

# ROBOFEST 2021 ~ 2022 Annual Assessment Report

September 21, 2022

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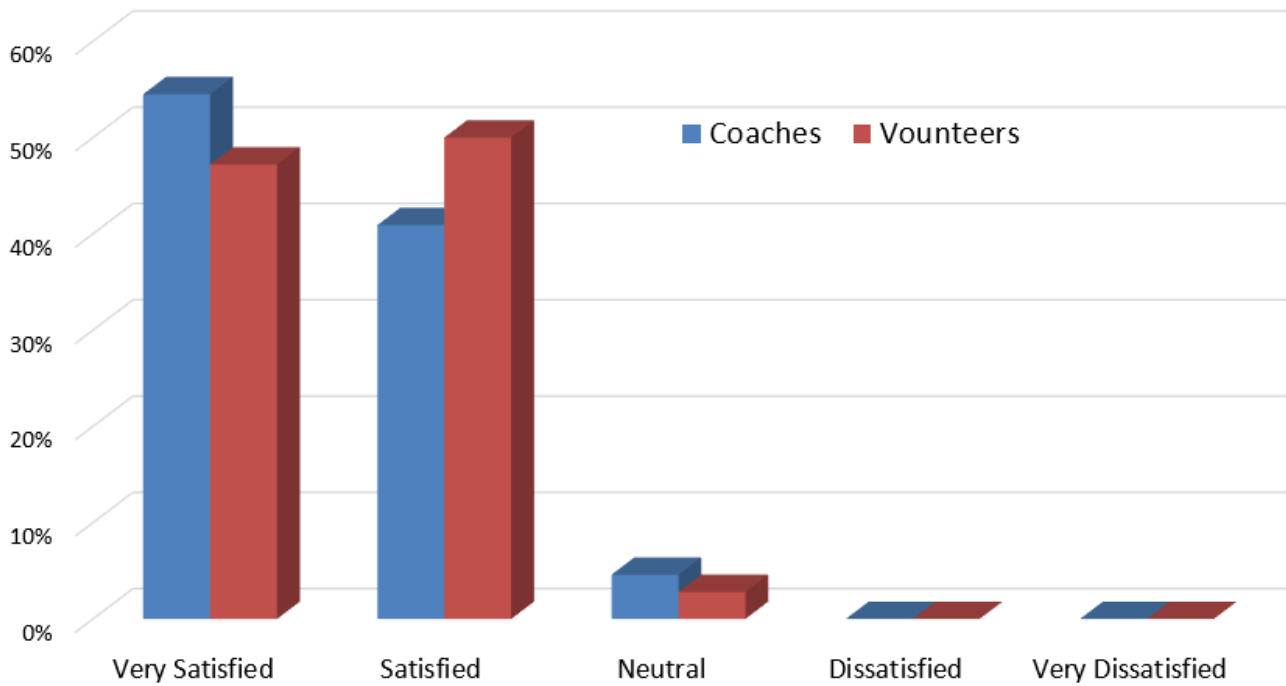
## 1. Robofest 2022 Coach & Volunteer Survey Results

Anonymous surveys were conducted after ROWC (Robofest Online World Championship) competitions in June 2022. 22 coaches, assistant coaches or team mentors participated in the coach survey. 36 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 were no “dissatisfied” responses this year.

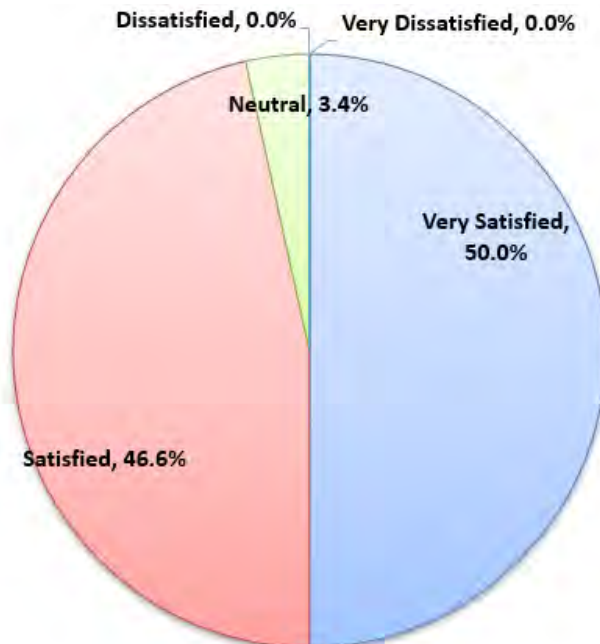
	# Coaches	# Volunteers (Local Judges)	Weighted Average %
Very Satisfied	12	17	50.0%
Satisfied	9	18	46.6%
Neutral	1	1	3.4%
Dissatisfied	0	0	0.0%
Very Dissatisfied	0	0	0.0%

(Table 1) 2022 Satisfaction rate from each of 2 surveys

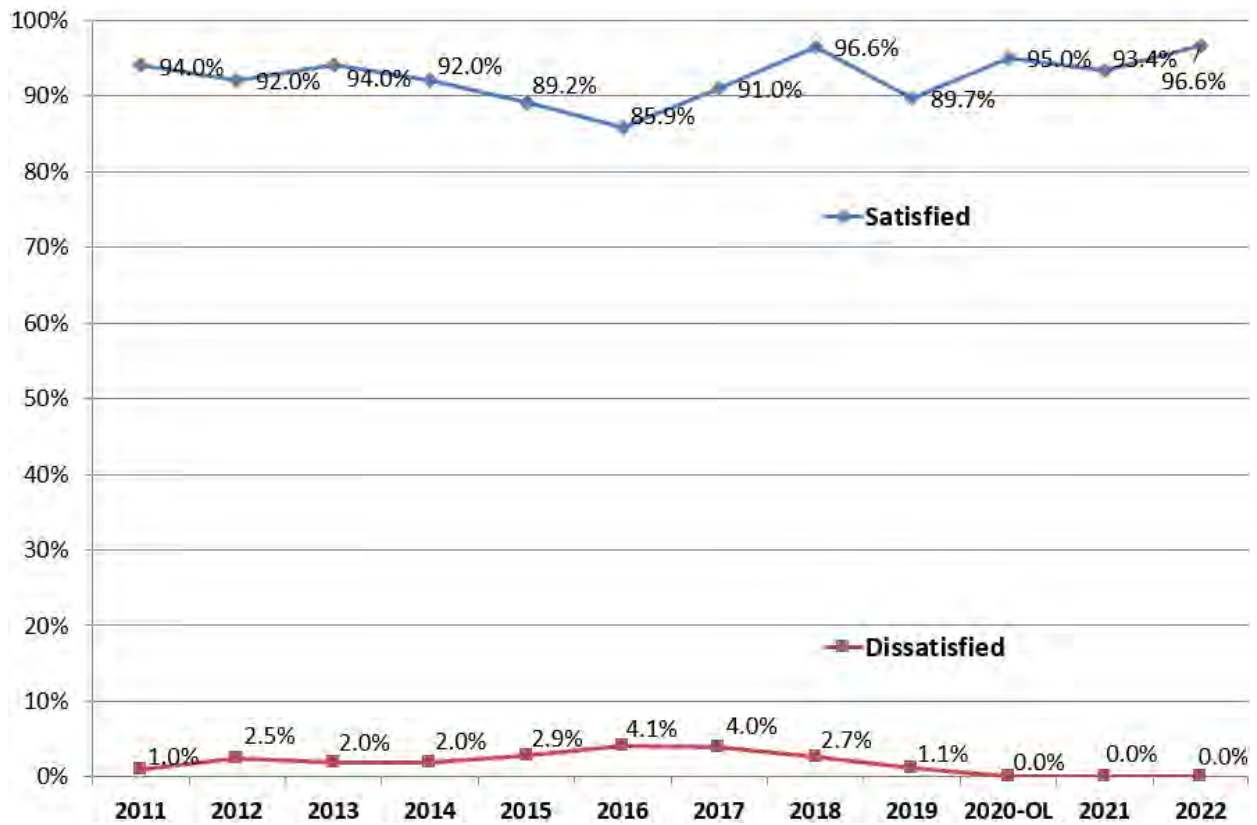
Figure 2 shows average satisfaction rate from the 2 surveys. Considering the satisfaction rate (50+46.6=96.6% were satisfied or very satisfied), Robofest 2022 was yet another successful year. Figure 3 shows overall coach/volunteer satisfaction rate changes since 2011. It does not show neutral cases.



