Lawrence Technological University

# ROBOFEST 2017~2018 Annual Report

**Contents**



**(Figure 1)** World Robofest 2018 participants on May 19 and major sponsors

# 1. Analysis of Robofest Team Participation Data

Robofest® is Lawrence Technological University's world-wide robotics program for students in 4th - 12th grade and college. Student teams design, construct, and program their autonomous robots to compete for trophies in a variety of competitions.

Robofest's mission is to generate excitement & interest among young people for Science, Computer Science, Technology, Engineering, and Mathematics (STEM), develop soft skills such as teamwork, leadership, creativity, communication and problem solving, and prepare them to excel in higher education and technological careers.

In the 2017~18 academic year, a total of 2,464 Robofest students in 811 teams participated from 12 countries (Canada, China, Colombia, Egypt, France, Ghana, Hong Kong, India, Macau, Mexico, South Africa and South Korea) in addition to 9 US States (California, Florida, Hawaii, Illinois, Michigan, Minnesota, Ohio, Oregon, and Texas). Table 1 shows the total number of officially registered coaches, teams, and students for the 2017~18 year. Note that Warmup and Virtual Regional sites are not added to this table to avoid double counting of the same teams who participated in qualifiers. 556 site volunteers registered as judges, check-in, setup/cleanup crew, etc.

| Site Name | # Coaches | # Teams | # Contestants |
|---|---|---|---|
| Alexandria_SiliconWaha_Egypt | 21 | 30 | 136 |
| Bangalore_ChristJrCollege_India | 27 | 97 | 270 |
| Beaverton_Mathletics_tech4kids_OR | 4 | 4 | 8 |
| BloomfieldHills_Cranbrook_MI | 14 | 22 | 64 |
| BloomfieldHills_Cranbrook_MI_BottleSumo | 5 | 10 | 18 |
| BloomfieldHills_Roeper_MI | 4 | 8 | 25 |
| BottleSumo_DayCamp_1 | 8 | 12 | 24 |
| BottleSumo_DayCamp_2 | 8 | 10 | 20 |
| BottleSumo_Camp_DPS | 1 | 8 | 16 |
| Brazoria_TX | 2 | 6 | 14 |
| Canton_Achieve_MI | 15 | 19 | 56 |
| Canton_CCA_MI | 19 | 26 | 93 |
| Canton_Gallimore_MI | 13 | 14 | 41 |
| CenterLine_MCS_MI | 5 | 10 | 35 |
| Chicago_HolyTrinity_IL | 4 | 30 | 76 |
| Cloquet_MN | 2 | 12 | 27 |
| Coimbatore_HindustanCollege_India | 4 | 14 | 33 |
| Detroit_UDJH_MI | 7 | 25 | 94 |
| Houston_UrbanSTEM_TX | 1 | 2 | 8 |
| IEEE_HTD_East_Lansing_MI | 3 | 3 | 9 |
| International_Video_Qualifier | 2 | 4 | 17 |
| MathDance_1 | 1 | 9 | 18 |
| MathDance_2 | 1 | 8 | 16 |
| Medina_AIRoot_OH | 8 | 14 | 55 |
| MI_Invitational_Jr_GroupA * | 10 | 11 | 41 |
| MI_Invitational_Jr_GroupB * | 7 | 9 | 23 |
| MI_Invitational_Jr_GroupC * | 6 | 8 | 24 |
| MI_Invitational_Sr * | 5 | 7 | 22 |
| Ocala_Cornerstone_FL | 3 | 12 | 47 |
| Oldsmar_Nielsen_FL | 9 | 16 | 42 |
| PearlCity_HIFusionED_HI | 17 | 71 | 266 |
| RoboParade_DayCamp | 9 | 10 | 22 |
| StPeteBeach_FL_Parade | 7 | 24 | 47 |
| Troy_Bethany_MI | 7 | 7 | 25 |

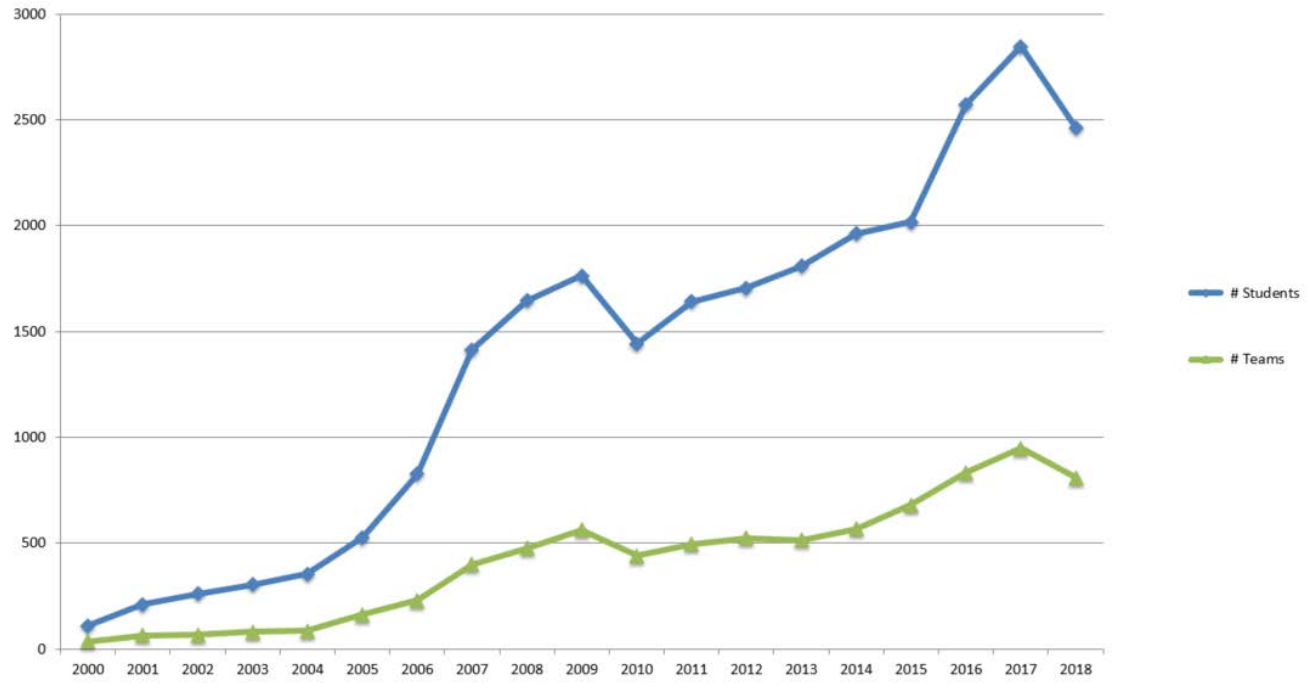
| | | | |
|---|---|---|---|
| USA_Video_Qualifier | 14 | 18 | 55 |
| WestBloomfield_WBHS_MI | 10 | 21 | 82 |
| Westland_FordCareerTechCtr_MI | 8 | 7 | 23 |
| Wolfville_Acadia_Canada | 13 | 21 | 79 |
| World_Championship_BottleSumo | 40 | 61 | 147 |
| World_Championship_Exhibition ** | 12 | 16 | 56 |
| World_Championship_Game ** | 27 | 35 | 117 |
| World_Championship_RoboArts | 7 | 5 | 21 |
| World_Championship_RoboParade | 16 | 21 | 68 |
| World_Championship_UMC | 17 | 24 | 63 |
| World_Championship_Vcc | 6 | 10 | 21 |
| **Total:** | 429 | **811** | **2,464** |

(*) Some teams were re-formed after qualifiers. It is true some teams are double counted, but we do not have detailed data.
(**) USA teams are not added to this data to avoid double counting of the same teams who participated in USA qualifiers.

