ROBOFEST 2020 ~ 2021 Annual Assessment Report

Contents

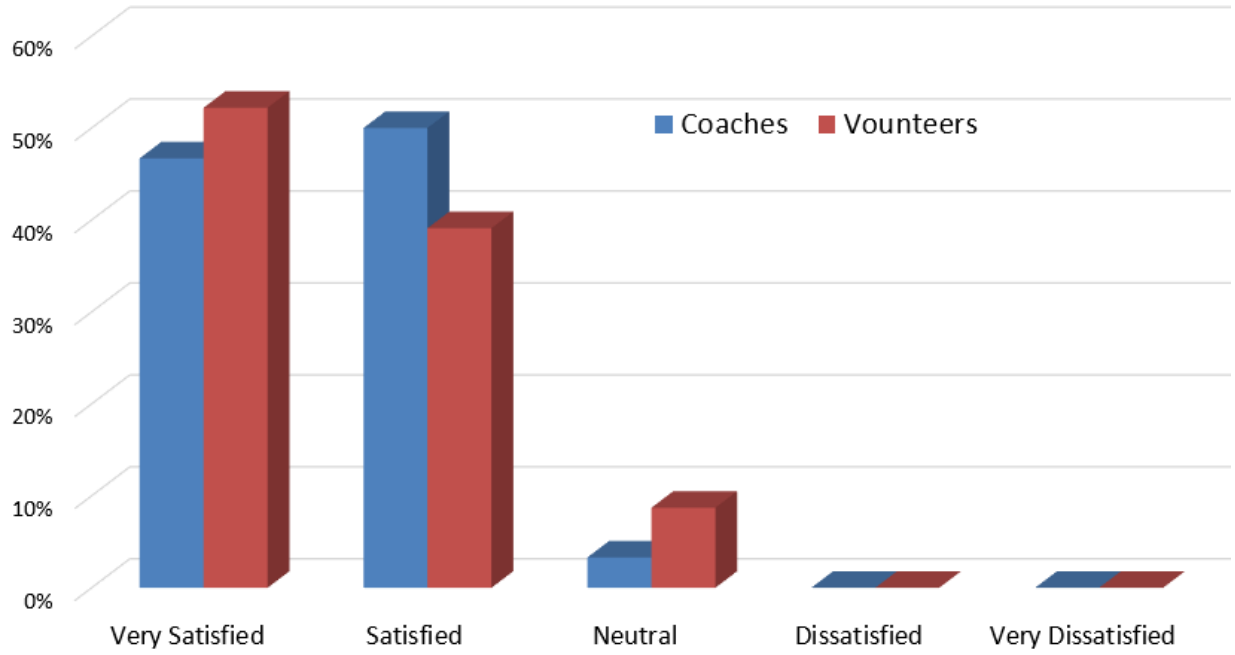
1. Robofest 2021 Coach & Volunteer Survey Results

Anonymous surveys were conducted after ROWC competitions in October 2021. 30 coaches, assistant coaches or team mentors participated in the coach survey. 46 volunteers, or 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.

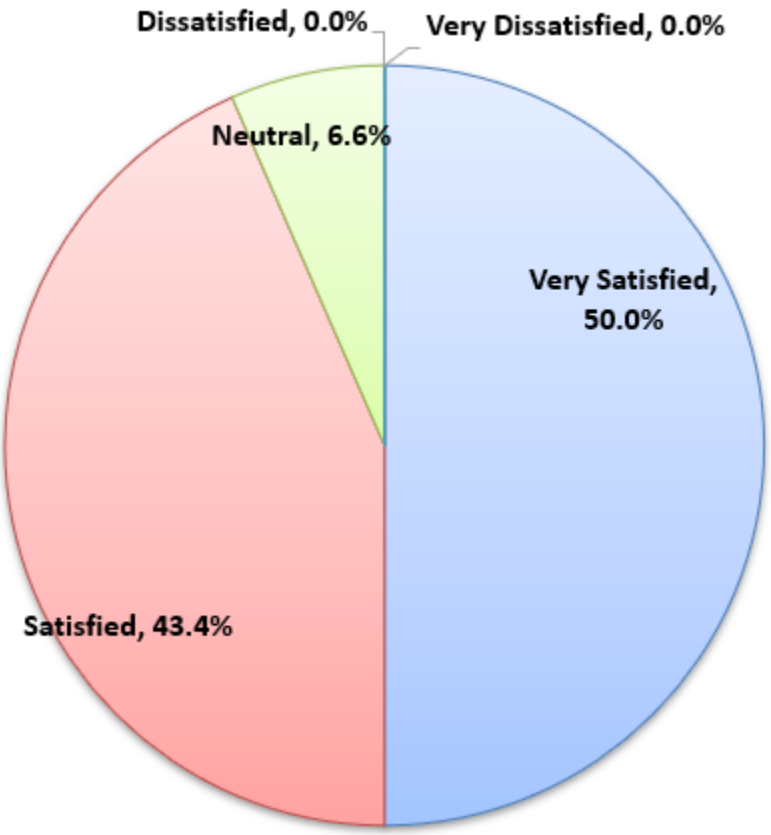
	# Coaches	# Volunteers (Local Judges)	Weighted Average %
Very Satisfied	14	24	50.0%
Satisfied	15	18	43.4%
Neutral	1	4	6.6%
Dissatisfied	0	0	0.0%
Very Dissatisfied	0	0	0.0%

(Table 1) 2021 Satisfaction rate from each of 2 surveys

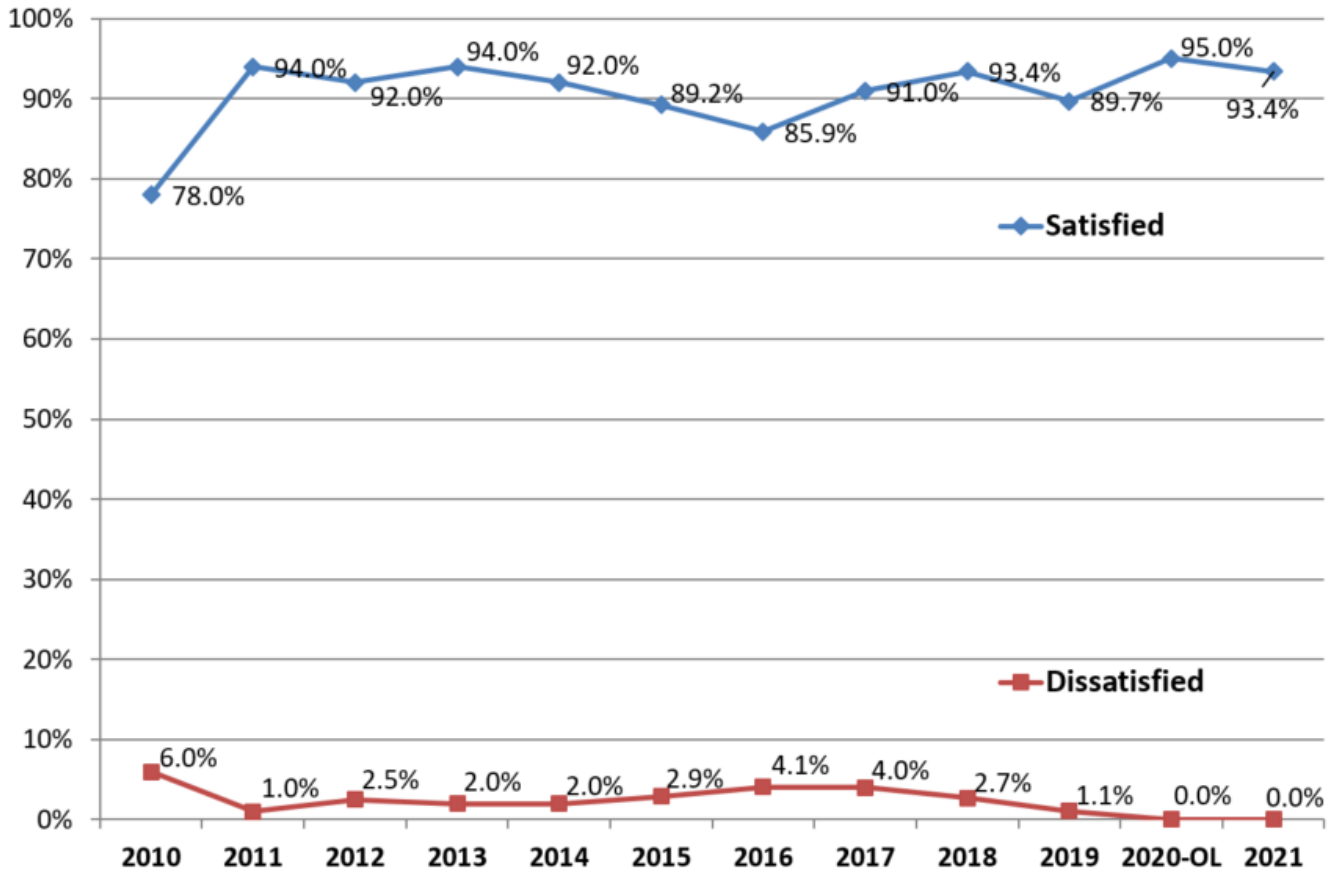
Figure 2 shows average satisfaction rate from the 2 surveys. Considering the satisfaction rate (50+43.4=93.4% were satisfied or very satisfied), Robofest 2021 was yet another successful year. Figure 3 shows overall coach/volunteer satisfaction rate changes since 2010. It does not show neutral cases.



