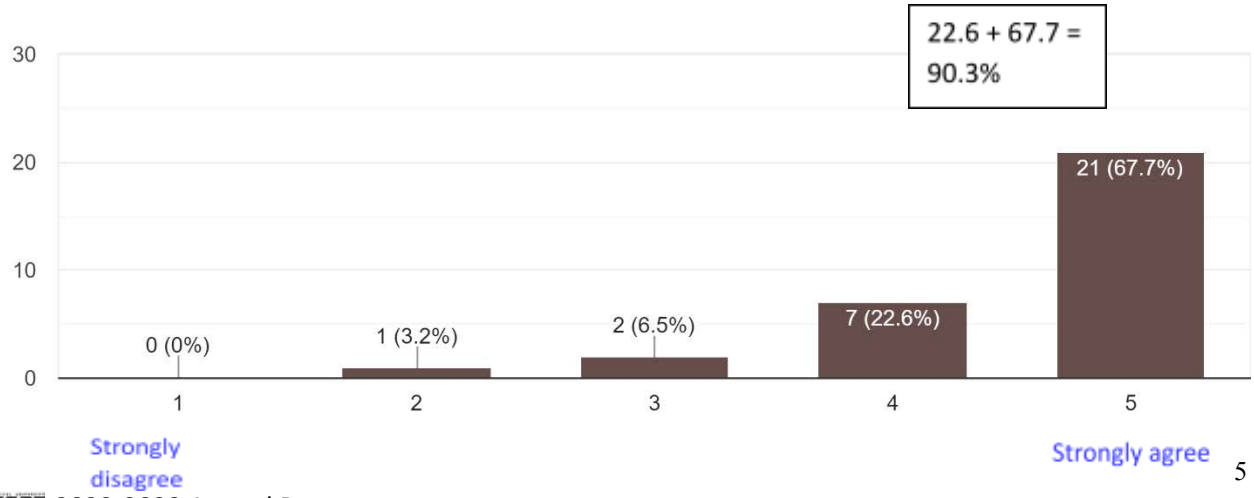
Q4. What areas do you think are enhanced (or can be enhanced) through Robofest programs?

31 responses



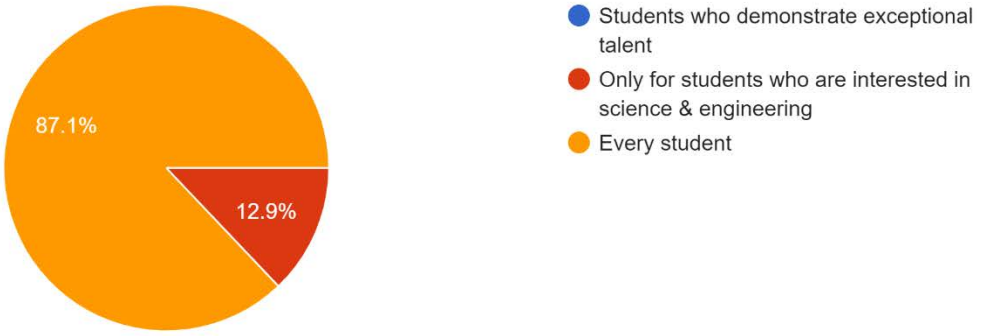
Q5. Do you think your team members learned and improved science, technology, engineering, math, and/or coding knowledge through Robofest 2023 programs?

31 responses



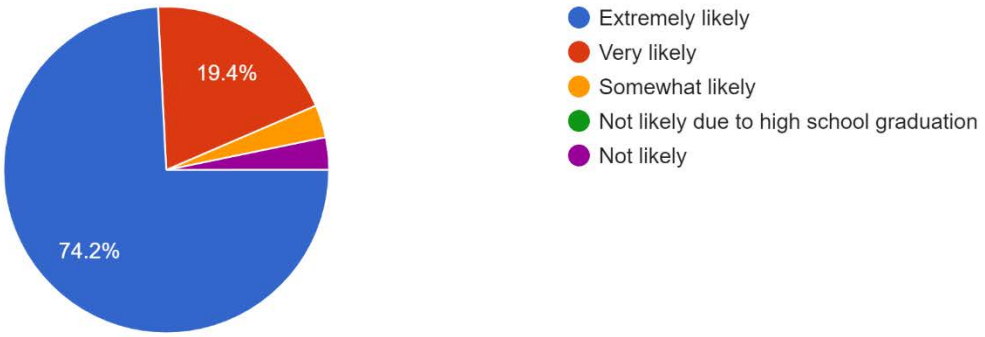
Q6. For whom do you think the Robofest programs should be designed?

31 responses



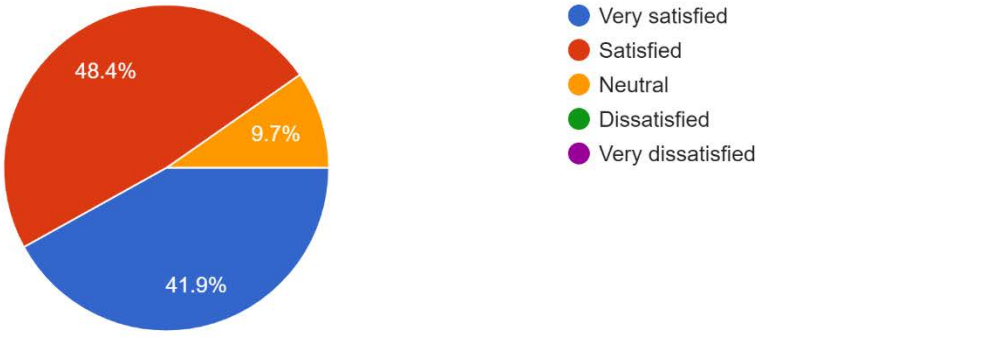
Q7. How likely are you to participate in Robofest next year?