**(Table 1)** Number of Registered Participants at Robofest 2017-18 Official Competition Sites

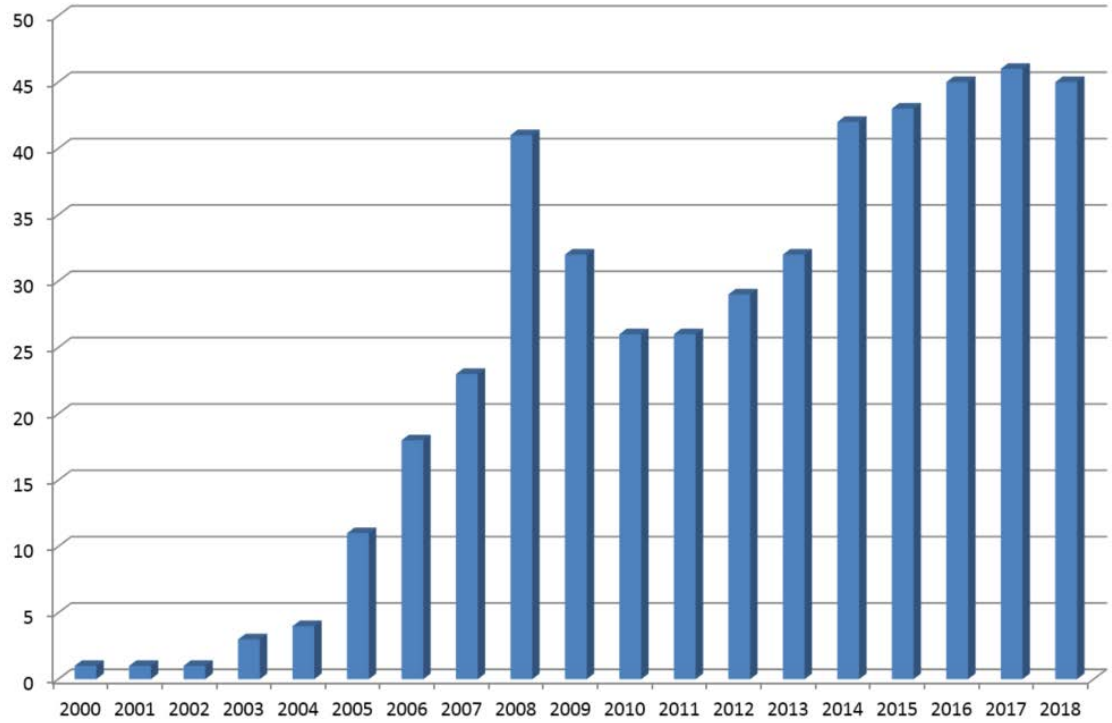
Table 1 shows only the data on Robofest web database system. China, Ghana, Hong Kong, India, Macau, Mexico, South Africa, and South Korea had more local teams in their countries. World Championship data above shows only the teams that advanced and participated in World Championship at LTU in May.

The average Robofest team size in 2018 was 3.0, which is same as that of last year. This small team size is good for effective learning, because each student has more opportunities to contribute to the team's objectives. Figure 2 shows the number of student participants since 2000. The cumulative number of registered students and teams in our web database since 2000 has reached 25,879. There was a sharp decline in numbers this year. We think this is due to the following 3 major reasons: (1) The Autonomous Tennis Ball Collector (AtBC) game was the hardest in Robofest history. Many teams dropped out of the competition. (2) A lesser number of international teams participated due to the location of World Championship. We attracted more international teams last year as World Championship was held at a beach in Florida. (3) Two key Robofest staff members left the Robofest office and 2 key coaches in Michigan did not return.



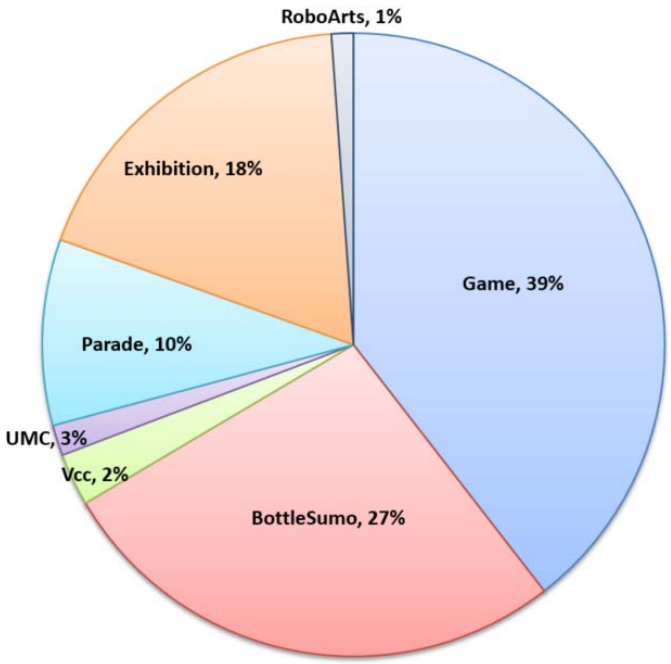

**(Figure 2**) Number of Robofest Student Participants and Teams Since 2000

The total number of Robofest competition site locations listed in Table 1, excluding warmup, was 46 in the 2017-18 year. On average, 55 students and 18 teams participated per competition site that Robofest managed. Figure 3 shows the history of number of official competition sites since the inception of Robofest.