(Figure 1) Satisfaction rate from each of 2 surveys in 2021



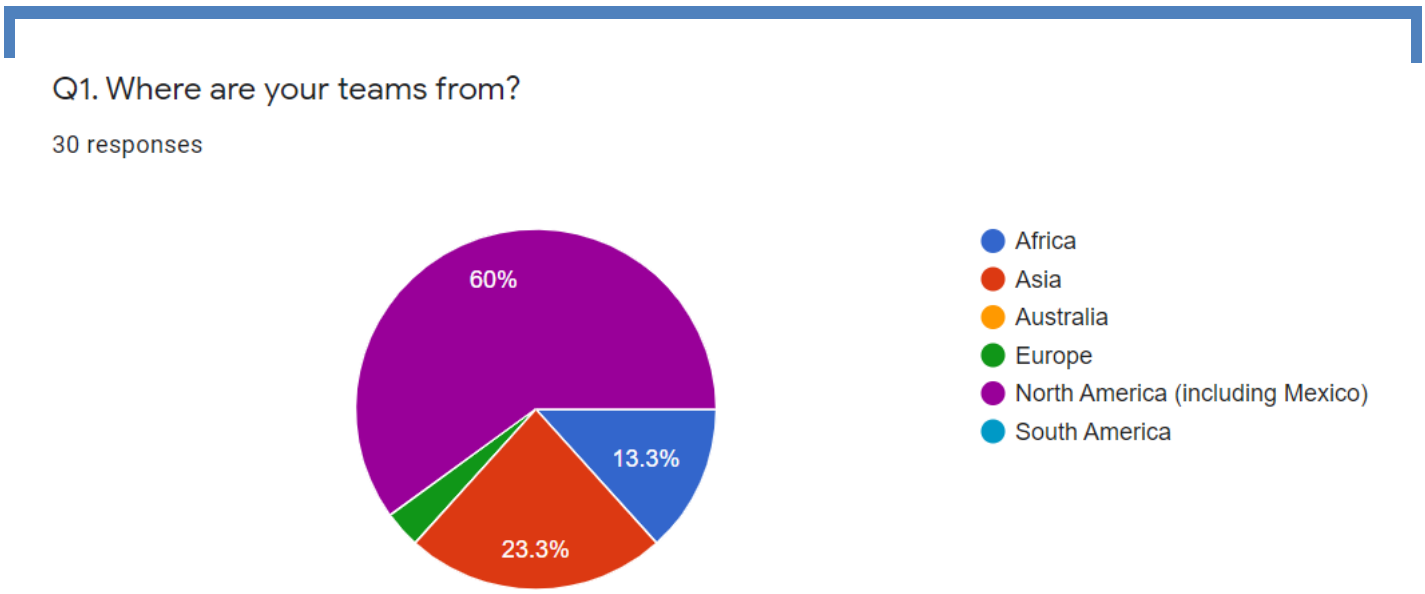
(Figure 2) 2021 Coach/Volunteer averaged satisfaction rates



(Figure 3) Overall coach/volunteer satisfaction rate changes since 2010 (2014 year contains only coach data)

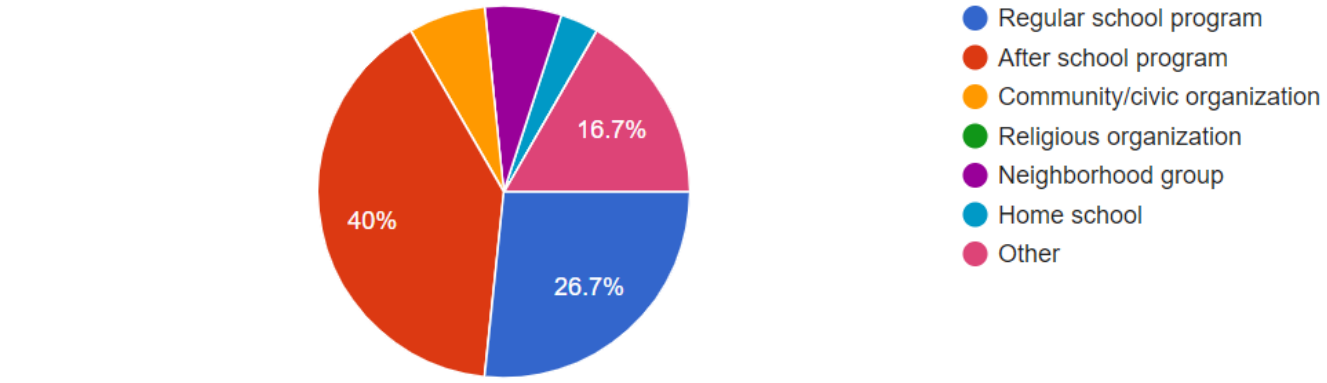
1.1 Coach Survey Results

The following (Figure 4) with 9 questions shows the results of 2021 coach surveys.



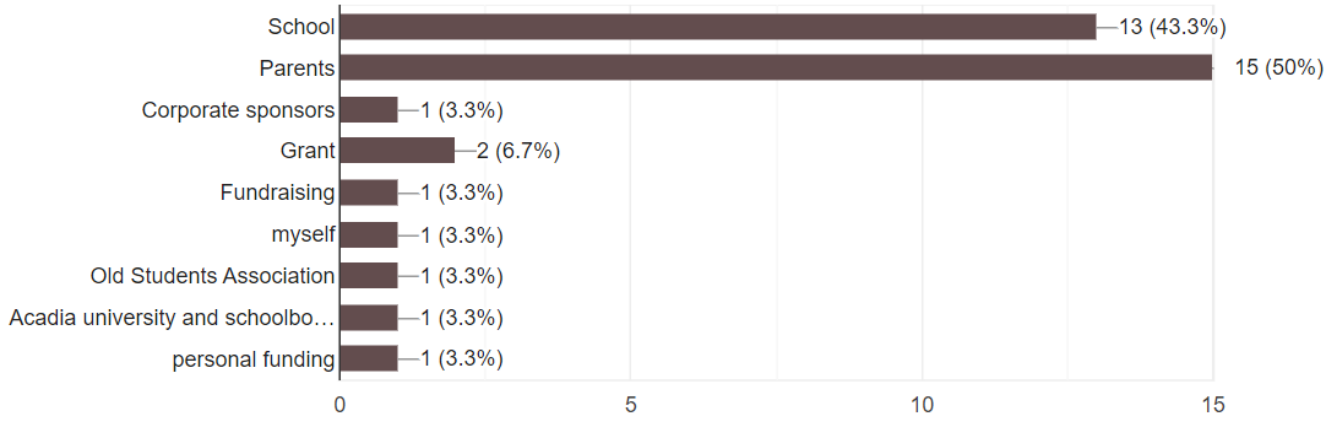
Q2. Your team participated in Robofest 2021 through:

30 responses



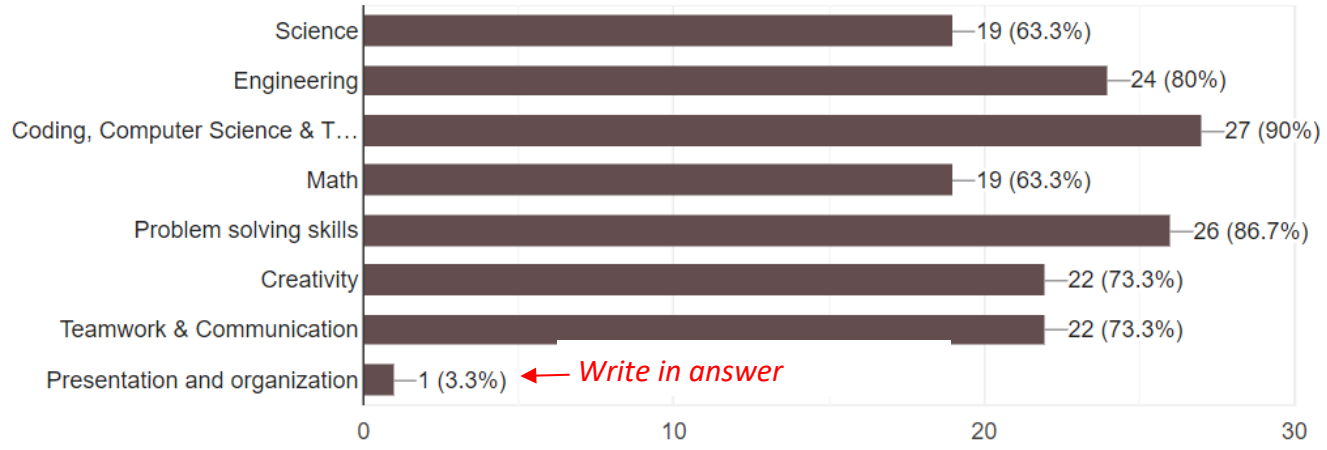
Q3. From whom did your team receive funding?

30 responses



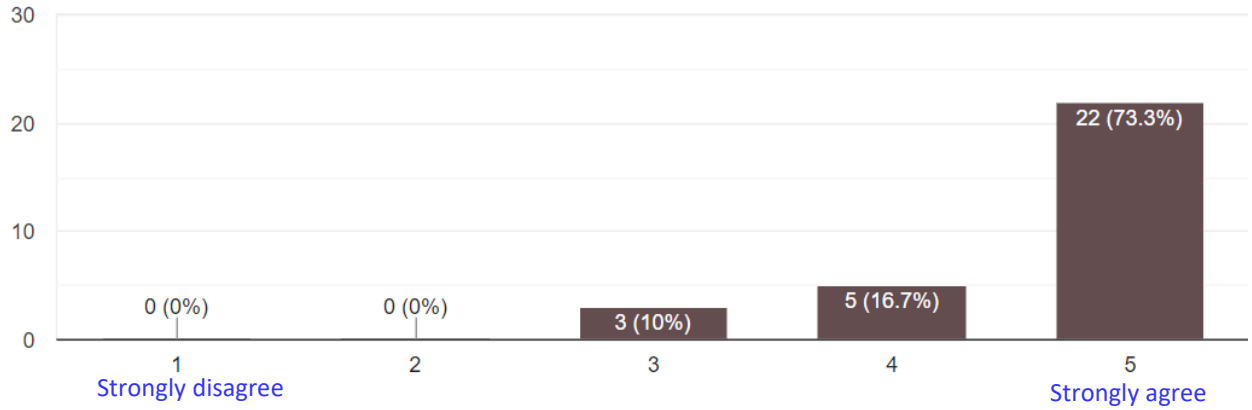
Q4. What areas do you think are enhanced (or can be enhanced) through Robofest programs?

30 responses



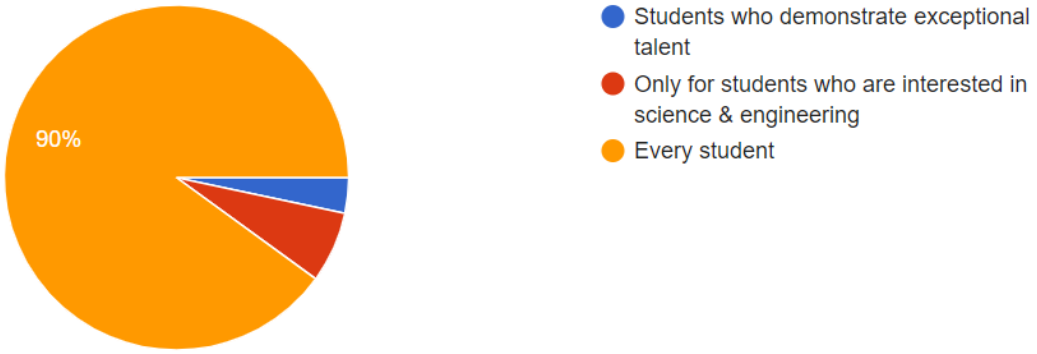
Q5. Do you think your team members learned and improved science, technology, engineering, math, and/or coding knowledge through Robofest 2021 programs?

30 responses



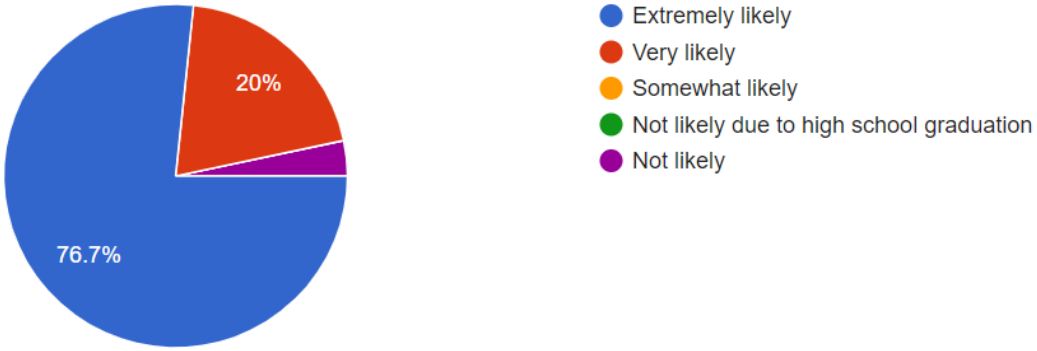
Q6. For whom do you think the Robofest programs should be designed?