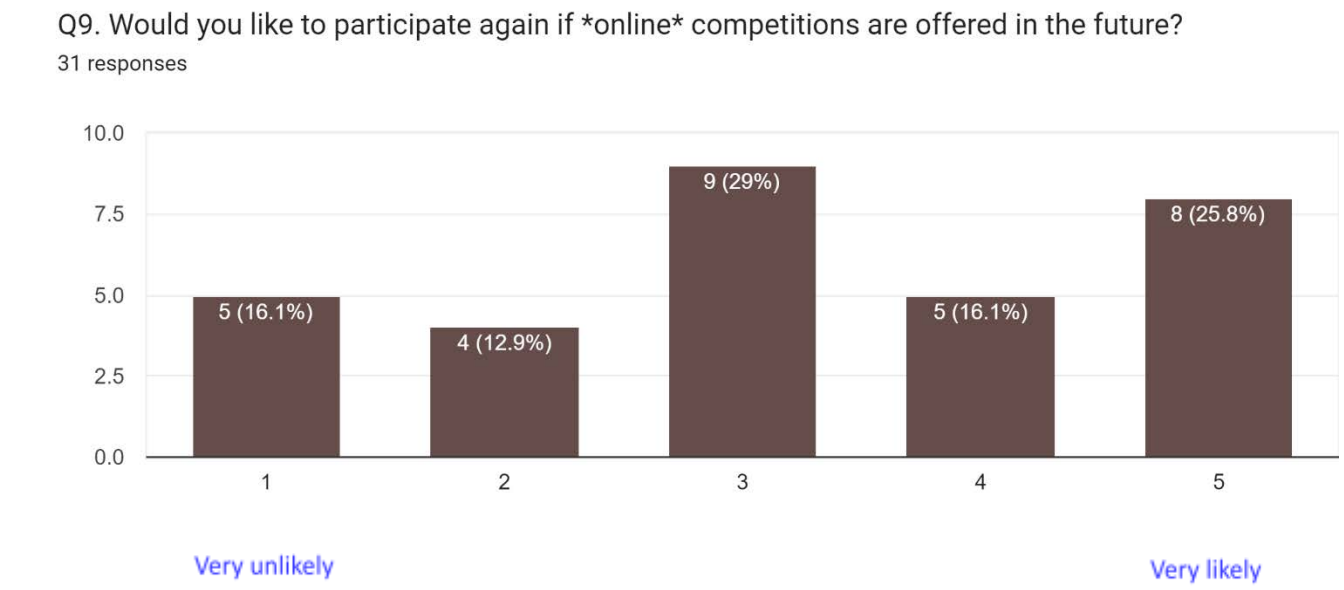
31 responses

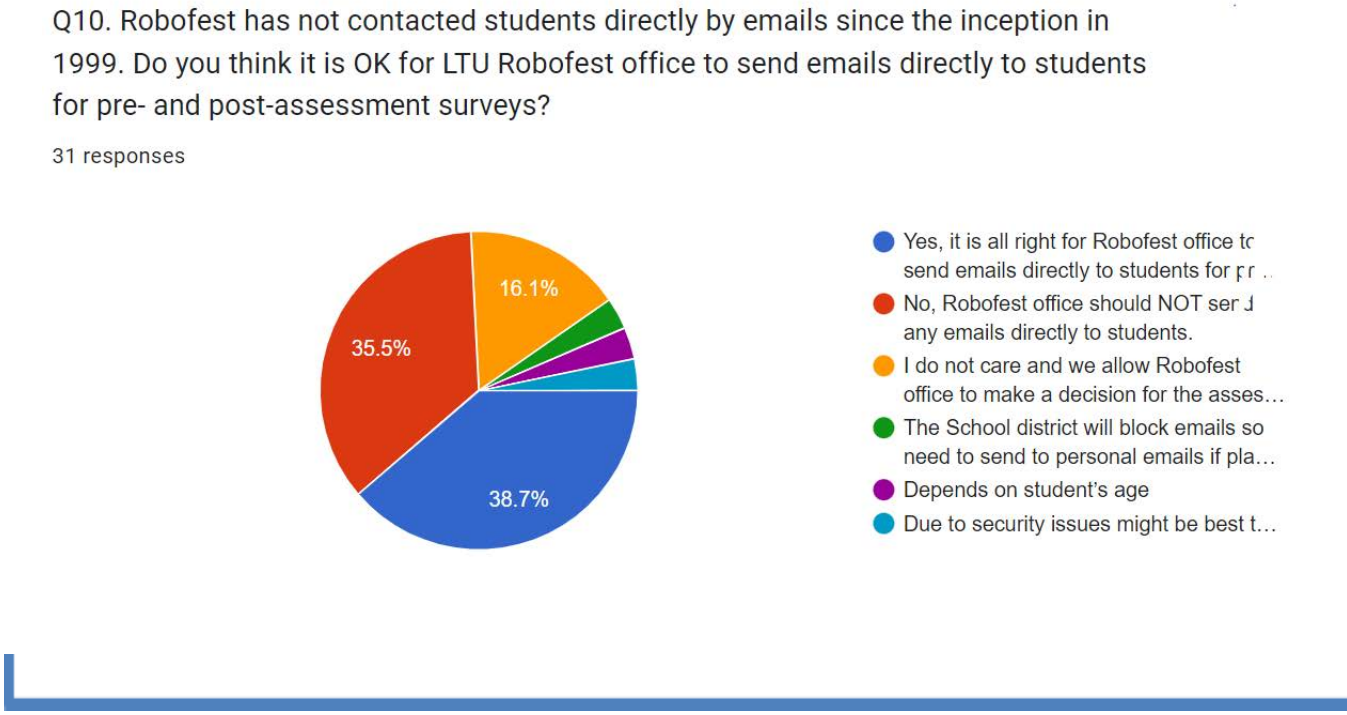


Q8. How would you rate your overall Robofest 2023 season experience?