(Figure 1) Satisfaction rate from each of 2 surveys in 2022



(Figure 2) 2022 Coach/Volunteer averaged satisfaction rates



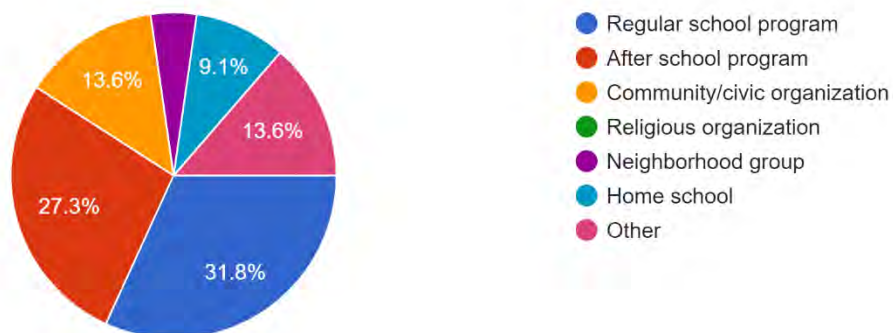
(Figure 3) Overall coach/volunteer satisfaction rate changes since 2011 (2014 year contains only coach data)

## 1.1 Coach Survey Results

The following (Figure 4) shows some results of 2022 coach surveys.

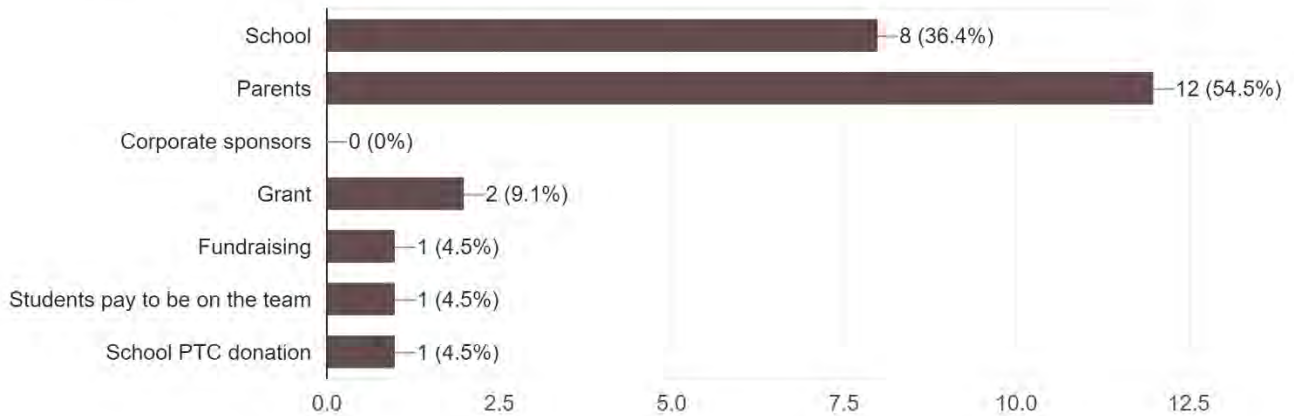
Q2. Your team participated in Robofest 2022 through:

22 responses



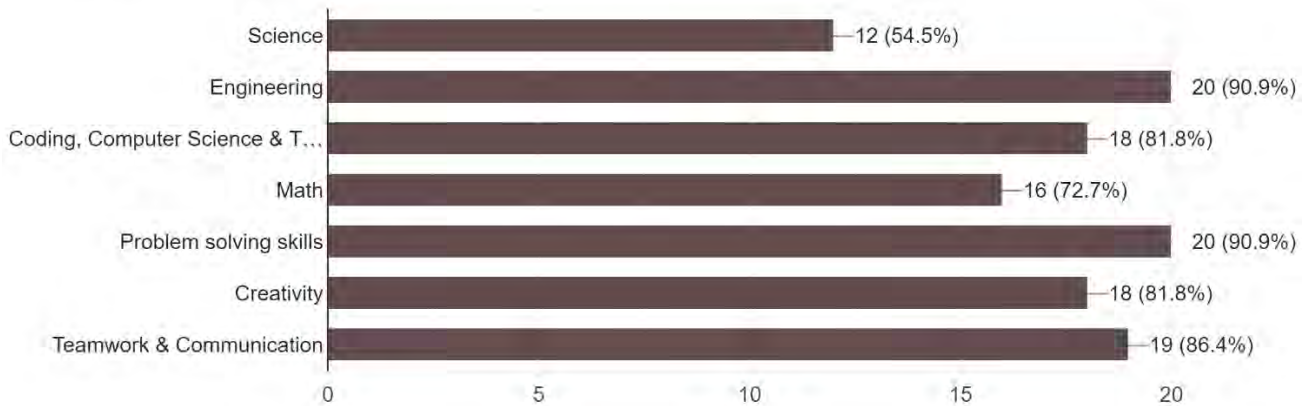
### Q3. From whom did your team receive funding?