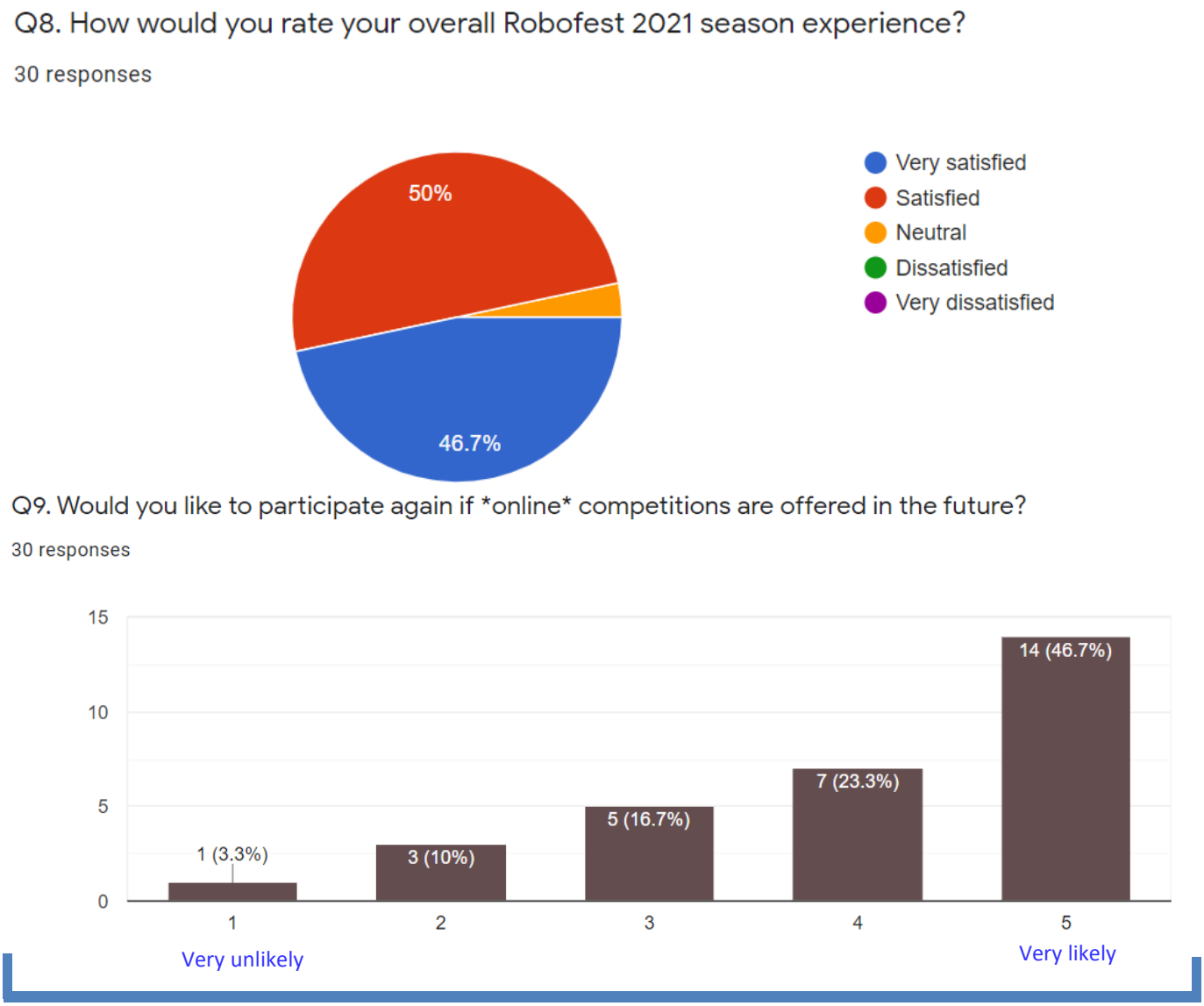
30 responses



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

30 responses





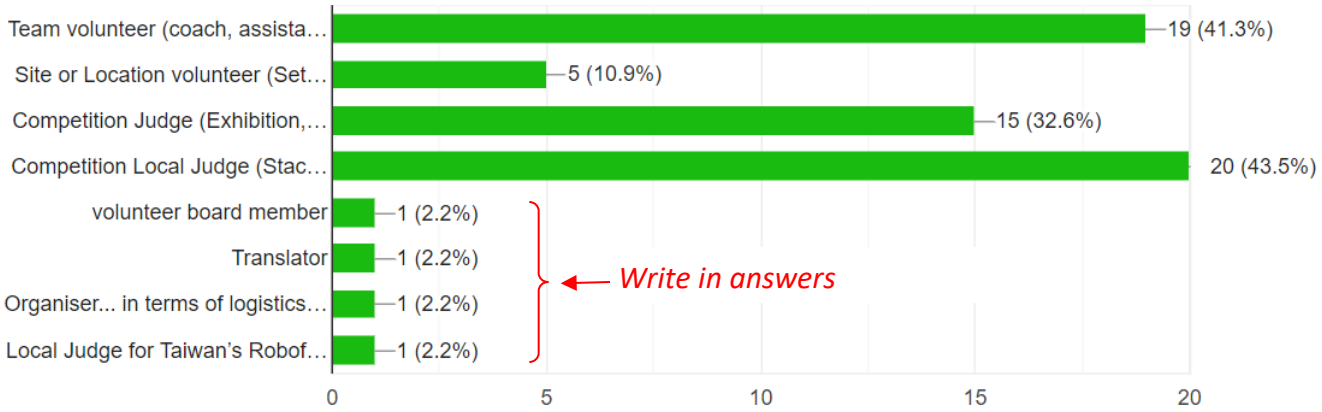
(Figure 4) 2021 Coach Survey results

1.2 Volunteer Survey Results

The following (Figure 5) with 5 questions shows the results of 2021 Volunteer/Judge surveys.

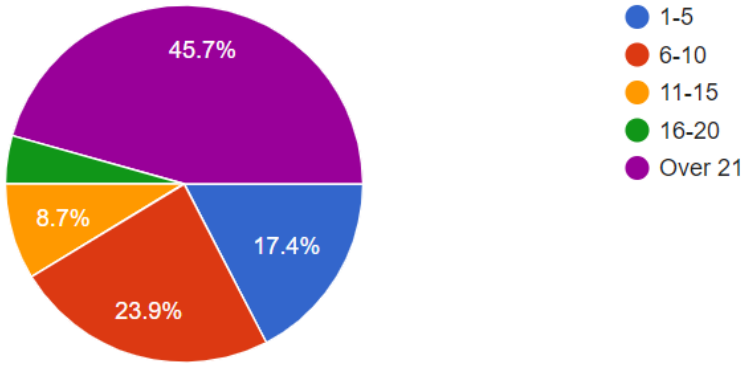
Q1. What was your role as a volunteer?

46 responses



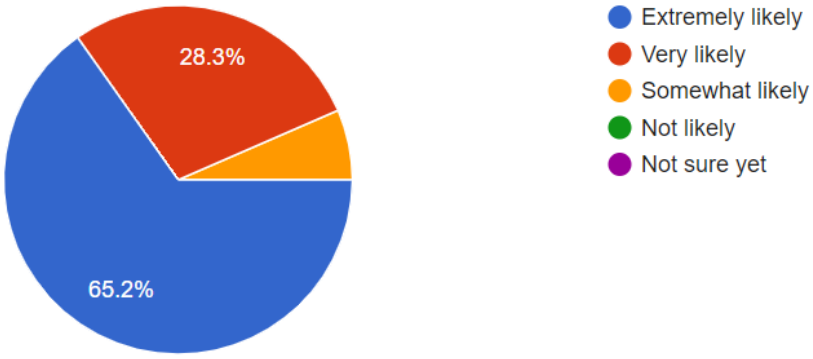
Q2. How many total number of hours did you volunteer for Robofest competitions this season?