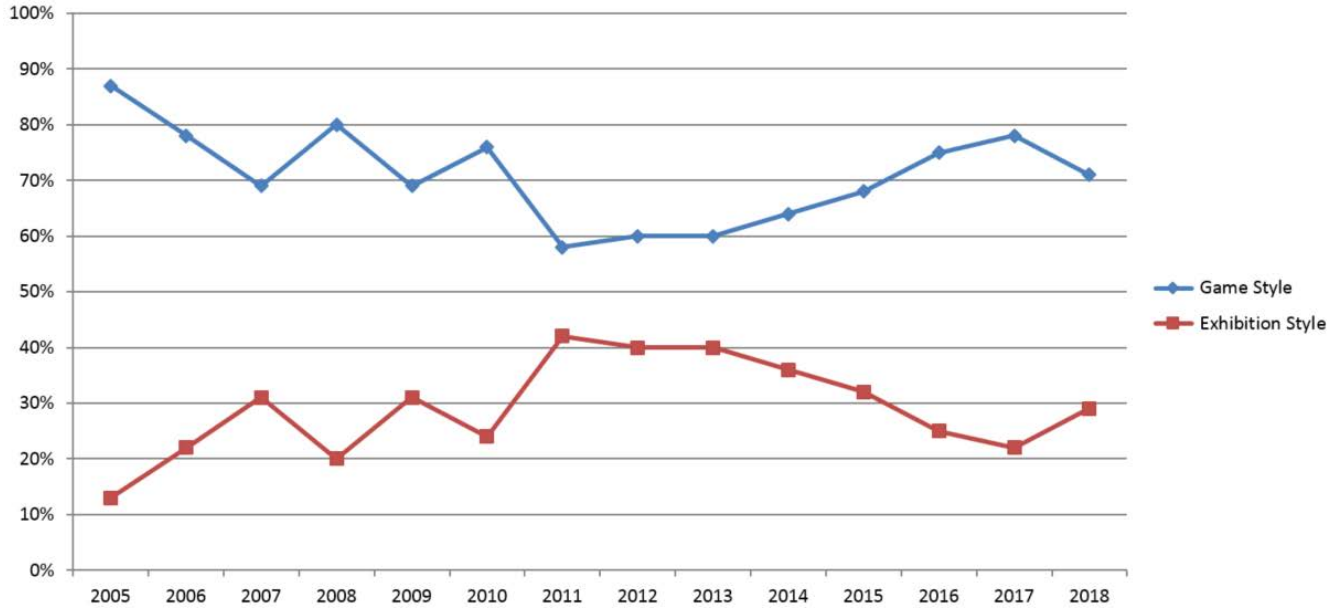

**(Figure 3**) Number of official competition site locations

Robofest offers a variety of categories in which to compete. 39% of teams participated in the AtBC Game. The second most popular category was BottleSumo with 27%, then Exhibition with 18% of teams. Figure 4 below shows percentages of teams by competition category.



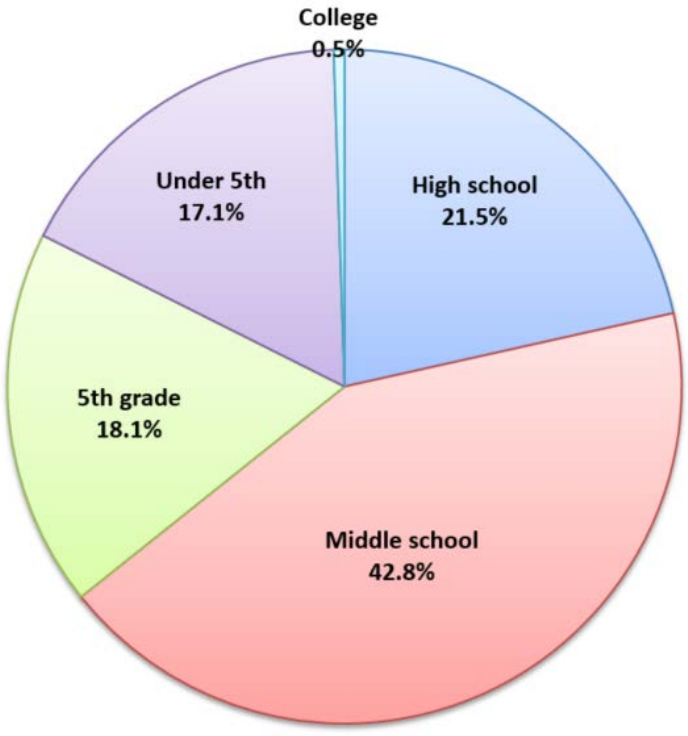

**(Figure 4)** Percentages of Teams per Competition Category in 2018

Robofest competitions can be generalized into two categories: Games that use fixed rules (including BottleSumo, Vision Centric Challenge, and Unknown Mission Challenge) and open-ended style that has no fixed rules (including Exhibition, RoboParade and RoboArts). Figure 5 shows the trend of number of teams between Games and Exhibition since 2005. We can see that the participation in the open-ended exhibition categories was increased last year.

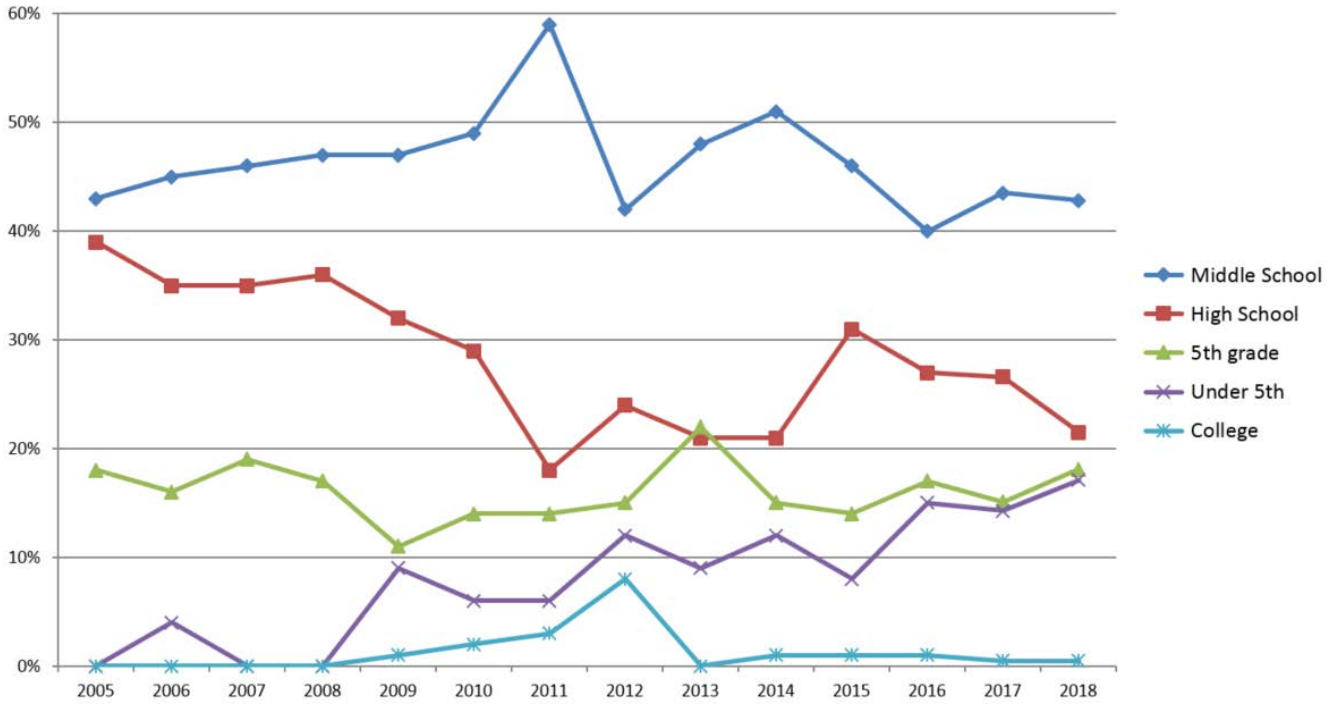



**(Figure 5)** Percentages of Game style teams and Exhibition style teams

Figure 6 shows student participation by academic level. 42.8% of the students were from middle school (6th through 8th grade). Figure 7 shows the trend of each age group since 2005. The participation of upper elementary students is increasing.