22 responses



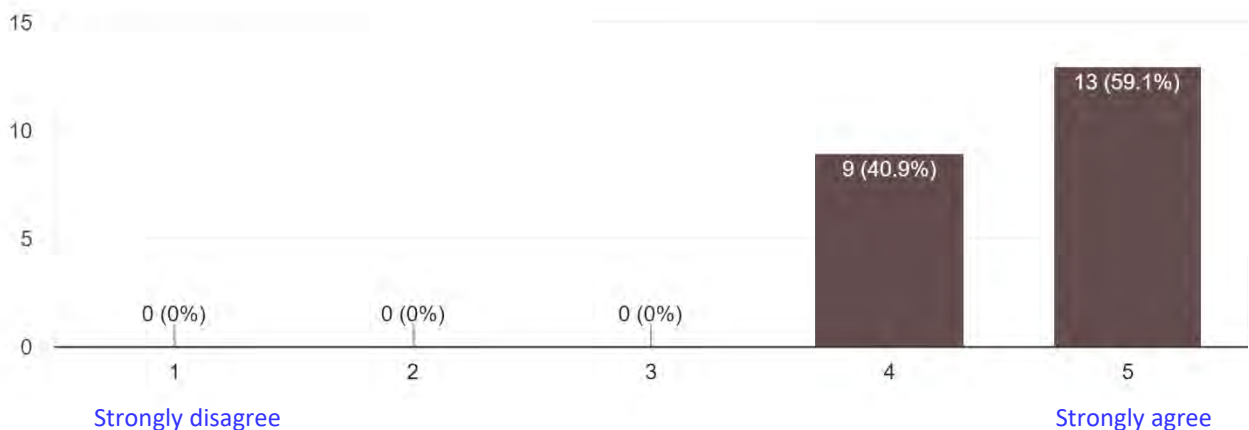
### Q4. What areas do you think are enhanced (or can be enhanced) through Robofest programs?

22 responses



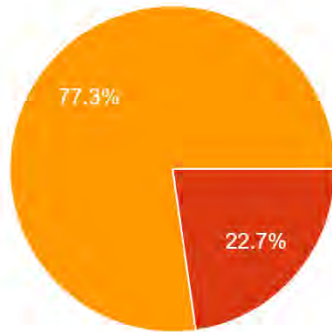
### Q5. Do you think your team members learned and improved science, technology, engineering, math, and/or coding knowledge through Robofest 2022 programs?

22 responses



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

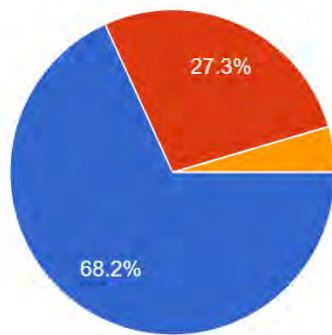
22 responses



- Students who demonstrate exceptional talent
- Only for students who are interested in science & engineering
- Every student

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

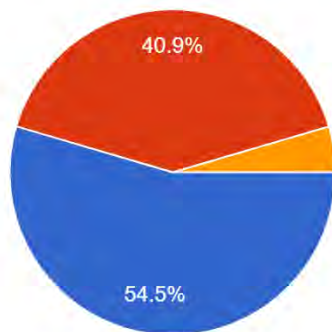
22 responses



- Extremely likely
- Very likely
- Somewhat likely
- Not likely due to high school graduation
- Not likely

Q8. How would you rate your overall Robofest 2022 season experience?

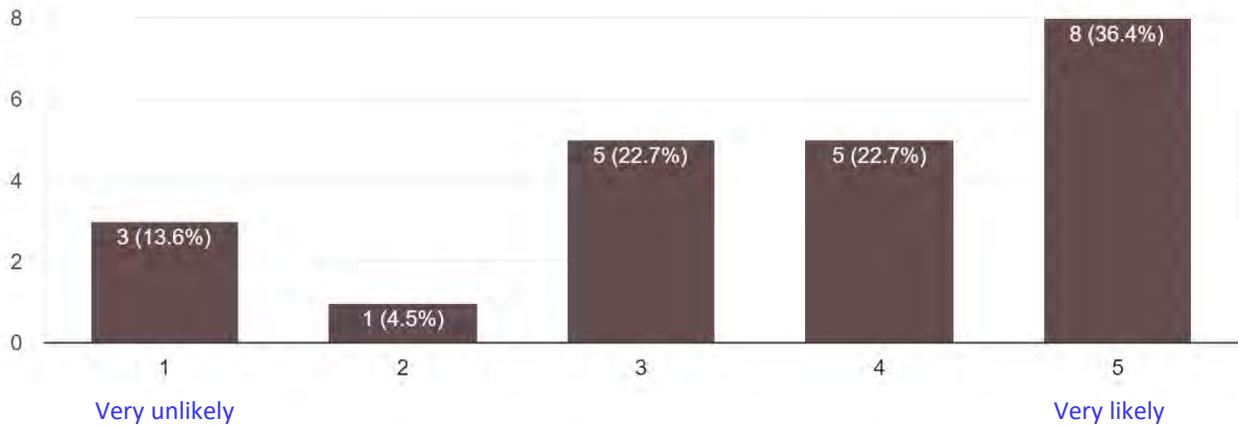
22 responses



- Very satisfied
- Satisfied
- Neutral
- Dissatisfied
- Very dissatisfied

Q9. Would you like to participate again if \*online\* competitions are offered in the future?

22 responses



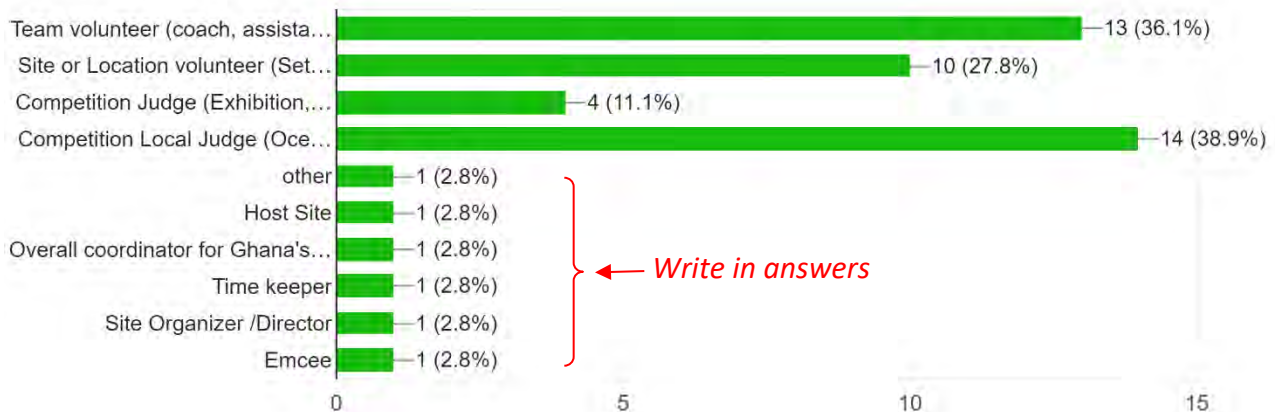
(Figure 4) 2022 Coach Survey results

## 1.2 Volunteer Survey Results

The following (Figure 5) with 5 questions shows the results of 2022 Volunteer/Judge surveys.