31 responses



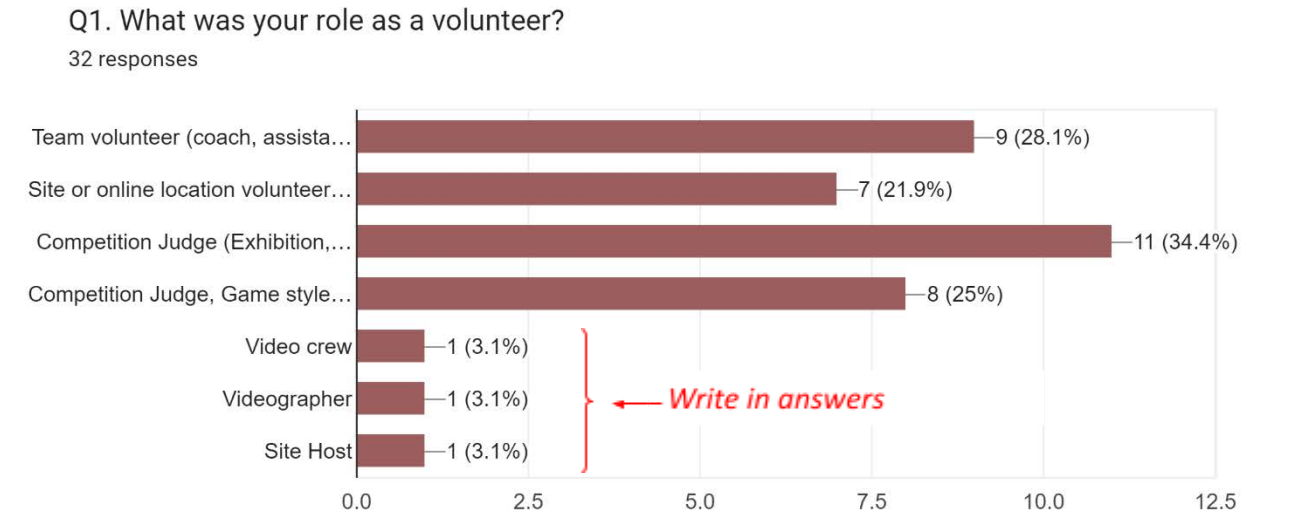


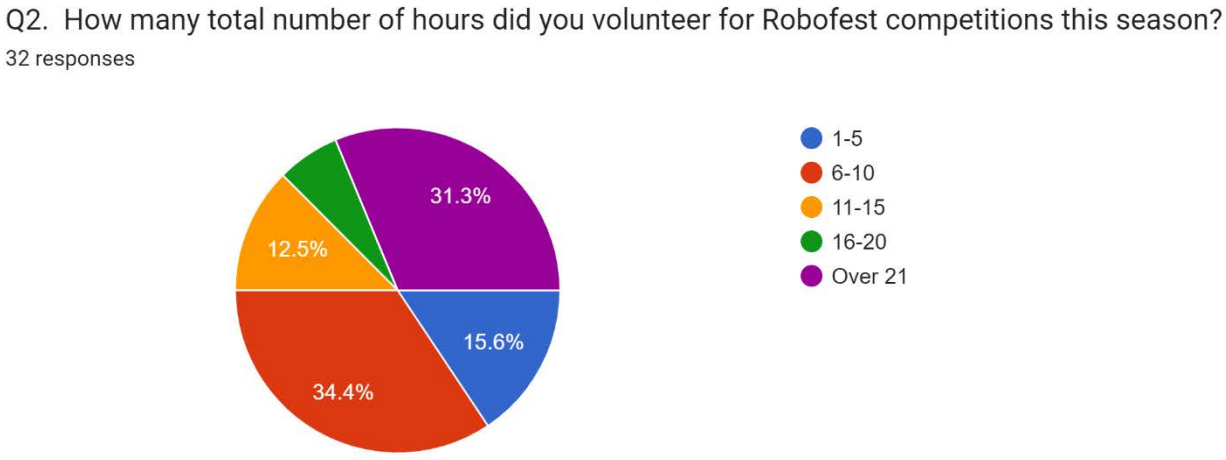


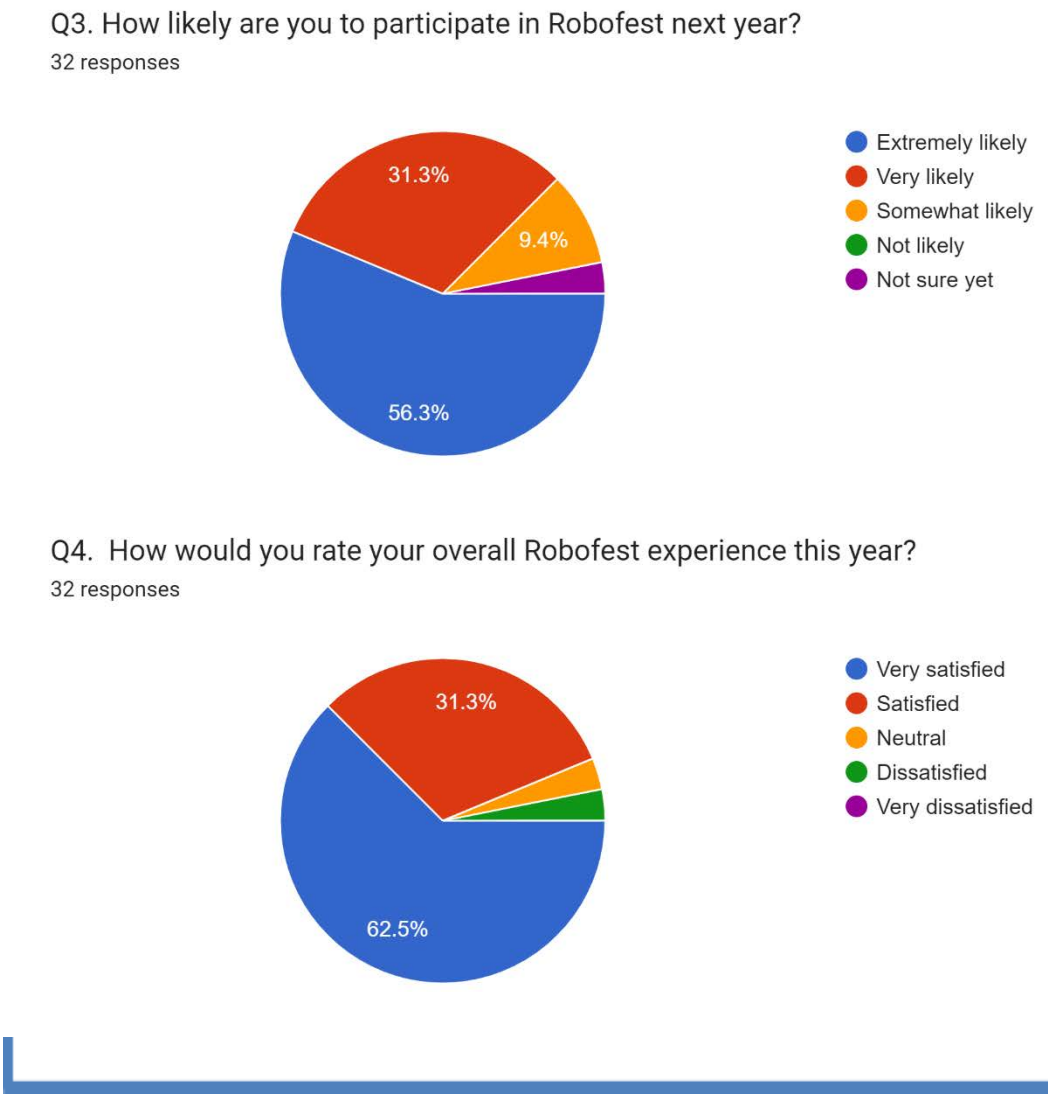
(Figure 4) 2023 Coach Survey results

1.2 Volunteer Survey Results

The following (Figure 5) with 5 questions shows the results of 2023 Volunteer/Judge surveys.







(Figure 5) 2023 Volunteer & Judge survey results

The coach survey included an essay (short answer) question: *Q11. Please write any suggestions, comments, criticism, and encouragement to improve the quality of Robofest.* Comments and corresponding Robofest office's responses/comments can be found in Appendix 1.

The surveys for Volunteers & Judges had an essay question: *Q5. Please provide any suggestions/comments which will help us enhance the quality of Robofest.* Volunteers' comments and corresponding Robofest office's comments can be found in Appendix 2.