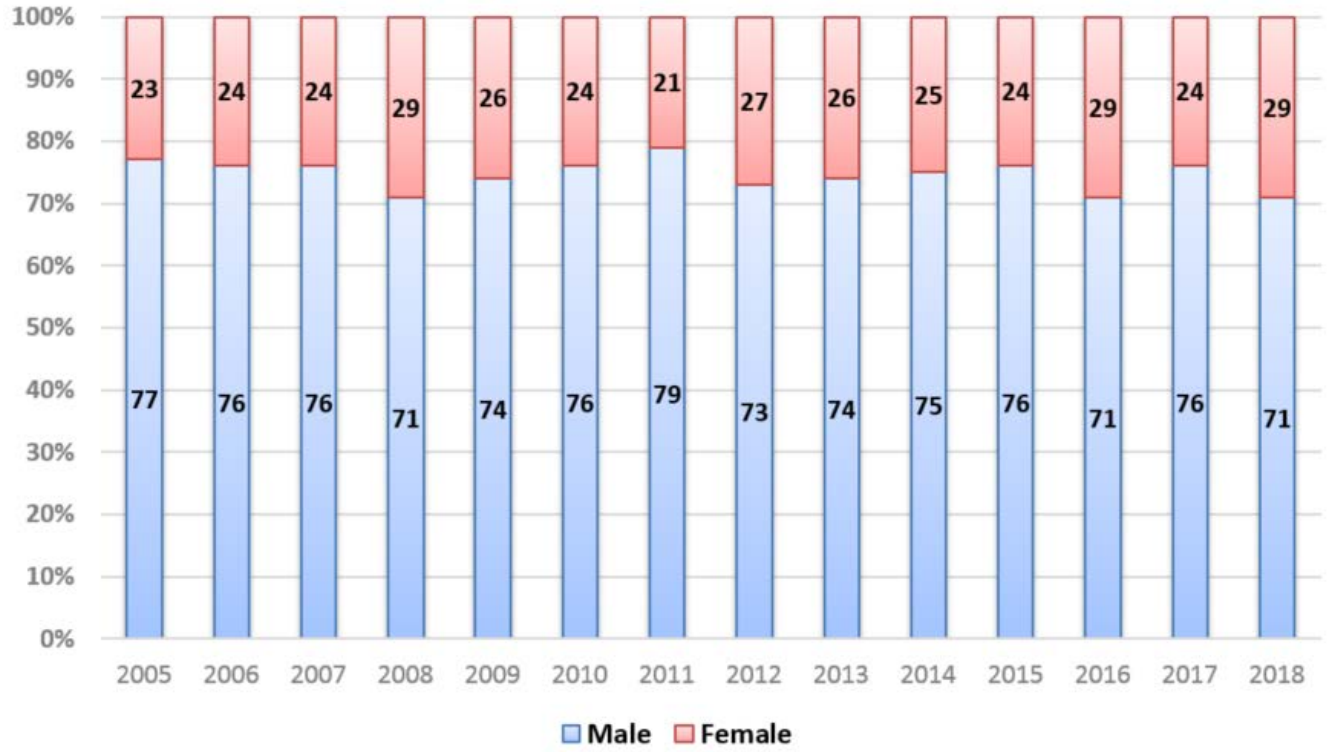



**(Figure 6)** Percentage of Student Participant per School Grade in 2018



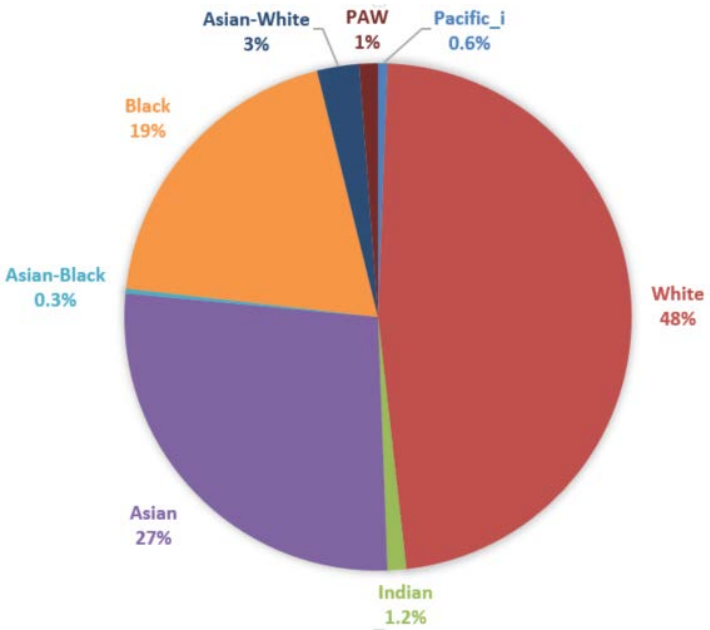

**(Figure 7)** Percent of age group since 2005

Regarding gender, we experienced an increase of female student population in 2018; 71% were male and 29% were female students. Figure 8 shows the gender ratios of Robofest students. The average since 2005 had been 75% male and 25% female. Note that the data is taken directly from our registration database. Many international students' data is excluded.