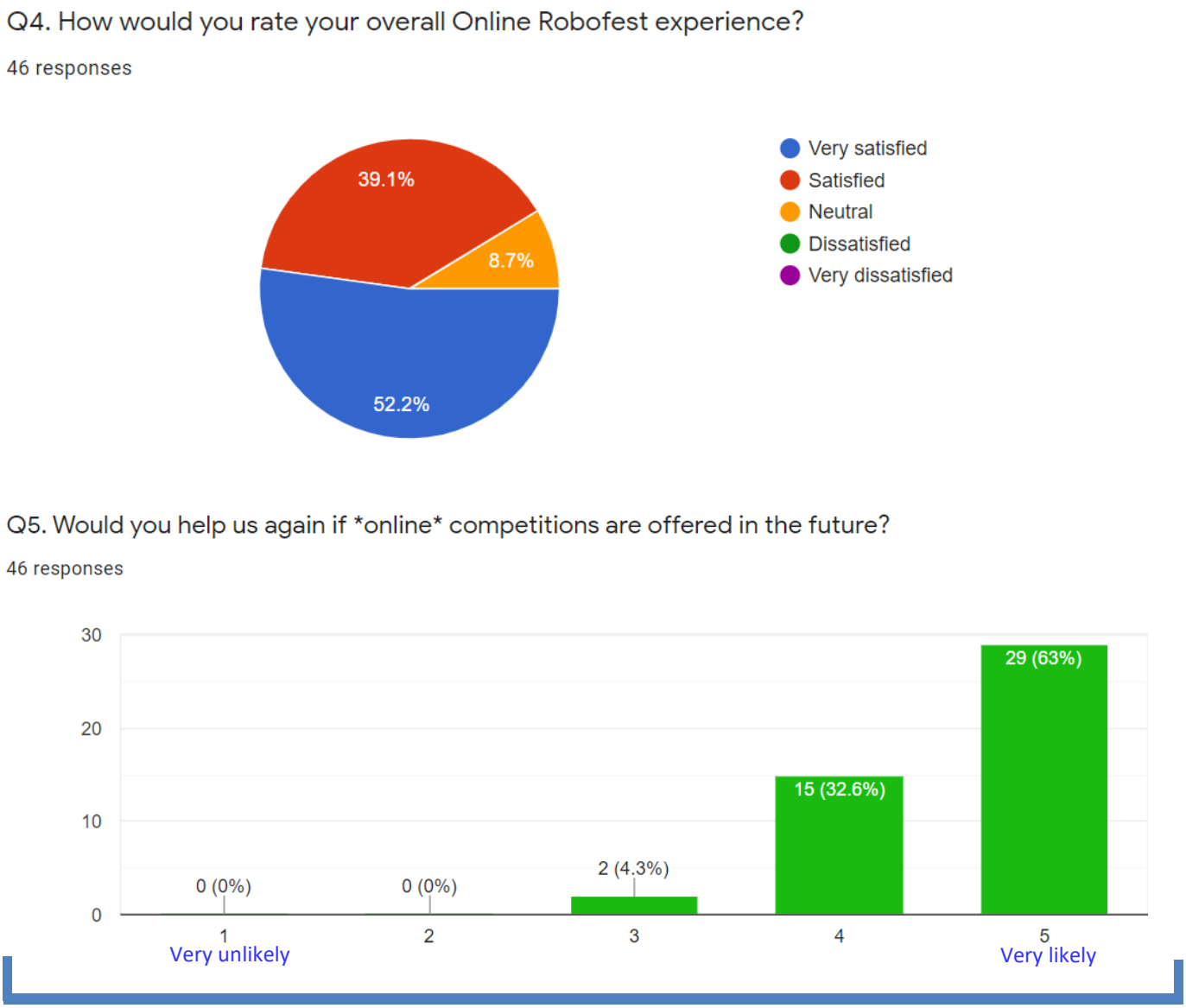
46 responses



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

46 responses





(Figure 5) 2021 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

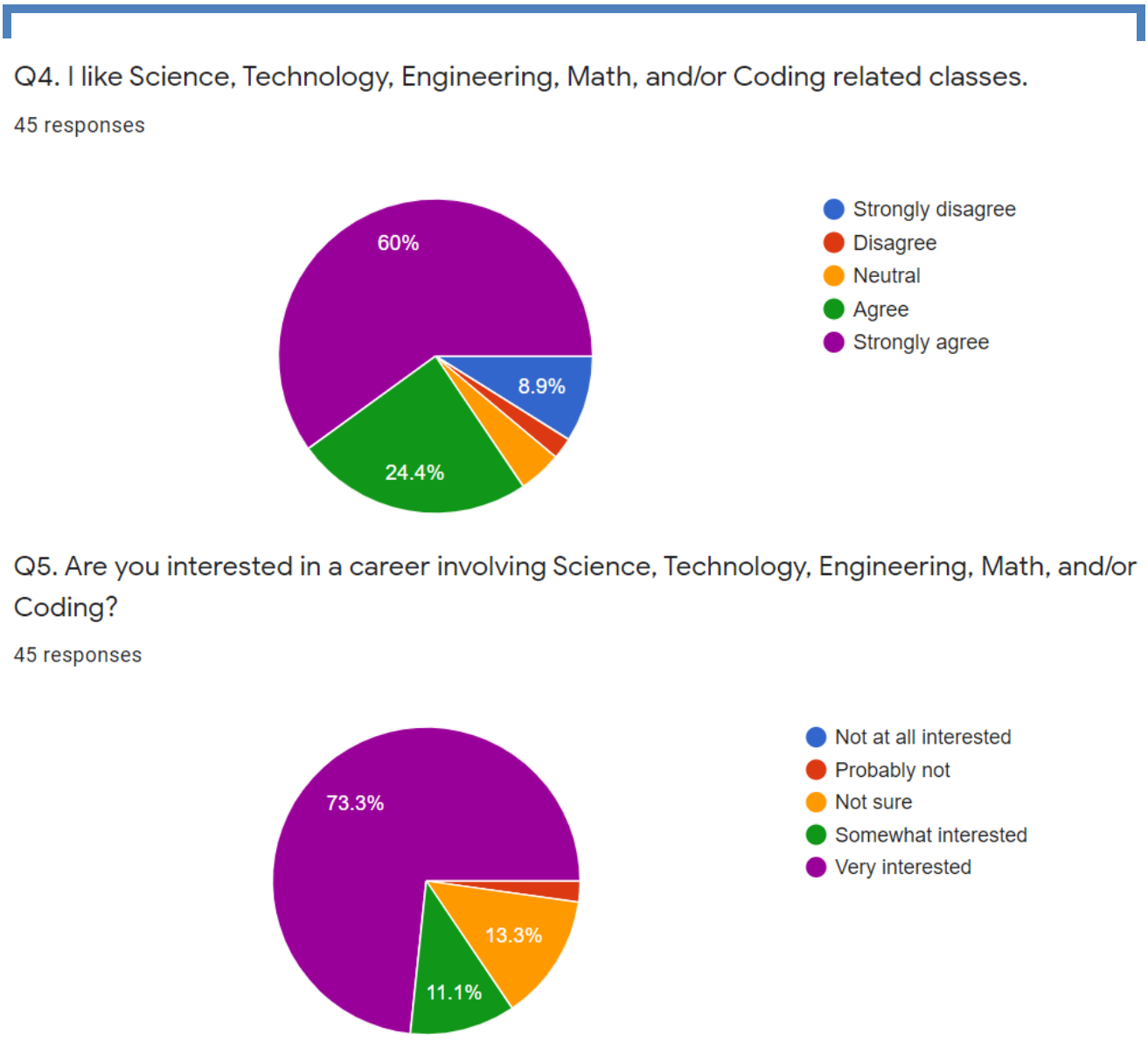
In order to assess the impact of autonomous robotics competitions in STEM education, Robofest students were asked indirectly through coaches to take online anonymous surveys before and after the competition.

2.1 2021 Pre-survey

60 students participated in the pre-assessment survey anonymously when teams were registered before starting Robofest work. 85% of students agreed or strongly agreed that they like STEM and/or Coding classes. 86.7% of the students were very or somewhat interested in career in STEM fields in the beginning.

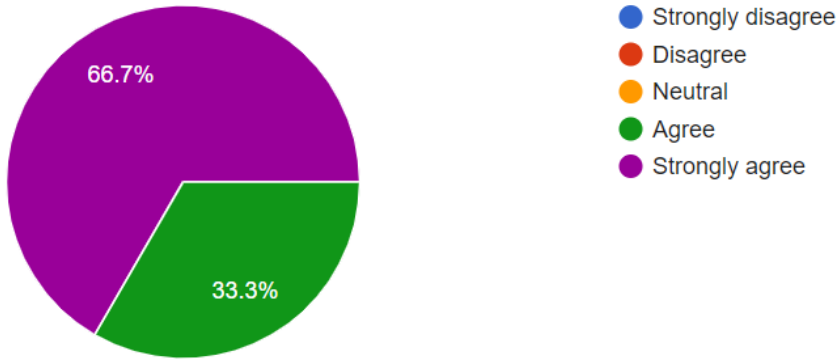
2.2 2021 Post-survey

After the World Championship was completed, a post-assessment survey was conducted. 45 students participated in the survey anonymously. See figure 6 below.



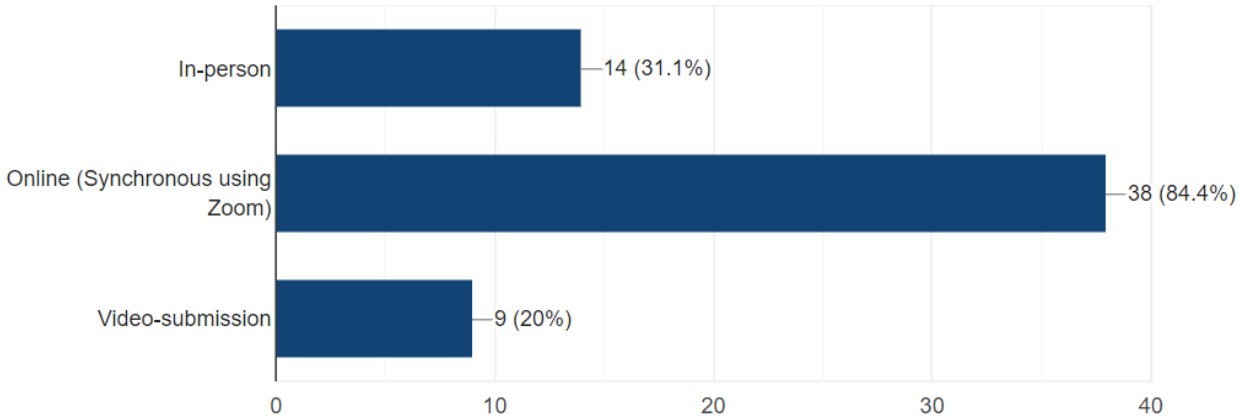
Q6. Robofest robotics experience helped me learn more about Science, Technology, Engineering, Math, and/or Coding.