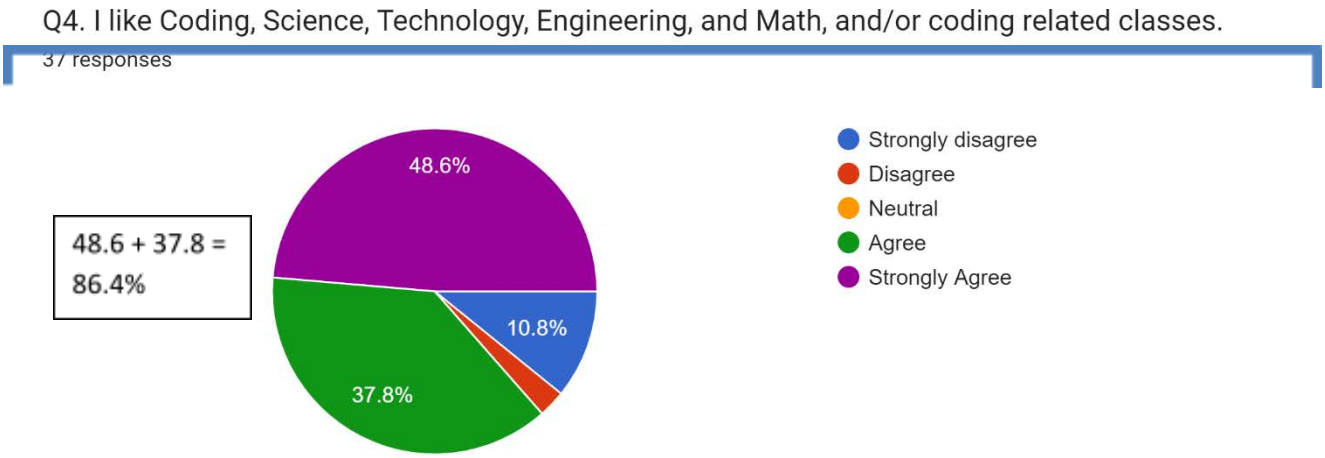
We appreciate everyone who participated in the surveys. Please note that the survey was completely anonymous.

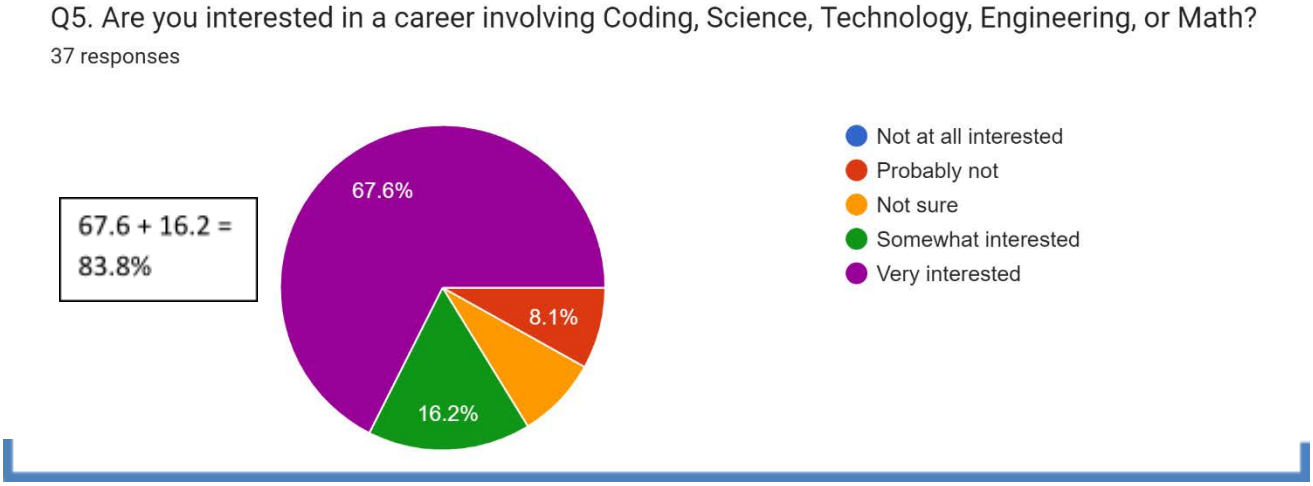
2. Student Assessment

In order to assess the impact of autonomous robotics competitions in STEM education, Robofest students were asked indirectly through coaches to take online anonymous surveys before and after the competition. Robofest does not contact students directly.

2.1 2023 Pre-survey

37 students participated in the pre-assessment survey anonymously when teams were registered before starting Robofest work. Unfortunately, due to a problem with Google Form setup, this year we could not collected data for Q4. I like Coding, Science, Technology, Engineering, and Math, and/or coding related classes. 88.1% of the students were very or somewhat interested in career in STEM fields when the team was registered.



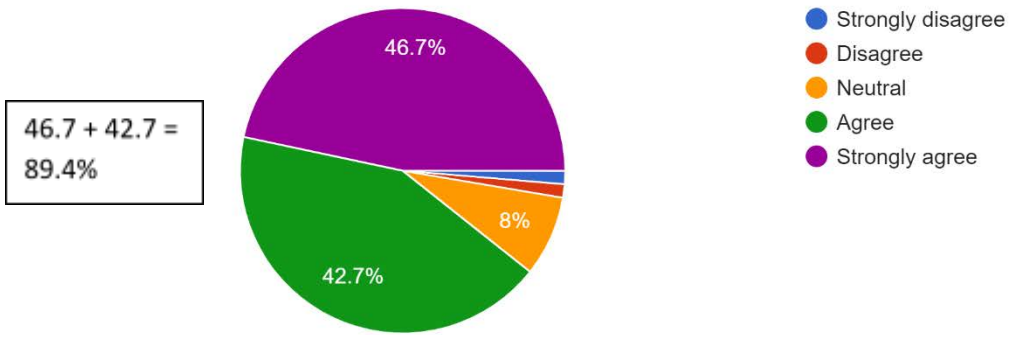


2.2 2023 Post-survey

After World Championship events were completed, a post-assessment survey was conducted. 75 students participated in the survey anonymously. See figure 6 below.

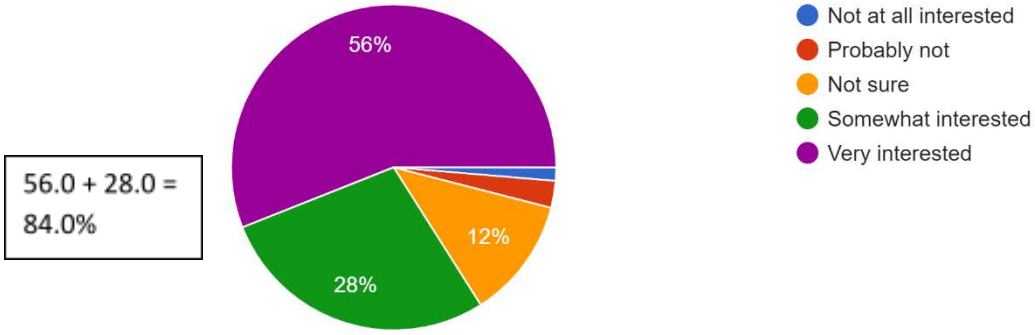
Q4. I like Science, Technology, Engineering, Math, and/or Coding related classes.