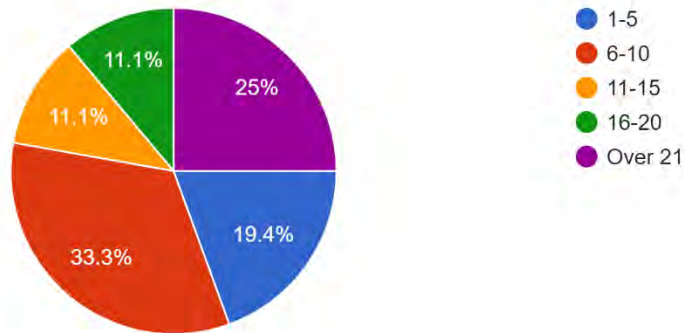
Q1. What was your role as a volunteer?

36 responses



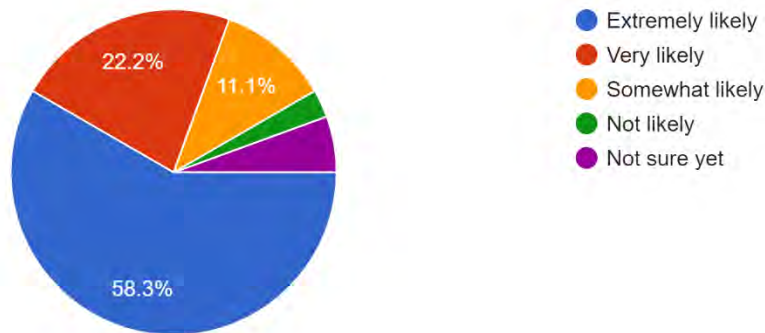
Q2. How many total number of hours did you volunteer for Robofest competitions this season?

36 responses



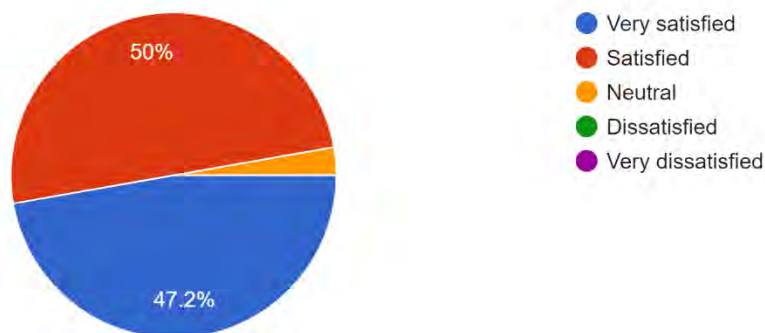
Q3. How likely are you to participate in Robofest next year?

36 responses



Q4. How would you rate your overall Robofest experience this year?

36 responses



(Figure 5) 2022 Volunteer & Judge survey results

The coach survey included an essay (short answer) question: *Q10. 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 2022 Pre-survey

58 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 collect 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 they sign up the team.

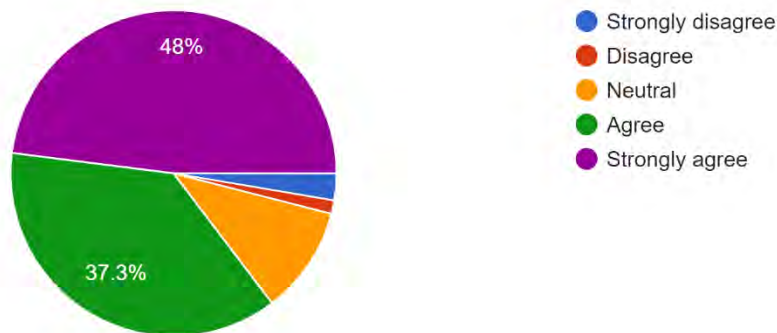
### 2.2 2022 Post-survey

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

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

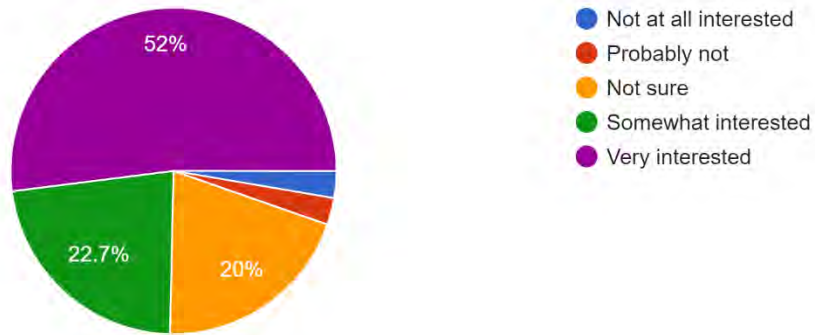
75 responses





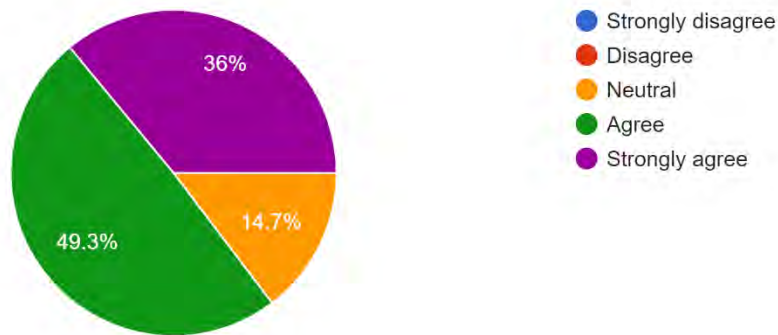
Q5. Are you interested in a career involving Science, Technology, Engineering, Math, and/or Coding?