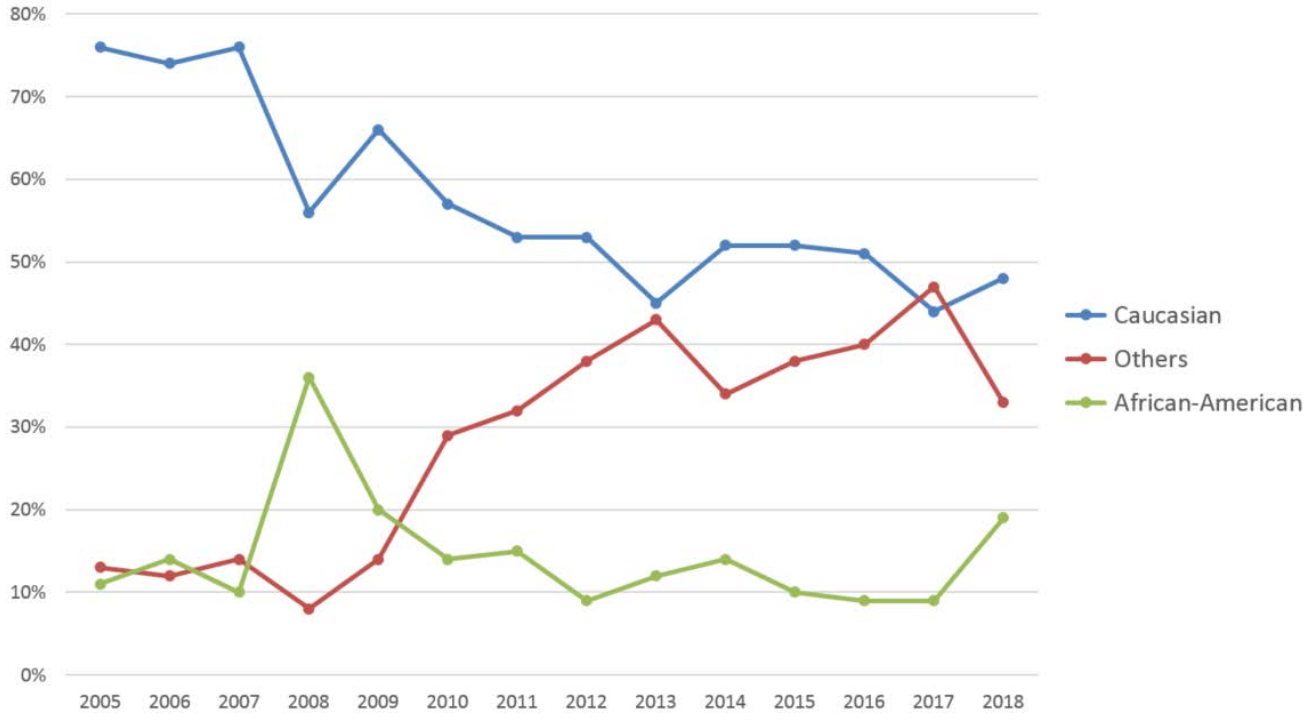



**(Figure 8)** Gender Ratios of Robofest Students

This year, we introduced a new optional field on the registration system to identify ethnicity when a coach registers team members online. Since the field was not required, a majority of coaches did not provide the students' ethnicity information. The following data is from 26% of students who participated in the USA competitions. 19% of Robofest 2018 students were African American as shown in Figure 9. This increase is due to summer camp competitions in targeted areas. Figure 10 shows the changes since year 2005. Asian, Asian-Black, Asian-White, Pacific Islander, PAW (Pacific Islander, Asian, and White), and American Indian are grouped into "Other" to show the data in the same categorical format as before. Note that the ethnicity data is only from the USA sites.

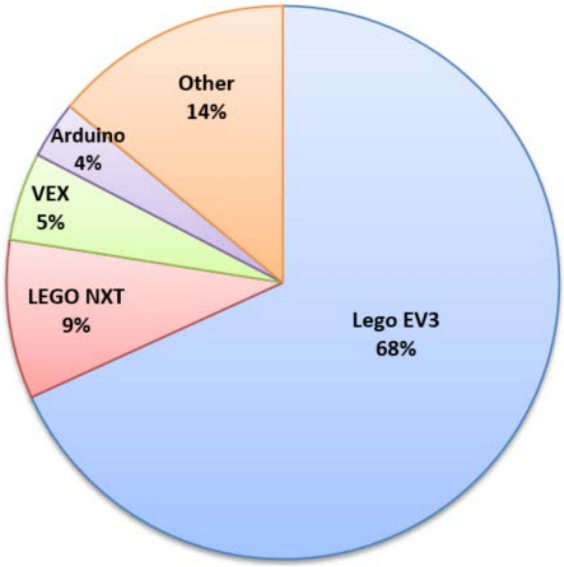



**(Figure 9)** Percentage of Student Participant by Ethnicity Data



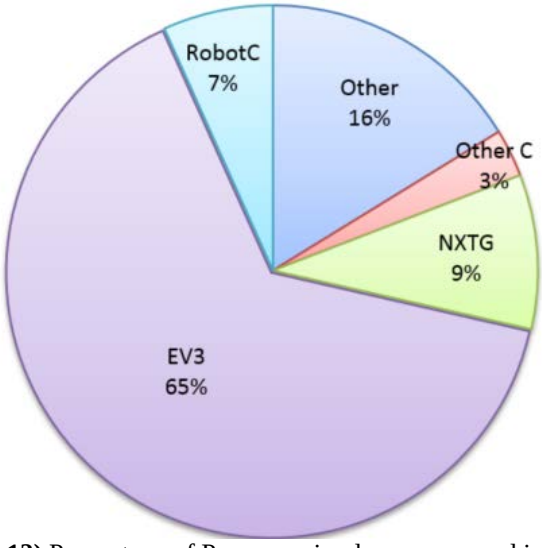

**(Figure 10)** Robofest Ethnicity Data since 2005 (The surge of African American in 2008 was due to a targeted grant)

Robofest is completely open and allows the use of *any* robotics platform, which is one of its unique features. Figure 11 shows the data on robotics kits used by the teams. The majority of the teams (77%) were using LEGO products. 2nd generation Lego NXT kits are still popular (9%). The use of VEX platforms increased from 2% to 5% in 2018. According to 2015-2017 data, 63% of World Championship winning teams were using standard kits such as Lego or VEX for Game. 80% of Jr. Game teams were using standard kits.




**(Figure 11)** Percentage of Robotics Kits Used by teams in 2018

Robofest remains focused on getting student participants to learn STEM through computer programming and testing. The coding languages used in Robofest 2018 are graphed in Figure 12. Student teams continue to use advanced and varied forms of programming languages. Allowing students to use whatever programming language they prefer is one of the unique features of Robofest. "Other C" in the figure includes NXC and Arduino C (Sketch). RobotC became popular when Carnegie Mellon Robotics Academy provided free licenses for Robofest teams beginning in 2009. All C-style languages together totaled 10%. "Other" includes Java, C#, and Robot Mesh. Robofest provides opportunities to learn professional programming languages and helps prepare our students for future professional career paths. Robofest students continue to show advanced technical skills and improvements in their STEM and Computer Science abilities. This is possible because of the many dedicated coaches and technical mentors associated with Robofest.