75 responses



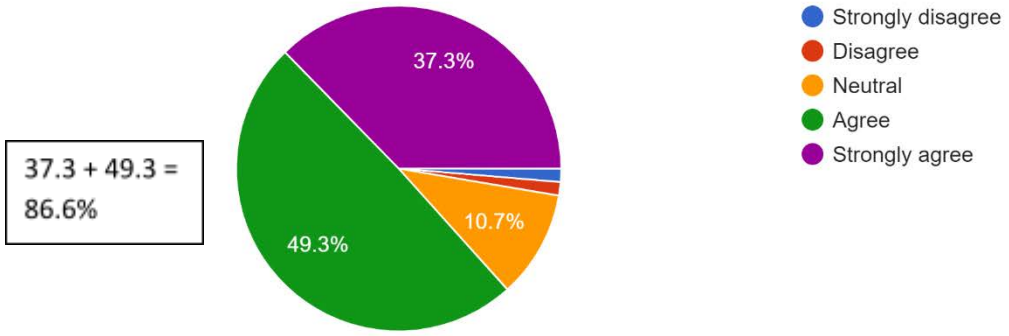
Q5. Are you interested in a career involving Science, Technology, Engineering, Math, and/or Coding?

75 responses



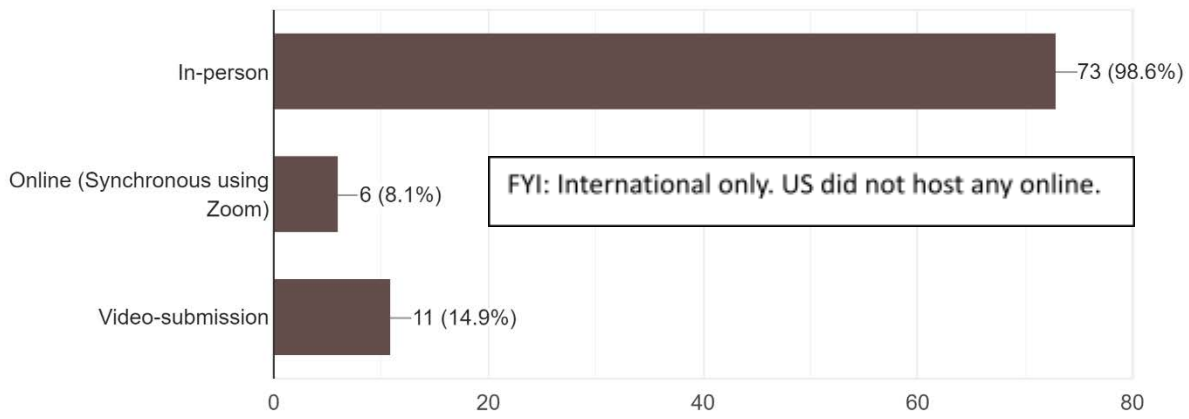
Q6. Robofest robotics experience helped me learn more about Science, Technology, Engineering, Math, and/or Coding.

75 responses



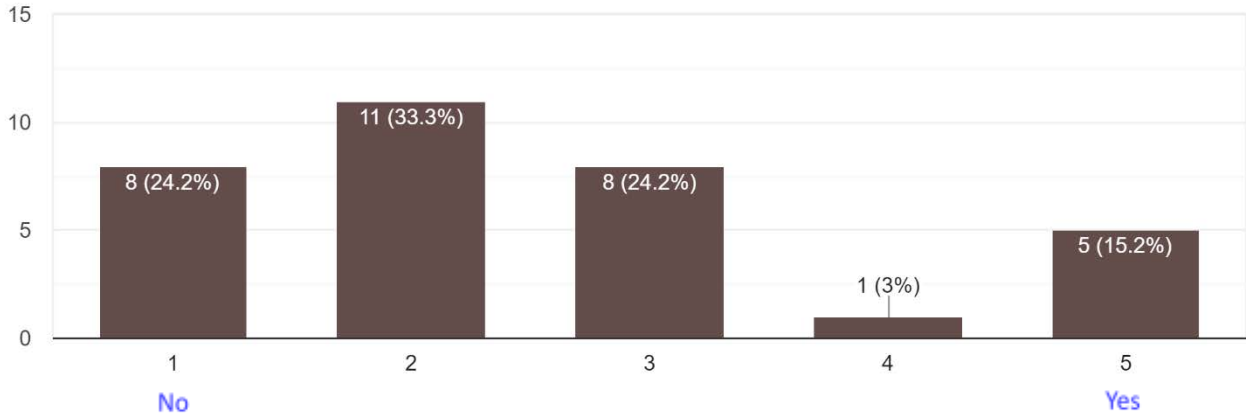
Q7. Which competition formats did you participate in this season? (Check all that apply)

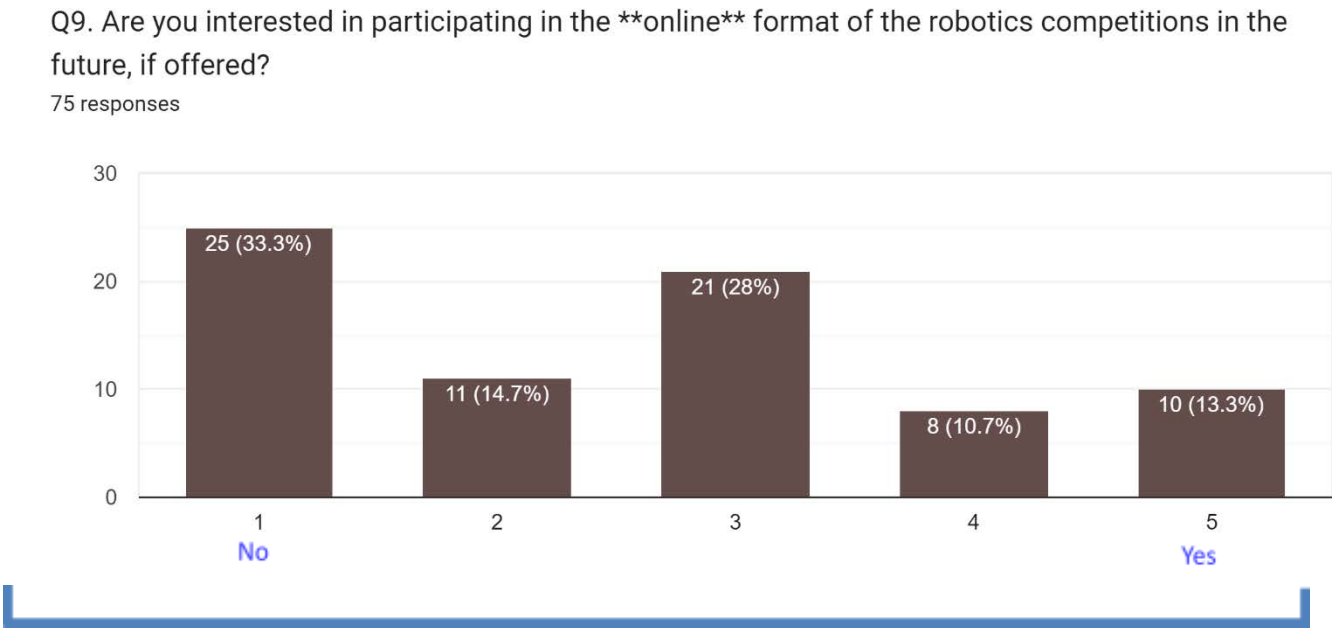
74 responses



Q8. [Optional question] Did you like the **online** format of the robotics competitions? (in case you participated in online competitions)