75 responses



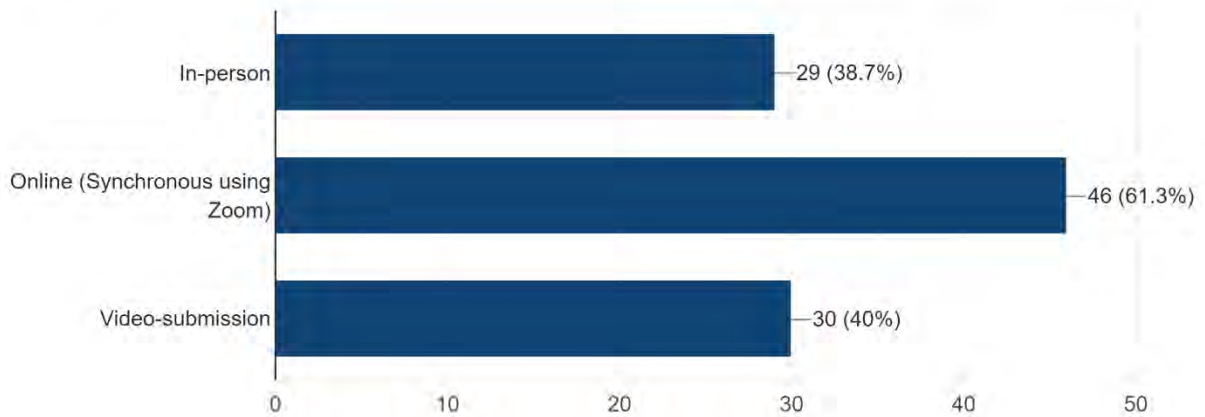
Q6. Robofest robotics experience helped me learn more about Science, Technology, Engineering, Math, and/or Coding.

75 responses



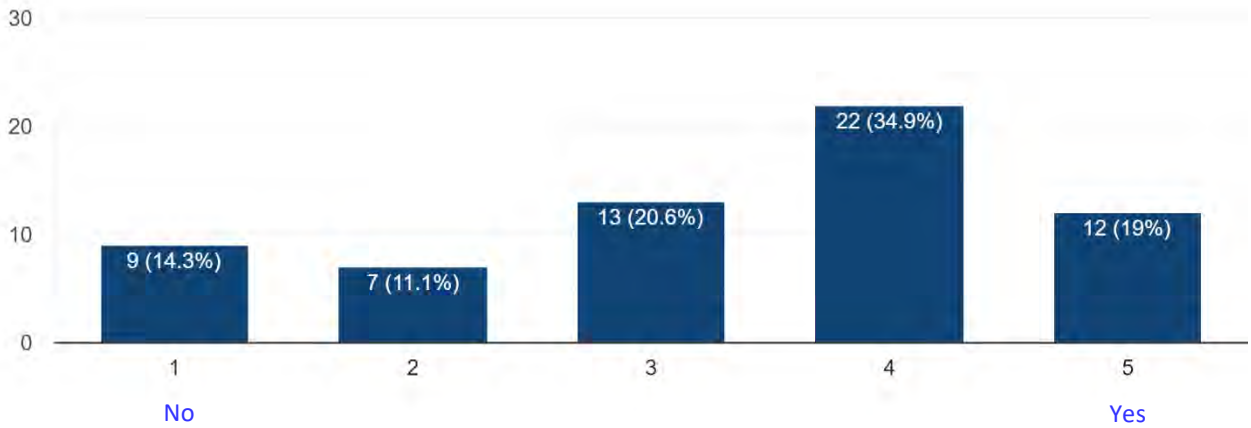
Q7. Which competition formats did you participate in this season? (Check all that apply)

75 responses



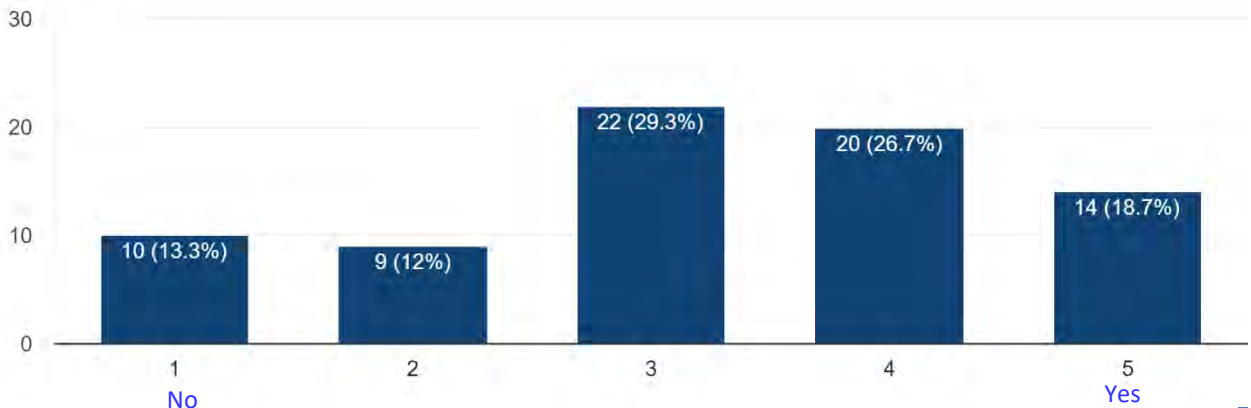
Q8. Did you like the **online** format of the robotics competitions? (in case you participated in online competitions)

63 responses



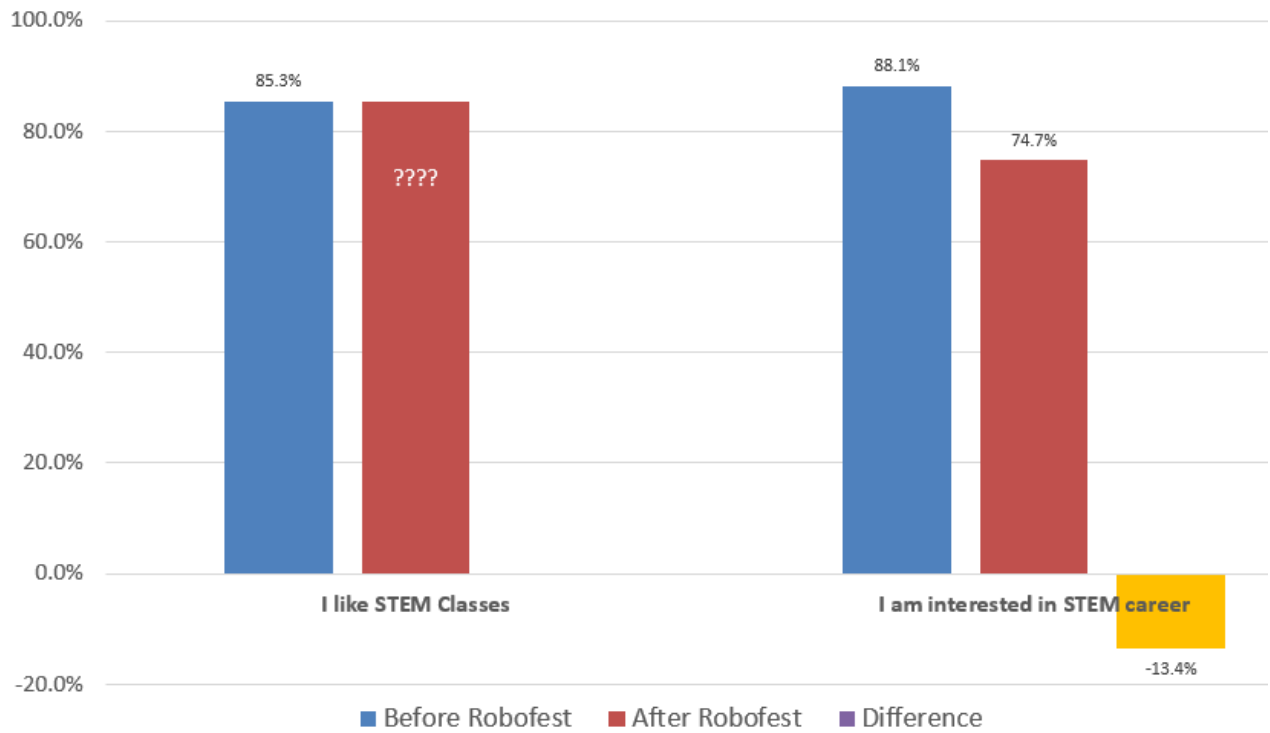
Q9. Are you interested in participating in the **online** format of the robotics competitions in the future, if offered?