45 responses



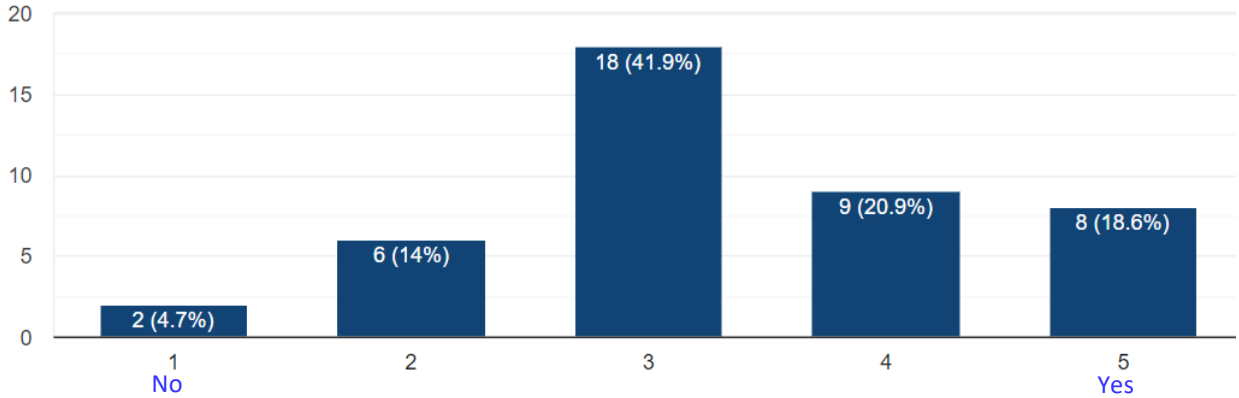
Q7. Which competition formats did you participate in this season? (Check all that apply)