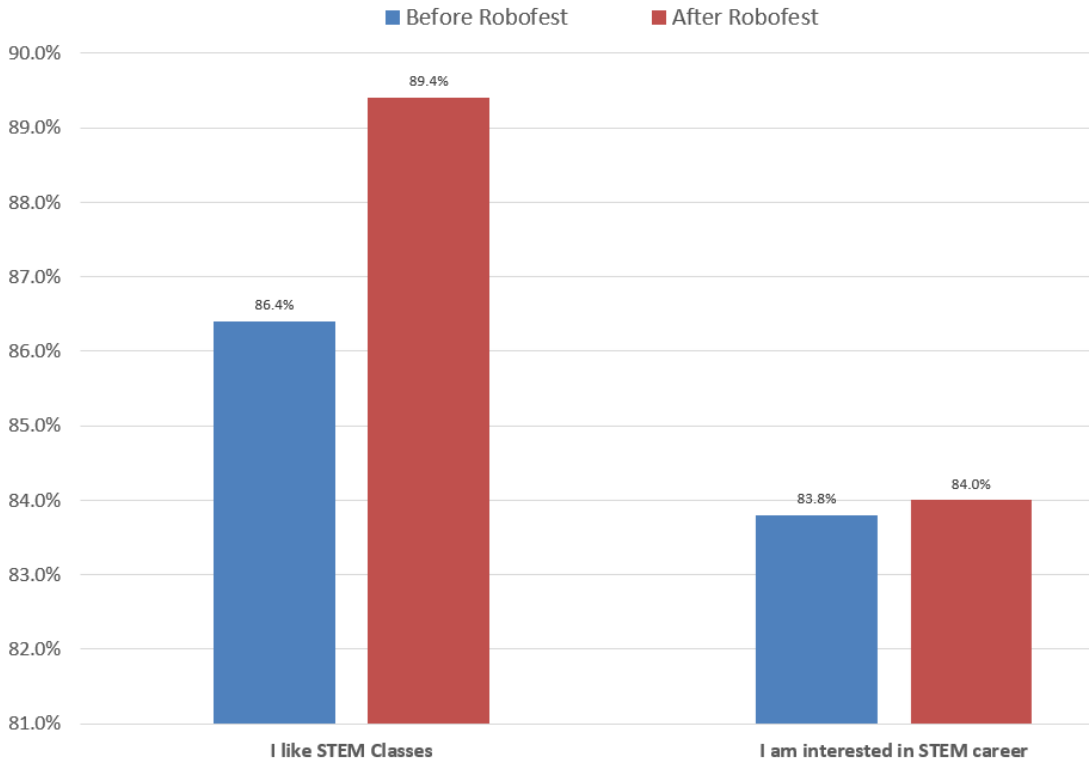
33 responses





(Figure 6) Summary of 2023 post-assessment student survey

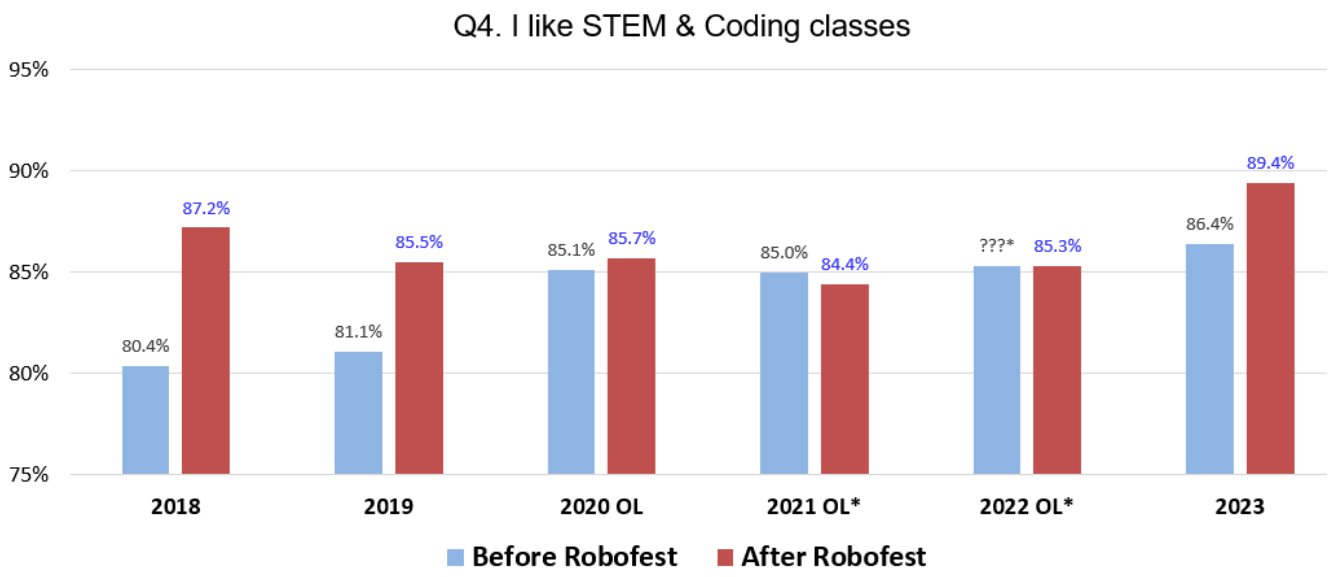
As shown in 2023 post-survey, 89.4% of students liked STEM classes and 84% of students also expressed that they would now consider a career involving STEM after their Robofest exposure. The result of Q6 in Figure 6 shows that 86.6% students indicated the Robofest robotics experience helped them learn more about Science, Technology, Engineering, or Math (STEM).