**(Figure 12)** Percentage of Programming languages used in 2018

## 2. Robofest 2018 Coach & Volunteer Survey Results

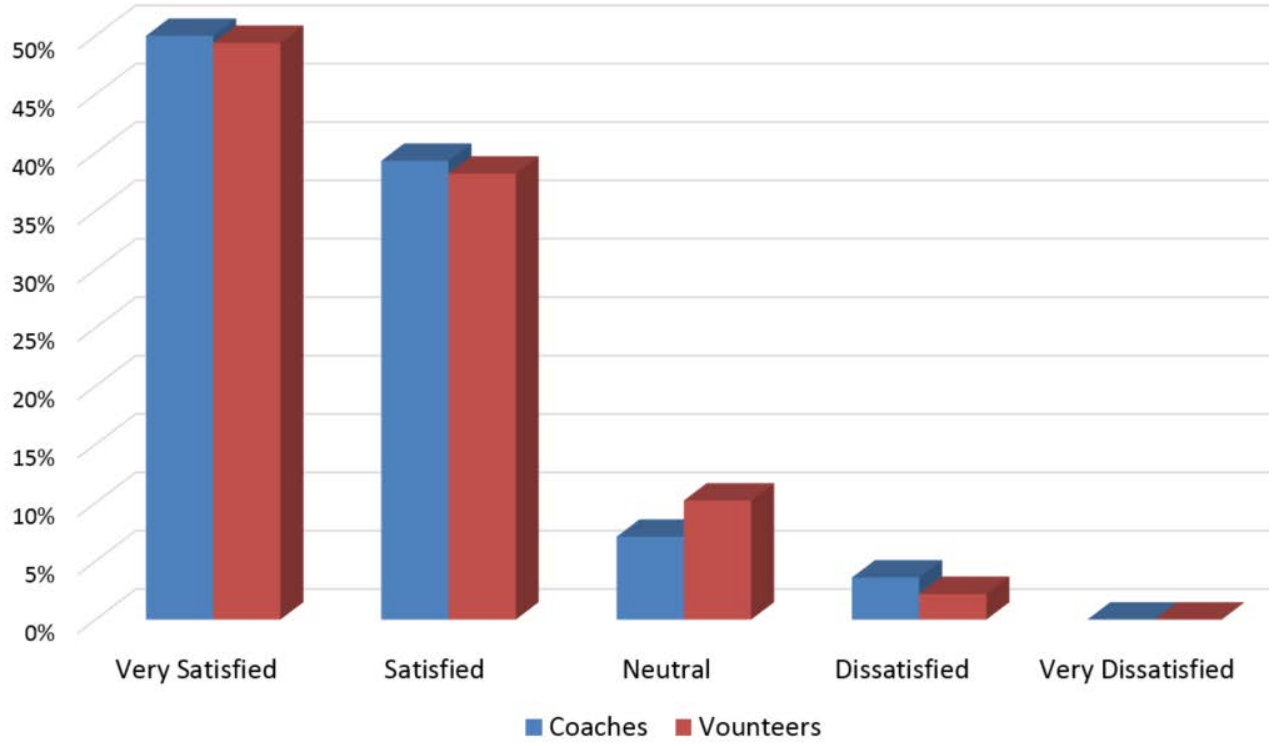
This section shows the results of the following anonymous web surveys.

- Coach survey (56 coaches participated)
- Site Volunteer survey (89 volunteers participated)

Table 2 shows the satisfaction rate from each survey and Figure 13 displays the data in a 3D bar graph. There were no "very dissatisfied" responses this year.

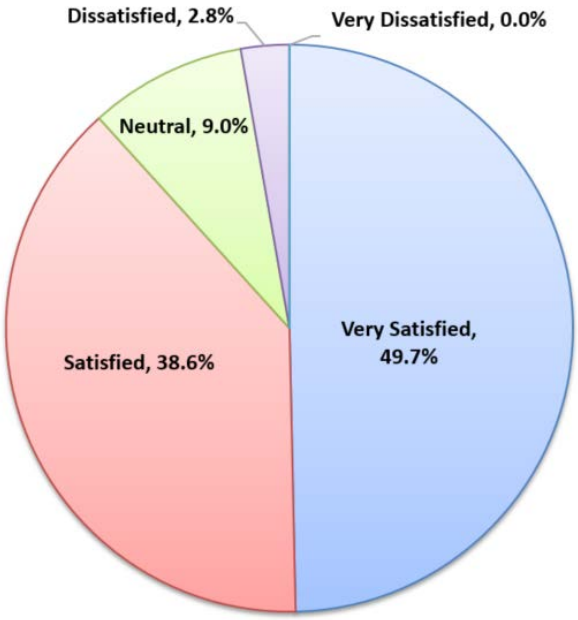
| | Coaches | Site Volunteers (Judges) | Weighted Average |
|---|---|---|---|
| Very Satisfied | 50.0% | 49.4% | 49.7% |
| Satisfied | 39.3% | 38.2% | 38.6% |
| Neutral | 7.1% | 10.2% | 9.0% |
| Dissatisfied | 3.6% | 2.2% | 2.7% |
| Very Dissatisfied | 0.0% | 0.0% | 0.0% |