75 responses



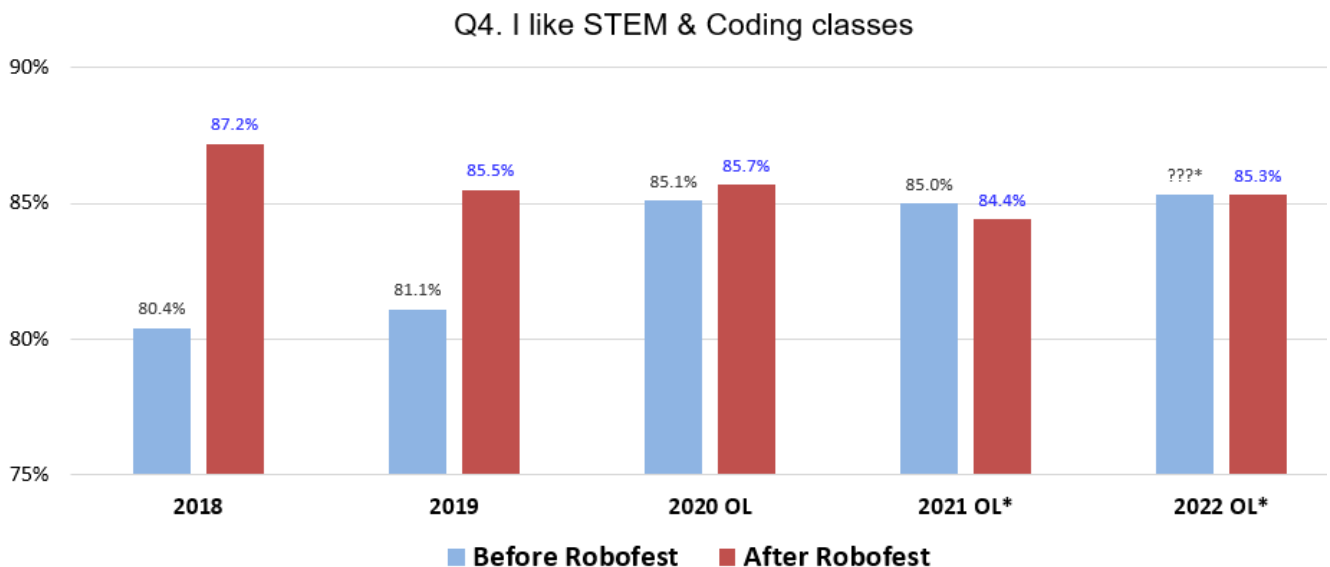
**(Figure 6)** Summary of 2022 post-assessment student survey

85.3% (48%+37.3%) of students liked STEM classes as shown in Q4 and 74.7% (52% + 22.7%) of students also expressed that they would now consider a career involving STEM after their Robofest exposure as shown in Q5. The result of Q6 in Figure 6 shows that 85.3% (36%+49.3%) students indicated the Robofest robotics experience helped them learn more about Science, Technology, Engineering, or Math (STEM).



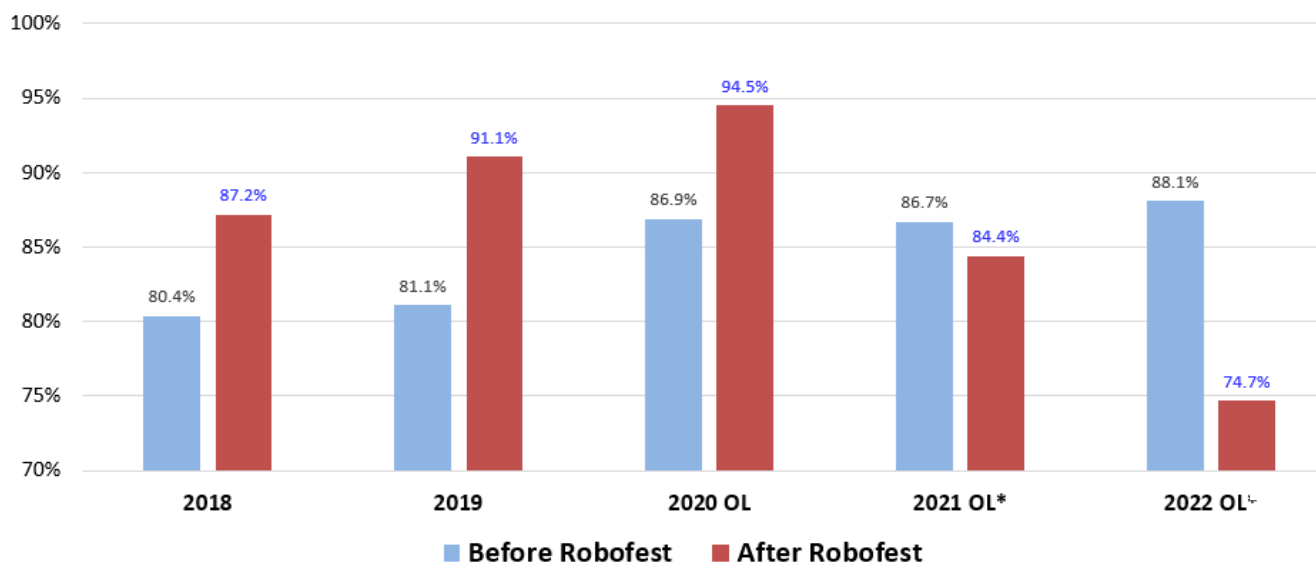
(Figure 7) 2022 Pre & Post Assessment Summary

Figure 7 above shows the changes between pre and post survey results for the Q4 (STEM Likert) and Q5 (STEM Career interest). As mentioned in 2.1, the data for STEM Likert scale was not collected due to Google Form issues. After students' Robofest experience this year, STEM career interest ratio was decreased again as shown in Figure 7. We think the decrease is due to (1) lower number of survey participants, (2) the difficulty of the OceanBots game challenge this year, (3) lack of in-person support for teams due to the pandemic, (4) fewer % of rookie participants, possibly. The following, Figure 8, shows the STEM Likert pre & post assessment scores since 2018. Figure 9 shows the STEM Career interest data from pre & post assessments since 2018.