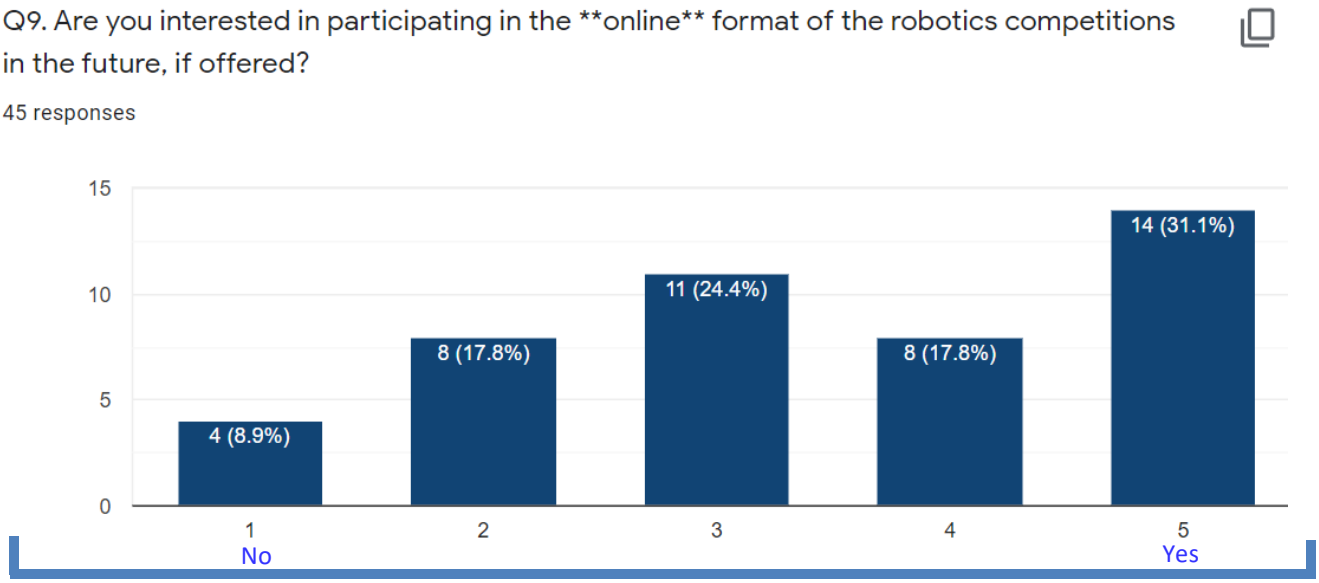
45 responses



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

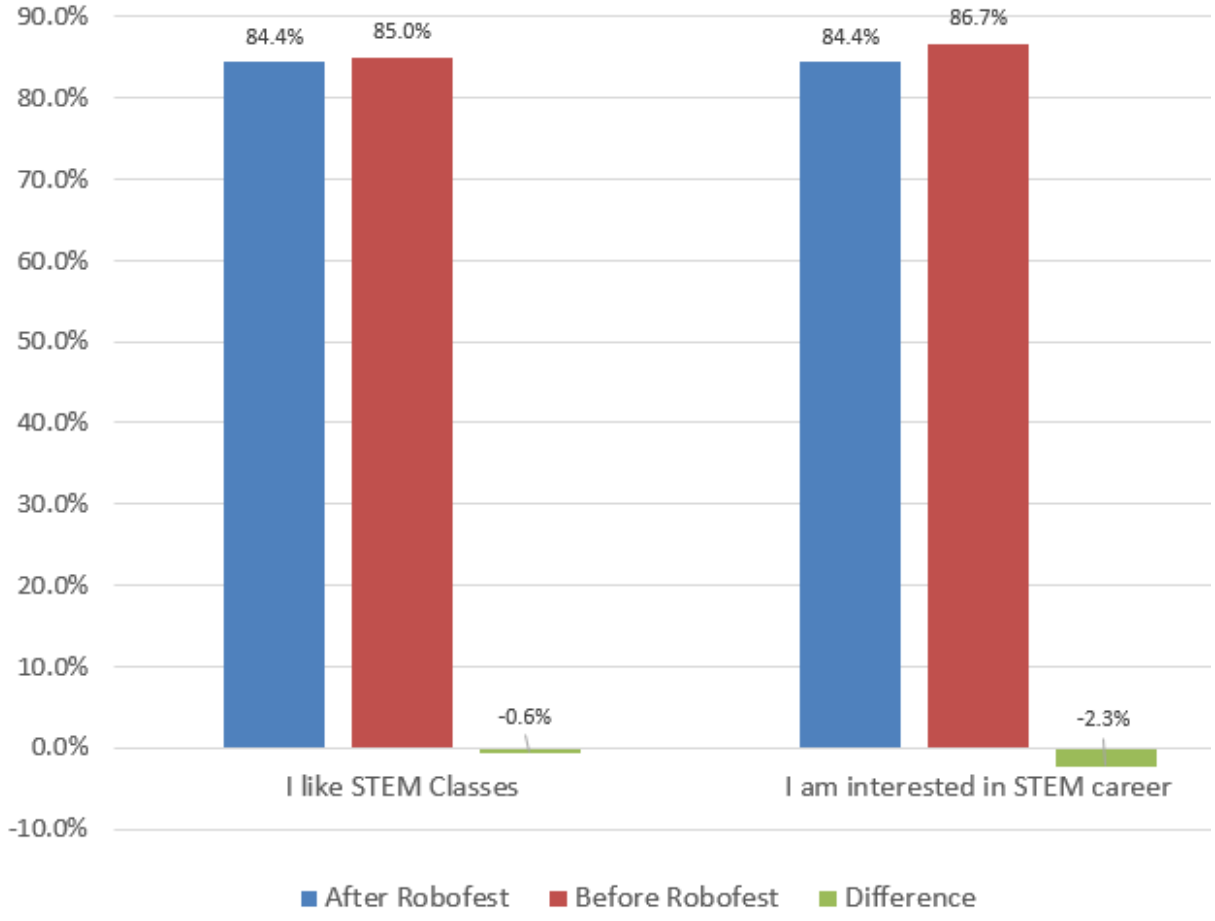
43 responses





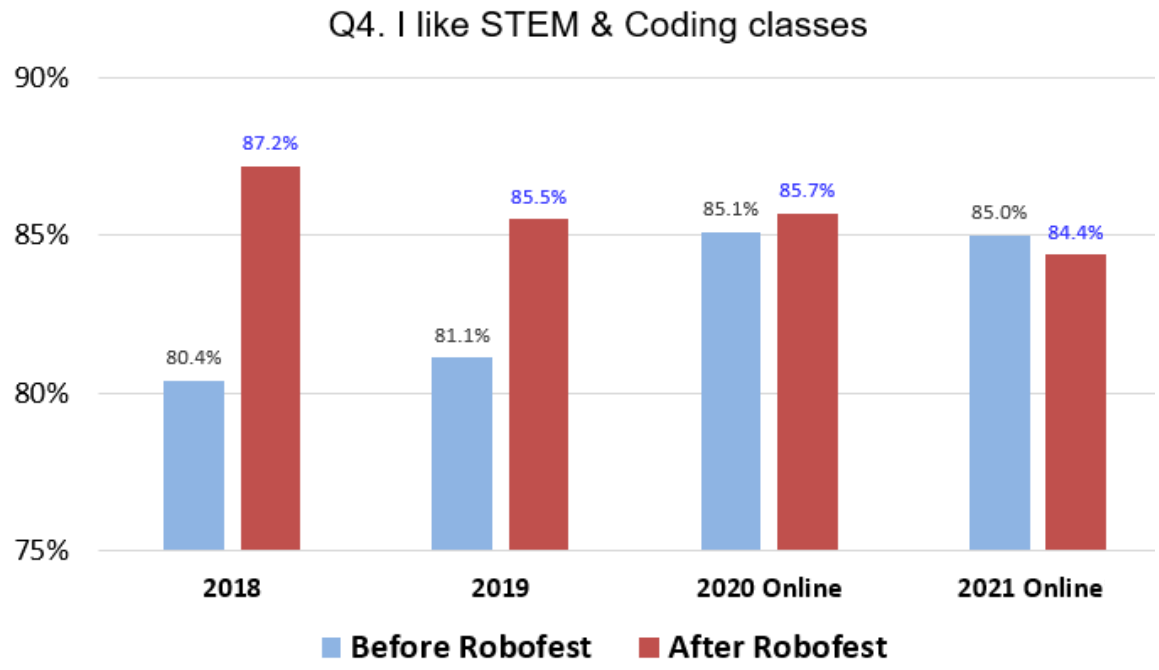
(Figure 6) Summary of 2021 post-assessment student survey

84.4% (60%+14.4%) of students liked STEM classes as shown in Q4 and 84.4% (73.3% + 11.1%) 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 100% students indicated the Robofest robotics experience helped them learn more about Science, Technology, Engineering, or Math (STEM).

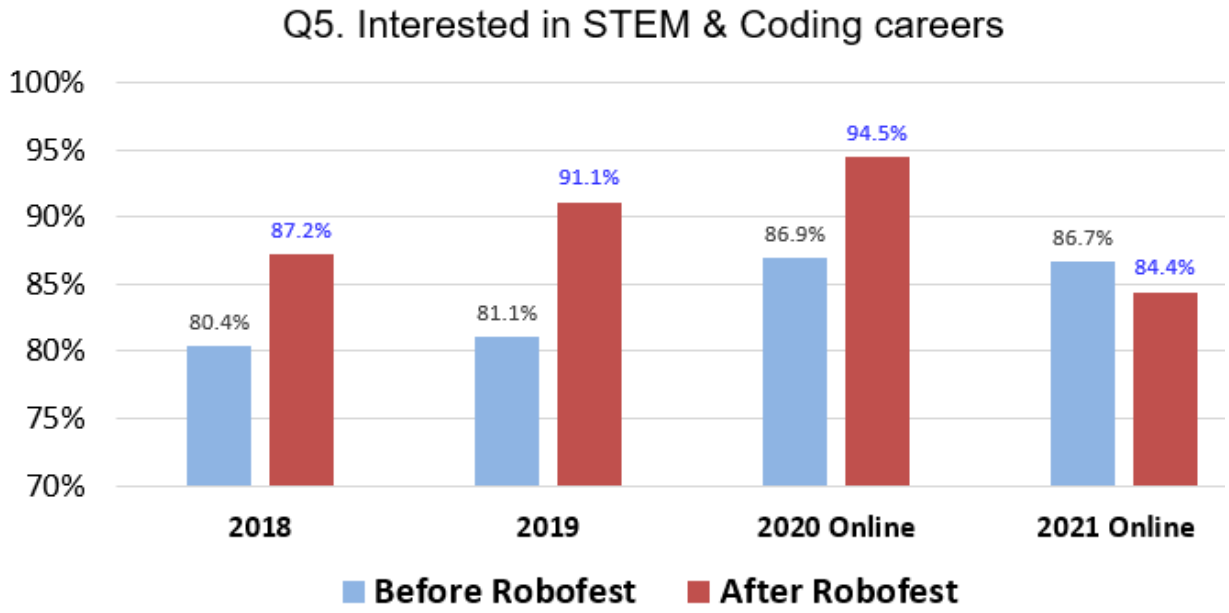


(Figure 7) 2021 Pre & Post Assessment Summary

Figure 7 above shows the changes between pre and post survey results for the Q4 (STEM likert) and Q5 (STEM Career interest). After Robofest experience this year, both ratios were slightly decreased as shown in Figure 7. We think the decrease is due to (1) lower number of survey participants, (2) the difficulty of the StackRolls game challenge this year, (3) lack of in-person support for teams due to the pandemic. The following Figures 8 shows the STEM Likert pre & post assessment scores since 2018. Figures 9 shows the STEM career interest data from pre & post assessments since 2018.



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



(Figure 9) 2021 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 soft core skills such as problem solving, creative thinking, and teamwork (leadership & communication)
C) Prepare them 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 soft core skills such as teamwork, leadership, creativity, communication and problem solving

Evaluation of the 2021 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 2020-2021 year related to Robofest's goals is analyzed in Table 3.

Metric #	Criteria	Goal	Outcome	Evaluation
1)	Total number of registered teams	> 500	473	Nearly successful
2)	Dropout rate	< 5%	8.15%	Unsuccessful
3)	% of Game teams with over 60% scores	> 30%	19.7%	Unsuccessful
4)	% of Exhibition teams with over 3.0	> 50%	57.9% (*)	Successful
5)	% of Game teams that solved unknown task	> 40%	49.2%	Successful
6)	Overall coach & volunteer satisfaction rate	> 80%	93.4%	Successful
7)	% of Game teams that tried 2nd Chance before World Championship	> 30%	3%	Unsuccessful
8)	% of Game teams that improved scores on average in the 2nd chance competition	> 60%	66.7%	Successful
9)	% of students who indicate that Robofest experience helped them learn more about STEM	> 80%	100.0%	Successful
10)	Increased % of students who like STEM classes after having Robofest experience	> 5%	-0.6%	Unsuccessful

11)	Increased % of students who consider a career involving STEM after their Robofest exposure	> 5%	-2.3%	Unsuccessful
12)	% of coaches who indicate that Robofest experience helped students in learning core skills such as teamwork, creativity, leadership, communication & problem solving	> 60%	90.0%	Successful

(*) Data from Taiwan Exhibition competitions were not included.

(Table 2) Evaluation of 2021 year for each metric number

Goal ID	Metrics used to measure the success of the goal	Successfully or almost successfully achieved metrics in 2021	Evaluation
A)	1), 2), 6), 7), 10), and 11)	1) and 6)	25% (1.5/6)
B)	4) and 12)	4) and 12)	100% (2/2)
C)	3), 4), 5), 8), 9), 10), and 11)	4), 5), 8) and 9)	57% (4/7)

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

4. Summary

Based on student, coach, and volunteer surveys as well as self-evaluation data, I believe 2020-2021 Robofest has achieved two of its primary mission goals, which are (B) Develop soft core skills such as problem solving, creative thinking, and teamwork (leadership & communication) and (C) Prepare them to excel in higher education and technological careers. We could not achieve goal (A), which is to generate excitement & interest among young people for STEM in large part due to the continued global pandemic. We will continue to find new ways to inspire students into STEM fields and to support their STEM learning through new Robofest programs.