(Figure 7) 2023 Pre & Post Assessment Summary

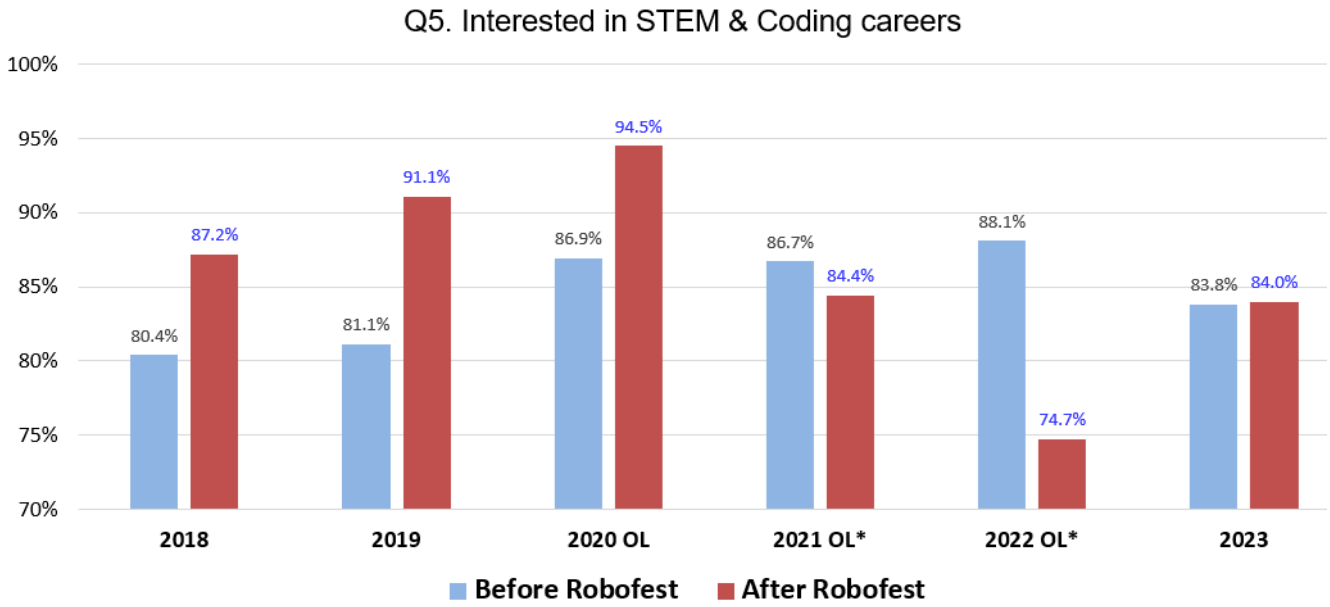
Figure 7 above shows the changes between pre and post survey results for the Q4 (STEM Likert) and Q5 (STEM Career interest). After students' Robofest experience this year, both STEM Likert and STEM Career interest were increased as shown in Figure 7.

The following, Figure 8, shows the STEM Likert pre & post assessment percentages since 2018. Figure 9 shows the STEM Career interest percentages from pre & post assessments since 2018.



(*) most of the competitions were online. FYI: 2020 were completely online

(Figure 8) Pre & Post STEM likert percentages since 2019



(*) most of the competitions were online. FYI: 2020 were completely online

(Figure 9) Pre & Post STEM Career interest percentages since 2019

3. Overall Program Self-Evaluation

Robofest's mission statement has the following three main goals:

A) Generate excitement & interest among young people for STEM
B) Develop essential skills such as problem solving, creative thinking, and teamwork (leadership & communication)
C) Prepare students to excel in higher education and technological careers

We defined and collected the following metrics to measure the success of a Robofest academic year.

1) Total number of registered teams during an academic year
2) Dropout rate (% of registered teams that did not compete)
3) Percentage of teams that received over 60% scores for Games
4) Percentage of teams that received over 3.0 out of 5 for Exhibition
5) Percentage of teams that solved the unknown problems without the help from adults. (Robofest has unknown problems like exams unveiled at the beginning of competition.)
6) Overall coach & volunteer (Judge) satisfaction rate
7) Percentage of teams that participated in the 2nd chance Game competition
8) Percentage of teams that improved scores on average in the 2nd chance competition
9) Percentage of students who indicate that Robofest robotics experience helped them learn more about STEM
10) Increased percentage of students who like STEM classes after having Robofest experience
11) Increased percentage of students who consider a career involving STEM after their Robofest exposure
12) Percentage of coaches who indicate that Robofest experience helped students in learning core soft skills such as teamwork, leadership, creativity, communication and problem solving

Evaluation of the 2023 year for each metric is summarized in Table 2. This evaluation is based on team registration data from RMS (Robofest Management System) database system, score sheets, and assessment surveys. The overall evaluation of the Robofest 2022-2023 year related to Robofest's goals is analyzed in Table 3.

Metric #	Criteria	Goal	Outcome	Evaluation
1)	Total number of registered teams	> 500	593*	Successful
2)	Dropout rate	< 5%	11.11%*	Unsuccessful
3)	% of Game teams with over 60% scores	> 30%	31.38%*	Successful
4)	% of Exhibition teams with over 3.0	> 50%	80.0%*	Successful
5)	% of Game teams that solved unknown task	> 40%	42.11%*	Successful
6)	Overall coach & volunteer satisfaction rate	> 80%	92.1%	Successful
7)	% of Game teams that tried 2nd Chance before the World Championship	> 20%	4.76%*	Unsuccessful
8)	% of Game teams that improved scores on average in the 2nd chance competition. Video submission teams included.	> 60%	67%*	Successful
9)	% of students who indicate that Robofest experience helped them learn more about STEM	> 80%	86.6%	Successful

10)	Increased % of students who like STEM classes after having Robofest experience	> 3%	3%	Successful
11)	Increased % of students who consider a career involving STEM after their Robofest exposure	> 3%	0.2%	Unsuccessful
12)	% of coaches who indicate that Robofest experience helped students in learning essential skills such as teamwork, creativity, leadership, communication & problem solving	> 60%	87.1% (based on Coach survey, Q4)	Successful

(*) data provided by Robofest Office

(Table 2) Evaluation of 2023 year for each quantifiable criteria

Goal	Metrics used to measure the success of the goal	Successfully or almost successfully achieved metrics in 2023	Evaluation
A)	1), 2), 6), 7), 10), and 11)	1), 6), 10)	50% (3/6)
B)	4) and 12)	4) and 12)	100% (2/2)
C)	3), 4), 5), 8), 9), 10), and 11)	3), 4), 5), 8), 9), 10)	86% (6/7)

(Table 3) Overall evaluation based on analysis of Goals and Metrics.

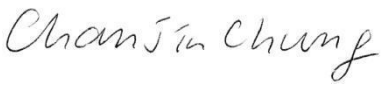
4. Summary

We are back to full in-person competition mode after the pandemic this year. Based on student assessment data as well as coach and volunteer surveys, 2022-2023 Robofest has achieved two of its primary mission goals, which are (B) Develop essential skills such as problem solving, creative thinking, and teamwork (leadership & communication) and (C) Prepare students to excel in higher education and technological careers.

We were not able to achieve the goal (A), which is to generate excitement & interest among young people for STEM. Even if the pandemic is over, we have not attracted students in pre-pandemic level yet. Another important issue is that math scores for 8th graders fell in the United States due to the pandemic (New York Times, Oct 22, 2022).