(Figure 8) Pre & Post STEM likert scores since 2018

### Q5. Interested in STEM & Coding careers



(\*) most of the competitions were online  
(Figure 9) 2022 Pre & Post Assessment Summary

## 3. Overall Program Self-Evaluation

Robofest's mission statement has the following 3 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 2022 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 2021-2022 year related to Robofest's goals is analyzed in Table 3.

Metric #	Criteria	Goal	Outcome	Evaluation
1)	Total number of registered teams	> 500	516	Successful
2)	Dropout rate	< 5%	9.02%	Unsuccessful
3)	% of Game teams with over 60% scores	> 30%	38.1%	Successful
4)	% of Exhibition teams with over 3.0	> 50%	90.48%	Successful
5)	% of Game teams that solved unknown task	> 40%	43.39%	Successful
6)	Overall coach & volunteer satisfaction rate	> 80%	96.6%	Successful
7)	% of Game teams that tried 2 <sup>nd</sup> Chance before World Championship	> 30%	4.23%	Unsuccessful
8)	% of Game teams that improved scores on average in the 2nd chance competition	> 60%	88%	Successful
9)	% of students who indicate that Robofest experience helped them learn more about STEM	> 80%	85.3%	Successful
10)	Increased % of students who like STEM classes after having Robofest experience	> 5%	n/a	n/a
11)	Increased % of students who consider a career involving STEM after their Robofest exposure	> 5%	-13.4%	Unsuccessful
12)	% of coaches who indicate that Robofest experience helped students in learning essential skills such as teamwork, creativity, leadership, communication & problem solving	> 60%	100.0%	Successful

(Table 2) Evaluation of 2022 year for each metric number

Goal ID	Metrics used to measure the success of the goal	Successfully or almost successfully achieved metrics in 2022	Evaluation
A)	1), 2), 6), 7), 10), and 11)	1), 2) and 6); 10) not counted	60% (3/5)
B)	4) and 12)	4) and 12)	100% (2/2)
C)	3), 4), 5), 8), 9), 10), and 11)	3), 4), 5), 8) and 9); 10) not counted	83% (5/6)

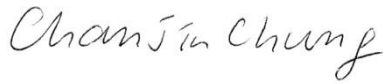
(Table 3) Overall evaluation based on analysis of Goals and Metrics.

## 4. Summary

Based on student assessment data as well as coach and volunteer surveys, 2021-2022 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 barely achieved the goal (A), which is to generate excitement & interest among young people for STEM. We think this is in large part due to the continued global pandemic. We will continue to introduce innovative ways to inspire students into STEM

fields, assure students' STEM learning, and improve students' STEM competencies through Robofest programs.

Respectfully,



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**Robofest Advisory Board Members:**

Paul M. Akangah, Emma Alaba, Phil Bigos, Gavin Coleman, Scott Eisele, Linda Pence, Josh Siegel, Gordon Stein, and Maurice Tedder



**Appendix 1: Coach Survey**

Q10. Please write any suggestions, comments, criticism, and encouragement to improve the quality of Robofest.	Robofest Answers/Comments by Robofest Office Staff
Would prefer in person competitions for the students	We are looking forward to the return to in-person competitions for the 2022-2023 season as well.
<p>Please return the World Championship to an in-person event. The opportunity to meet like-minded students from all around the globe is tremendously valuable to our students, and an important issue for us in choosing Robofest over FLL.</p> <p>My answer on "who Robofest is designed for" reflects my concern that is Robofest standards are set low enough to be accessible for everyone, our students who are into robotics will find the competition no longer satisfying.</p> <p>One suggestion on the Game: Consider making it difficult to score without using sensors. As you're designing the game, ask "How would I tackle this with using sensors," and if you could score more than, say, 30 points, make it harder. As a coach, I want to have your help convincing my students that they must use more than edge-sensing sensors.</p> <p>Robofest is a great program. Thank you for organizing it!</p>	<p>We are planning for the World Championship to be hosted in person in May 2023. We agree that the students all benefit from participating in an international event.</p> <p>We try to add complexity so more advanced students can still feel like they are learning something new. Exhibition Style events allow for participants to solve real-world complex problems with robots.</p> <p>We will take this question into consideration when designing the Game for 2023 and beyond. Thank you for the suggestion.</p> <p>Thank you for your comments.</p>
More robot coding sessions would be helpful.	We will work on the workshop schedule for January and February and announce it in the fall. If the sessions do not work with your schedule, we can possibly add additional dates. We also have many coding courses available on the eAcademy page of our website.

Robofest might open some summer camps; Senior (High school) team may mentor junior team (elementary school) team.	We are hosting two-day camp sessions in August. We did have camp sessions scheduled in Late June but canceled them due to lack of registrations. We welcome High School students who wish to mentor younger teams, and actually had some volunteers in 2022.
We have participated in Robofest for many years. We have seen it in person, online and a mixture of each. We have also participated in various competitions for it as well. The only competition that I feel really benefits from in person is the battle sumo because it is interactive between robots. I like that you didn't get rid of it during the online time though. I think the LTU team that organizes has shown a perseverance to provide robotics to students all over the world. We appreciate all the hard work that has provided Robofest to us. Thanks. Looking forward to next year.	Thank you for the kind words. The Robofest team appreciates your commitment to STEM education and we look forward to hosting in-person events next season.
Our team participated in the Game. Answer to Q6 is specifically regarding the Game. We like that there are events open to everyone. We like that the Game competition is open and fully autonomous. We really like the problem solving required by the unknown factors. We like having opportunities to compete with teams worldwide. We would like to see the mission announced earlier, so we can use the mission as a framework to teach key concepts and skills.	We will be announcing the 2023 Game rules on October 1, 2022. We will host a series of meetings to answer questions and make any necessary minor adjustments and clarifications before the final release for US teams in January.
Thank you for holding a beneficial competition for the children and I hope it will continue.	Thank you for the kind words.
Thank you for being flexible and available to help our team.	You are very welcome.
I know you did the best you could under the circumstances, but going forward, I really hope you are able to return to in-person competitions. I really liked this year's Game challenge: I liked the two start locations: I liked the color vs. size choice for sorting the turtles from the trash: I liked that the field elements were small enough and light-weight enough for the Lego robots to manage. The turtle on the piling was a clever addition. The blocks were definitely harder to pick up than balls.	We are very hopeful to return to an in-person format in 2023. Thank you for the feedback about the Game challenge.