Respectfully,
December 3, 2021

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Reviewed by 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 Staff
Students' interest is dwindling with absence of physical compensations.	We share your concern and are working hard to have as many in person competitions as possible next season.
More collaboration between teams. Try to push the main goal of children learning and becoming interested (or advancing their knowledge) in STEM. I'd like to see teams collaborate in learning rather than competing. Would like to see students build long term friendships with students on other teams. I don't know the best way to do this.	Thank you for the suggestion. We will investigate ways to do this.
Many thanks for all the work you put into providing the Robofest event for everyone	Thank you!
I would participate in another online competition, although I would greatly prefer a return to traditional in-person competitions.	We do too! We are working to have more in person competitions and an in person world championship next season.
We would participate n Robofest online if that were again the ONLY way to participate. We greatly prefer in-person competition. The experience of meeting and competing with other teams is valuable to us. A round that extends into the next school year is a non-starter for us, as many of our participants graduate each May. We are grateful that Robofest found a way to keep competitions alive last year, and hope that will be the only year that competitions need to be virtual. Thank you so much for offering Robofest! It's great for our kids and good for our school.	We are planning to go back to a more normal schedule next season that does not carry over into the next school year.
I prefer in person programs. would like to see training "camps" and workshops outside of Michigan for kids to participate in	We are working to have more in person activities (workshops, camps, competitions) next season.
I think only two rounds is a bit unfair in some situations. Robofest should consider doing at least a 3 rounds competition instead of two.	Thank you for the suggestion. We don't want to make the competitions too long, but we will consider this for the future.
The use of bluethoot has to be verified cause this can make miss understandings on the online competitions	We will clarify use of Bluetooth in future rules documents.
Thank you for the continued quality programming throughout the pandemic.	Thank you!
In person competition is prefered	We agree and are working towards that goal.
I would improve the navigation on your website. It is hard to find the info and some design could help visually.	Thanks you for your feedback. We are working on improvements to our website.
Great work again this year. Thank you to everyone at LTU!	Thank you!
More teams more country	We are always looking to increase the number of teams and countries that participate in Robofest.
We would like to see the robot game challenge revealed earlier in thew school year.	Thanks you for your feedback. We are working to release the new game as soon as possible.
This year's Game challenge was difficult for EV3, because the TP rolls were heavy and our motors were not strong enough. Students had to gear down and still could only lift two rolls at a time. Other platforms with stronger motors had an advantage.	Thank you for your feedback. We try to design the game competitions to not favor a particular robot platform. However, the suitability of a specific platform to the Robofest game will vary year to year since the tasks change year to year.
Robofest adds excite for my students You have all opened a woderful, dedication programs to every student in my school. I am teaching 1st , 2nd and 3rd graders skills to help when they join as 4th graders, Thank you for all youguys do.The time and dedication	Thank you!

We should encourage the students who do their own works through and eliminate the assistance of Adults signing or indication as most as possible, such as share screen download program issue to prevent the times of re-run, thanks. Also to unify and prevent double-work or adult for Exhibitions, we should provide a sample format of answers for Q&A for the email questions after the event.	"The students do the work" is a Robofest mantra. We will continue to improve our rules and procedures to make this a reality.

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
Reduce background noise	Thank you for the feedback. We will work on ways to reduce the background noise.
Thanks for continuing to offer Robofest during the pandemic. Hope to see everybody in person next year!	Thank you for your participation and support!
Market it it's amazing and everyone should know about it.	We will continue to improve our exposure and outreach
I love the philosophy driving Robofest for the past 21 years that the projects entering the competitions have to be by the children from start to finish and in every aspect. However, some projects that I observed, for a big part of it raised questions about the degree of children's work in it. I noticed that the highly experienced and capable judges were trying to ascertain the authenticity of every project. Unfortunately, the quality of answers they got could be compromised by language barrier. I would like to suggest that: Apart from videos, source code, teams should keep a Documentation of Learning from idea generation stage to project completion stage. This can be in the form of poster or journal, and participants will be called upon to answer questions related to different stages of their project. All in all, thank you for the sincere, conscientious and continuous effort everyone in Robofest put in all these years to keep this wonderful learning experience going for children all over the world. THANK YOU.	Thank you for your feedback. We will work to improve the qualtiy of our interiew process.
We miss the in-person world championship experience	We do too! We are working to enable an in person world championship next season.
It is quite obvious that ROBOFEST has led the way as far as robotics online competition across the globe is concerned and this is a beautiful feather in its cap; and it (ROBOFEST) feels 'indebted' to the local organisers for their support in executing the event - justifiable so. I however think ROBOFEST should tightened up the 'understandably' relaxed rules. Eg. 1. The number of members on a team (for a example, just one person cannot be a team), 2. The apparent 'support' for teams by their coaches or other adults during the online competition (sometimes seen on camera or audio thereof heard) In all, the past 2 years have been EXECELLENT. I am happy to have been involved.	We will review the rules to determine the appropriate number for members on a team.

Robotics is a nice education to give children but its materials are kind of expensive for those of us in Ghana, i don't really know how help can be provided but is a concern please	Thank you for the feedback
Thank you for an amazing international experience despite the limitations of the pandemic. I really enjoyed myself.	Thank you for the feedback
The Zoom latency and language barriers presented problems but not sure how to address them given the constraints were currently under!	Thank you for the feedback. We will work to improve our competition methods using Zoom.
Carrying over the competition from one school year to another was very difficult for the students to stay motivated. It would be nice to try and avoid this in the future.	We are planning to go back to a more normal schedule next season that does not carry over into the next school year.
Camera judges for game needed better training, I don't think all of them understood what was important about their filming for scoring. The online location judges needed more practice resetting things and understanding that process. I liked being able to ask exhibition teams questions via email. It was hard to come up with appropriate questions to someone who had trouble understanding or expressing english on short notice. Some teams were better able to explain their knowledge of things. I liked online judging a lot because I didn't have to travel for an hour or help with the set up. Biggest problem with online exhibition is that the team's live presentations basically mirrored their submitted videos. So you might want to give teams different requirements for the two so they can better express their understanding (or lack thereof) of things. Something that's been bothering me for exhibition for awhile is what I like to call roboparade bots: they've got 4 wheels and they go back and forth but that's about all they are. Especially at the senior level. I wish the coaches understood that experienced judges have seen that before, a lot, and that the game bots are better than exhibition as they do more things. While there's definitely a place for those, I think there needs to be communication that 4 wheeled bots in exhibition need to aim more for what game bots are like. Like the fire-fighting bot that one junior team did or the one that followed the user's face in his demo video. I see tons of potential from exhibition but too often it seems wasted. Even UMC bots can do more and the teams only have 90 minutes to build them. I liked that exhibition teams had to submit and hopefully explain their code; properly commented code is a key to stem. I think to help prepare kids for college, the students for exhibition should be required to provide sources for the things they assert, at least at the senior level. Maybe ask them to write a page or so about it. Yeah that's more work for the judges, but it seems appropriate. For game I think some sort of complication or encouragement for optimization might be good. For example for stack rolls there could have been 2 bad rolls that cause you to lose the round if they are moved or a hard to get roll that is worth extra points. Like the hard to get roll was on top of one of the lose the round rolls so you have to touch the one but not the other and it has to be grabbed at specific point.	We will work to improve our Local Judge training and assure that all judges are trained.

The Robofest team has done an outstanding job (again!) of organizing the online tournament. Well done. Hats off to Shannan!	Thank you!
Suggest that the online activities be conducted as efficiently as possible.	We will work to improve the efficiency of our online activities.
If the team participate over the years, they need to show certain portion of new part in the project idea.	There are specific rules in exhibition style competitions that projects that have been used in previous competitions must have new features, which is factored into the judging.
Probably would be great to have a spot where coaches can share educational materials. I'd like to see more collaboration between teams, especially in exhibition projects. It would be amazing if each team member developed friendships and relationships with other robotics students all around the world... if we saw the other teams as people to collaborate with rather than to compete with.	Thank you for the suggestion. We will investigate the best way to do this.
Robofest flexibility to enhance /reach all students is what set it apart from other STEM programs. Like Video Qualifiers - Online competition will become as common as in-person competitions, which is a good thing.	Thank you for your feedback.
none	
Thank you for the continued opportunity to participate in such a fabulous student focused PBL competition.	Thank you for your participation.
Overall, I found Robofest as an educational event to promote students' independent problem solving skills and STEAM learning that I would highly support and recommend to all. However, I certainly hope to see Judges of events like RoboExhibition and RoboArts to ask more relevant questions to ascertain about the originality of, or the inspiration behind, the projects. Besides, judges can also find out more about the independent learning process, independent problem solving experience of teams. So, in awarding the scores and eventually determining the deserving winners, judges should ascertain that high level of teams' independent learning and problem solving have taken place in the process before winning should. Thank you.	Thanks you. We will work to improve the quality of the judging.