**(Table 2)** Satisfaction rate from each of 2 surveys

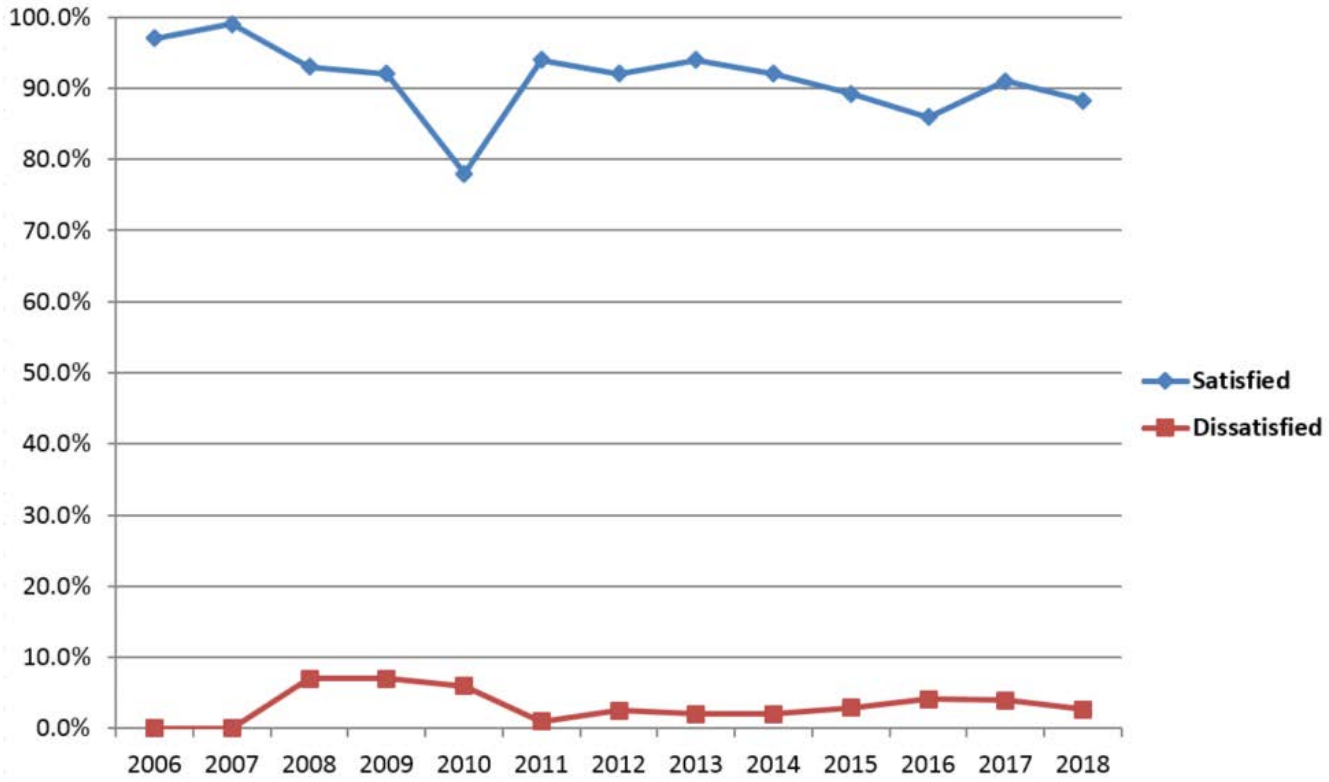



**(Figure 13)** Satisfaction rate from each of 2 surveys

Figure 14 shows average satisfaction rate from the 2 surveys. Considering the satisfaction rate (88.3% were satisfied or very satisfied), Robofest 2018 was yet another relatively sucessful year. Figure 15 shows Overall coach/volunteer satisfaction level changes since 2006. It does not show neutral cases.




**(Figure 14)** Coach/Volunteer Satisfaction rates

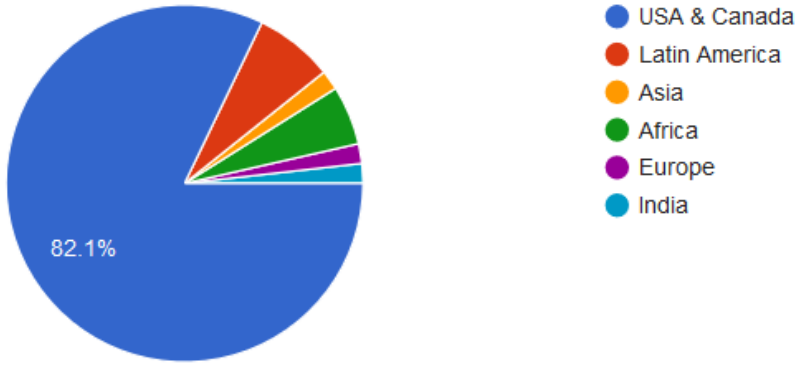



**(Figure 15)** Overall coach/volunteer satisfaction level changes since 2006 (2006~2009, 2014 data contains only coach data)

The following (Figure 16a) with 8 questions shows the results of coach surveys.

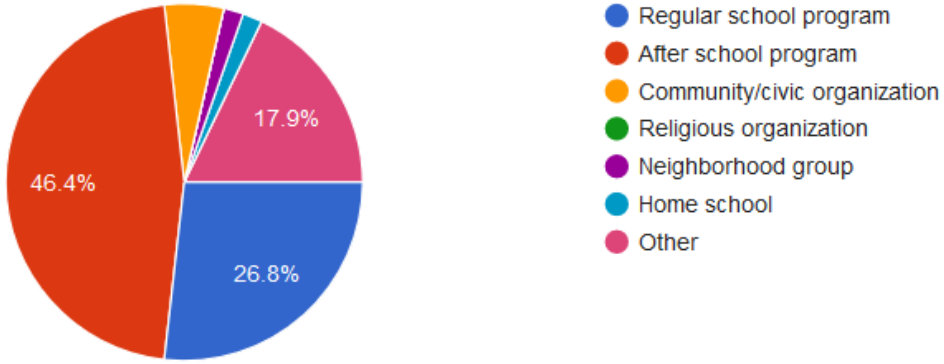
## Q1. Where are your teams from?