## Appendix 2: Volunteer Survey

Q6. Please provide any suggestions/comments which will help us enhance the quality of Robofest for education.	Robofest Answers/Comments by Robofest Staff
Everything is wonderful. We are so grateful for the hard-working Robofest staff who did an amazing job organizing all the online and in-person competitions this year. We are looking forward to hopefully being able to host and attend in-person competitions next year and are looking forward to participating in the in-person World Championship!	We are hoping to host in-person events next season!
I don't have suggestions; just appreciation for all the adults giving time to offer this experience to students.	Thank you!
I would recommend to include an additional specific short video (2-3 minutes) to pitch their ideas towards entrepreneurs.	We will review this suggestion for the upcoming season. Currently our rubric has points for entrepreneurship.
We would love to continue the partnership to bring more teams to Robofest at our Novi TechEd Center.	We look forward to working with you!

<p>The costs are way too high. Your organization should be able to do more with less in order to truly promote/achieve your core goals. Cut costs and get more kids doing this. The games are great, but I can run a similar game in-house and not have to come up with \$550 CND a team. A fraction of this money reinvested into more robots or program materials would be much better spent in my opinion as a volunteer and coach. This year's costs were particularly unjustified as the program did not need to rent space, provide food or transport staff and volunteers. Please reassess your programs priorities and consider your overhead and administration costs.</p>	<p>The Robofest staff will address this concern with the local Site Host. Each host has the option to charge a site fee (in addition to the \$75 registration fee) to defray costs, and we will review the cost benefit with the Site Host for the upcoming season.</p>
<p>Even though technology fails sometimes, I think Robofest should be mindful of giving second chances to teams which seem to have challenges with their robots when competition is supposed to be underway. It is possible teams could take undue advantage. Perhaps in due cause I will be able to suggest a few ideas which will help</p>	<p>We understand that technology does not always work the way students expect it to during an official competition run after it worked just fine during a practice session. The Chief Judge has, on occasion, allowed a team to restart or rerun if the robot has a major technical issue, but in most cases, the experience allows for teams to learn about how the tech, and the team, works under pressure.</p>
<p>Overall it was an enjoyable experience. However, the schedule did not account for the time it took to actually judge the robotics competitions and it threw off the entire schedule for the day, i.e. closing ceremony, lunch,...</p>	<p>Thank you for your comments. We try to keep to schedules, but sometimes the schedule slips due to extenuating circumstances.</p>
<p>The video submissions from teams did not go as smoothly as I thought they would. In one of my judging events, several of the team videos were missing by the deadline, and the Robofest administrators had to chase down the team coaches and ask for submissions or clear indications they were dropping out of the competition. The app also did not work properly some of the time and some of the judges were not able to log in with their codes. This caused some concern and worry that the scores they had input in previous sessions had been lost.</p>	<p>We will review this issue and make any necessary changes to the application.</p>
<p>Please go back to in-person. So much of the experience is having the students compete in an unknown environment.</p>	<p>We definitely hope to return to in-person competitions for the 2023 season</p>
<p>Going forward, I think Robofest Online /Zoom competitions are going to be a great addition to the Robofest initiatives to offer more students the opportunities to participate in the Robofest experience and the STEM adventures. The world has changed, Robofest has proved that they are able and willing to meet the challenges that are ahead - In-Person &amp; Online!</p>	<p>We are hoping to host in-person events next season, and we will take into consideration the option to host a series of online competitions as well.</p>
<p>I think it was very fun and I learned how to use a camera!</p>	<p>Congratulations and thank you!</p>
<p>I hope that there is still some sort of virtual component as much as it's nice to have everyone in person, it allows more teams from more areas to participate, giving diversity to the groups/competition.</p>	<p>We are hoping to host in-person events next season, and we will take into consideration the option to host a series of online competitions as well.</p>
<p>For exhibition, I think there should be a little more encouragement for the submitted videos to be more different than the live presentation.</p> <p>For game, I feel like there could be other avenues that aren't often explored. One is game theory. This could either be where the teams would have a lot of options of things to do to get points but have figure out the best one for them before they build their robot. Another application of this which would</p>	<p>We will take these suggestions into consideration when we develop the rules for upcoming seasons. Due to the cost for teams, we cannot require vision sensors yet.</p>



<p>be harder on the judges but might be doable is have the state of the second round dependent on the collective actions or performance of the teams in the first round. Maybe if at least half the teams get 50 points in the first round, the second will be easier and vice versa. Or maybe there could be a second game ending task and it'll change the second round a lot based on if an even or odd number of teams do it. That way the teams would have to make a decision for the first round and be ready for both possibilities in the second.</p> <p>Another option for the game is maybe have the robots do some sort of simple math calculation in the first half of the round which if correctly done, determines what it is doing in the second half. Or maybe the robot has to go read a color and based on the color it has to do different things. Finally, it seems like vision sensors and the ability to use them have gotten better so maybe there could be a part of the game which requires them.</p> <p>Thank you, I hope these suggestions help.</p>	
<p>Kudos for the effort and success in providing worldwide participation given the Covid/travel restrictions. The only suggestion comes with the hope that life goes back to on person.</p>	<p>We are planning a return to in-person competitions for the 2023 Qualifiers and World Championship.</p>
<p>Be more time efficient particularly for online competition.</p>	<p>We are sorry that you feel that we were not efficient with the time. When we designed the online competition, we took into account how much time each task would take and prepared a schedule. We hosted pre-meetings to be sure that all the coaches and judges were familiar with the tasks and agenda. Each online event started and ended within 15-20 minutes of the stated times.</p>
<p>As far as I remember, it took a little time to set turtles and trashes veiled on the right spot for some teams. So it resulted in the delay.</p>	
<p>I hope it will be on-site competition next year.</p>	<p>We are planning a return to in-person competitions for the 2023 Qualifiers and World Championship.</p>
<p>Thank you for providing this valuable learning through competition opportunity for my students - they learned so much and are excited to participate again next year. Very well organized especially due to offering both in person and online events.</p>	<p>Thank you</p>
<p>I suggest having an alternative face-to-face world headquarters for next year, I propose Mexico, there are safe facilities and cultural development, which would contribute to strengthening steAm</p>	<p>We have considered hosting the World Championship at an alternative location, and now that we can hopefully freely travel again soon, we will review the option again.</p>
<p>Emma Alaba did a fantastic job!</p>	<p>The Robofest team agrees 100%</p>
<p>VIRTUAL COMPETITIONS HAVE A LOT OF CHALLENGES, ESPECIALLY WITH SOUND.</p>	<p>We are often at the mercy of the available technology, and we agree that we had challenges with sound during the online competitions.</p>