We will continue to introduce innovative ways and improve our programs to inspire students to get interested in STEM focusing on Mathematics, assure students' STEM learning, and improve students' STEM competencies through Robofest programs.

Respectfully,



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Robofest Advisory Board Members:

Appendix 1: Coach Survey Comments / Answers

Q11. Please write any suggestions, comments, criticism, and encouragement to improve the quality of Robofest.	**Robofest Answers/Comments by Robofest Office**
Excellent program.	Thank you!
Electrical-Electronic circuits should be another instructional category included with Robofest.	Thank you for the suggestion. We will consider it for future offerings. LTU summer camp offers hands-on EE. https://www.ltu.edu/summer-camps
Excellent job by the staff. All the parents and students who I spoke with were very pleased.	Thank you
Robofest as a whole is an awesome experience for my students. I especially enjoy the opportunities for my students to compete alongside and network with international students. Unfortunately, the space between UMC and Sr. BottleSumo didn't allow for that kind of bonding this year. Ironing out scheduling will definitely improve that moving forward.	We will be reviewing the World Championship schedule and will make adjustments to allow more time between events.
It was a great experience for my team and myself! Feel wonderful to return in person for the world championship!	We were very happy to return to in-person events as well.
I'd love to see more feed back from our expert judges. The boys wondered what could have been improved- how could there project have evolved.	We will find ways to give more feedback to teams. We plan to form committee for exhibition style categories to improve Judging process.
This was reallt cool! Thanks!	You are welcome!
Competing in person is way better than online.	We agree.
On the day of the robot game, there was a short turnaround time for lunch, which wasn't adequate for the very limited food truck availability. Could this be a pizza lunch (instead of pizza the night before!?)? Overall a wonderful experience! Thank you!	We plan to add more options for lunch at future events to reduce the wait time.
For the closing be mindful of the audiences attention span. There were some speeches that the audience lost interest in. i.e. thanking the feeder event hosts one-by-one.	Since our site hosts are volunteers, we do need to recognize their efforts. Perhaps we could move the recognitions to another part of the event.
More intro/basic vocabulary instruction for coaches.	We will add a glossary of terms to the General Rules
If you start contacting students directly you will be blocked by Houston ISD, we are not allowed to work with any organization, company, or vendor that collects or contacts students directly. *If you want to do this, you will need to have their parents register the student and then in your system you will have to have a mechanism in place to ask the parents if they want their child to be contacted by you directly*. A good example is the way First Robotics handles this, although it is a total pain from my point of view to get students registered into their system and their system is not user friendly at all.	We will take this into consideration

I highly suggest an award that recognizes girls in Robofest	We will consider this for the future
None that I can think of at this time.	
none at this moment	
nothing to mention	
*1 My team consists of Middle School students. Students in that age range should not be contacted directly by either Robofest or the local site coordinator. *2 We were the only school at our qualifier in the Jr. Game division. That's concerning, and I wish there were several schools represented (as there used to be). *3 It is not at all clear that the move to Spike Prime makes things better for us in the Robofest competition. We're not going to teach an outdated platform, but we're counting on Robofest to design challenges that can be met with only six ports on the hub. *4 It has become common for Robofest to create game challenges that require stacking. Perhaps you could offer a workshop on various methods for stacking. Robofest is a terrific program, and we're grateful to LTU for supporting it!	*1 We will take this into consideration *2 We hope to encourage schools that participated in Robofest in the past return to the competition *3 We will consider more challenges that can utilize LEGO Spike Prime/Robot Inventor *4 We designed a Summer Day Camp “Object Manipulation” and will consider adding it to the workshop Thank you for your comments
We were very happy with Robofest and felt honored to participate in it this year.	Thank you!

Appendix 2: Volunteer Survey Comments / Answers

Q5. Please provide any suggestions/comments which will help us enhance the quality of Robofest for S. T. E. M. education.	**Robofest Answers/Comments by Robofest Office**
Went very well	Thank you!
Maybe a pre-competition workshop to help some international teams rehearse their presentation	Thank you for the suggestion. We will consider adding a presentation practice activity. Perhaps a special workshop on “Technical presentation in English”.
Unsure	
no suggestions as this point, will be much more involved this year, so may have some for next year	
My team and I have learned so much from the Robofest community! Kids love the challenges and seeing them resolving the challenges and growing are amazing!	Thank you
This was my first time participating and the students made the experience enjoyable! Need to ensure better planning for next year. Judging software is working or back-up plan in place, there is support for equipment (e.g. backup mic), and judging process for student presentations is streamlined with moving in sequence to next team. Lets make sure we have snacks for the children as well as water at least 1.5 - 2 hours after dinner.	We will work hard to plan and resolve concern quickly in the future. We will encourage the coaches to bring snacks and water for the students that may need them.
Maybe some virtual sessions for students as it's hard for remote schools to access the training opportunities at Acadia.	We do offer all workshop materials through the Robofest eAcademy and will consider offering online workshop sessions

Maintain the same format, do not change it too much. It will help in judging and conducting the event.	We need more specific information. We think some changes are necessary for improvement and innovation.
Awesome couldn’t wait for next year !	Thank you
The awards ceremony seemed too long. A shorter awards ceremony would be appreciated on the volunteer side.	We will try to find ways to recognize all the teams, hosts, sponsors and volunteers
Make sure Yellow Flag gets the footage of the winners, otherwise it was a great season!	We will work with YF to improve our final footage
Robofest Outreach Initiatives (Site Organizers, teams, coaches, volunteers, etc.) - the pandemic weakened the STEM core in public and private schools. So, rethinking how to reach this targeted audience. Having some events online (option) is a Big Plus and In-Person. Great job on your STEM initiatives - I know there is more to come . . .	We will consider hosting various formats in the future
Award of medals to coaches and assistant coaches will go a long way to motivate individuals to give out their best and have something to show for the hard work done instead of giving the students only and leaving the coaches and assistant coaches out.	We will consider this for next season
I suggest that the judgement of the competition should not be limited to just one day or few minutes. Contestants spend so many weeks and hours in preparations and practice but are judged only on a few minutes and this makes all the days of practice meaningless. I think more progress could be made if the event is spread over a period of 2 or 3 days where competitors are given different problems to solve each day and results are accumulated over about 3 or 4 different events of competition so that the team that emerges as winners are able to demonstrate greater skills.	We will consider extending the judging time. Judges are volunteers and Robofest must use their time prudently. Robofest feels that the ability to present in real time an important skill. The team video is a way for teams to assure that the critical points of their project are conveyed. We are forming committees to find ways to improve judging.
Probably more judges and more guidance for judges are needed for the competition.	We admit that we did not do well for recruiting qualified judges and training them.
I noticed some of the teams where trying to game the system for game. It required the teams to label the "front" but didn't specify what the front had to be and we didn't notice until impound.	We will consider adding specific requirements to indicate the front of the robot.