56 responses



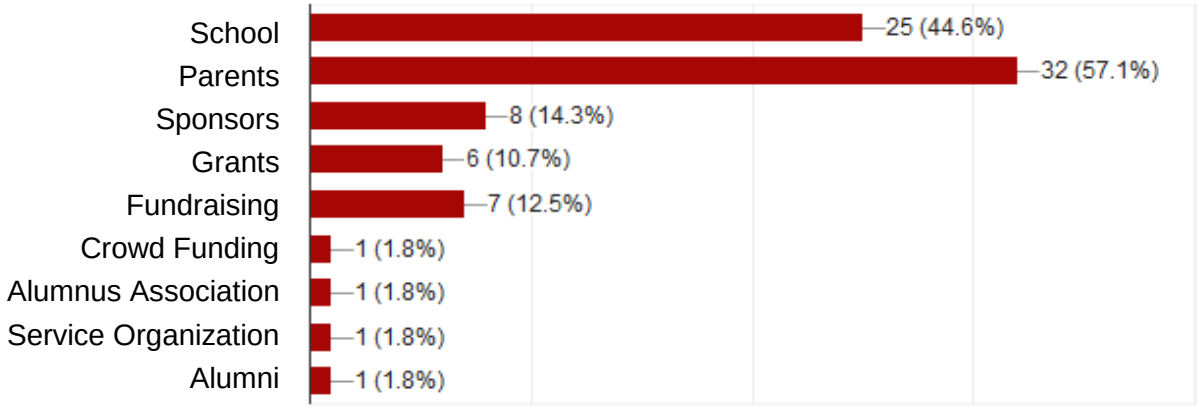

## Q2. Your team participated in Robofest 2018 through:

56 responses



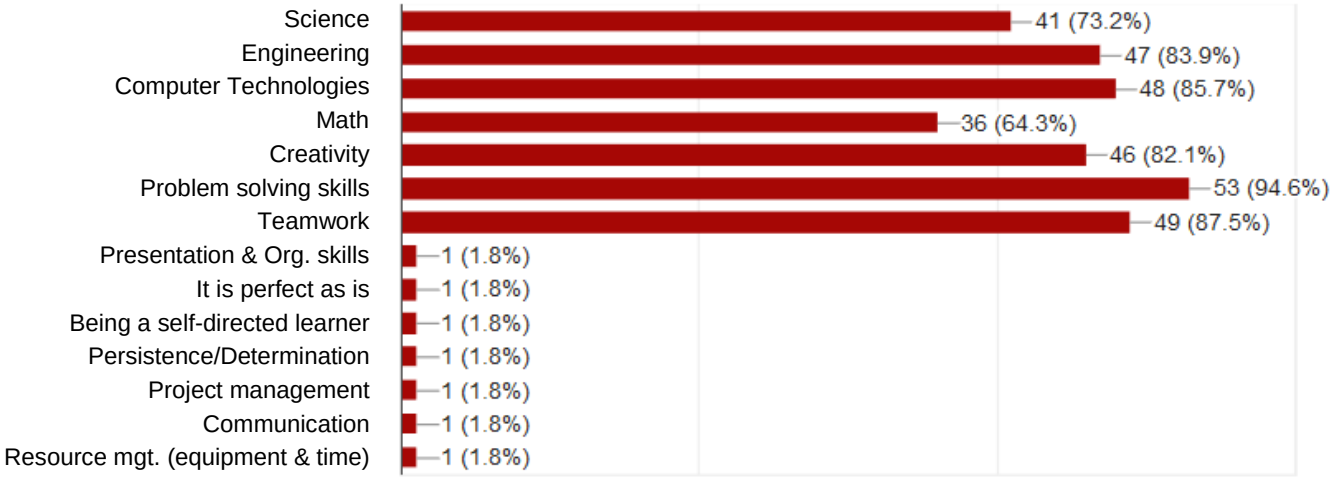

## Q3. From whom did your team receive funding?

56 responses

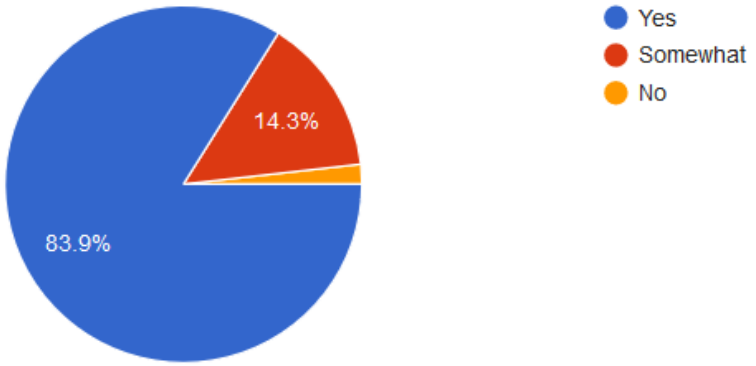


## Q4. What areas do you think are enhanced (or can be enhanced) through Robofest programs?

56 responses

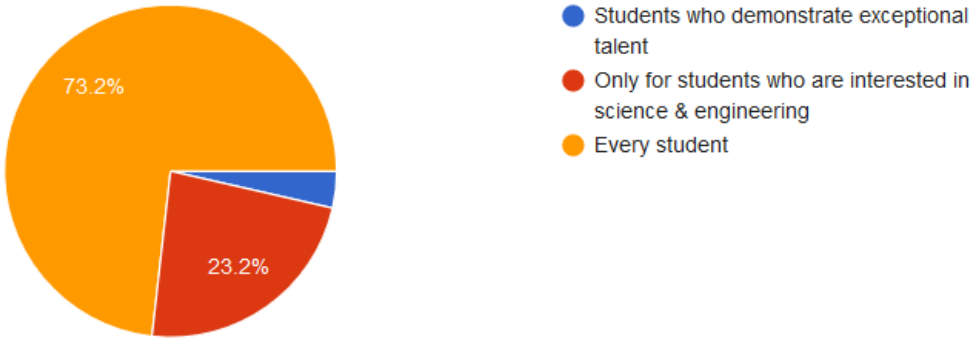


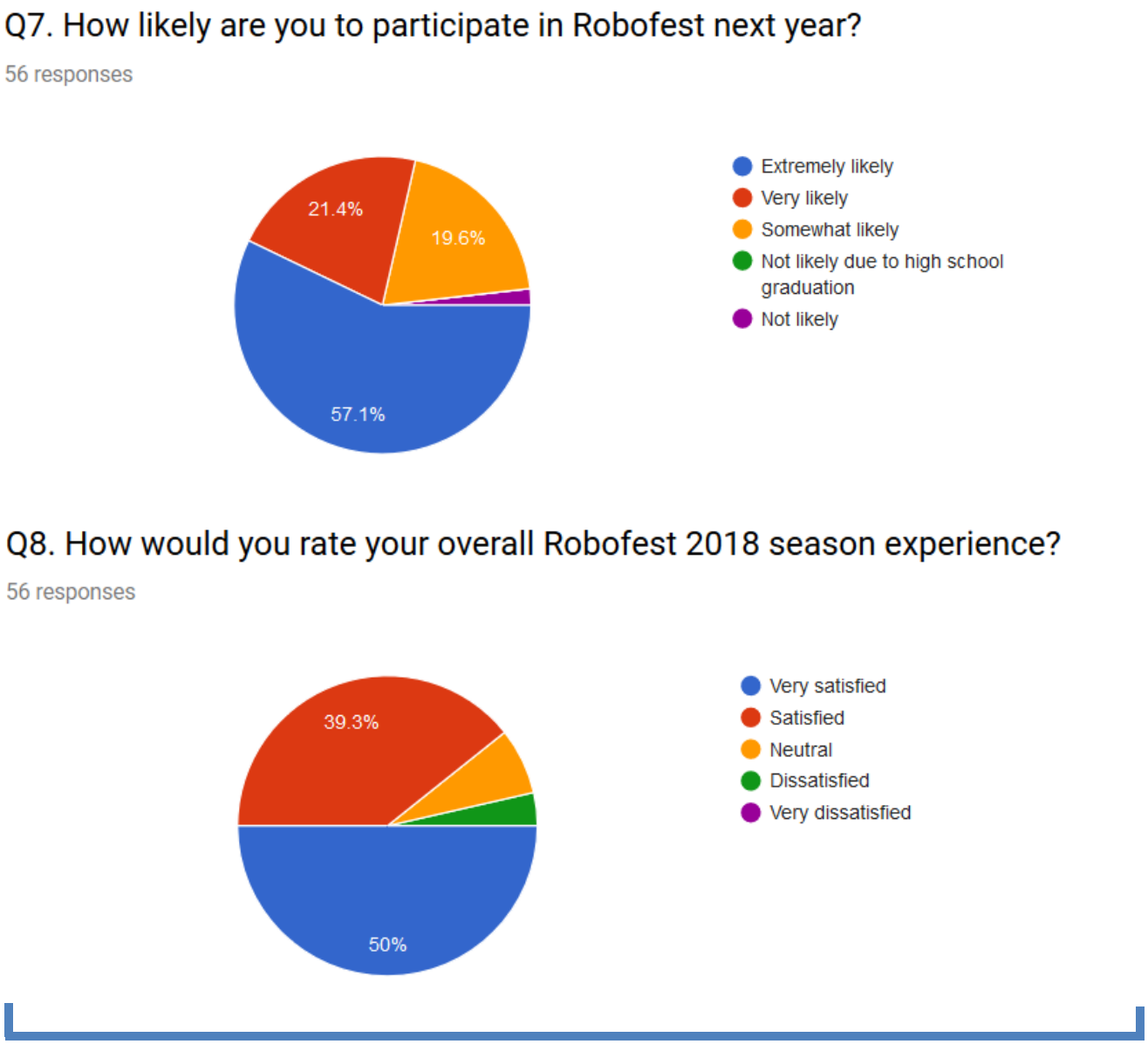

## Q5. Do you think your team members learned and improved science, technology, engineering, and math knowledge (STEM) through Robofest 2018?




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

56 responses



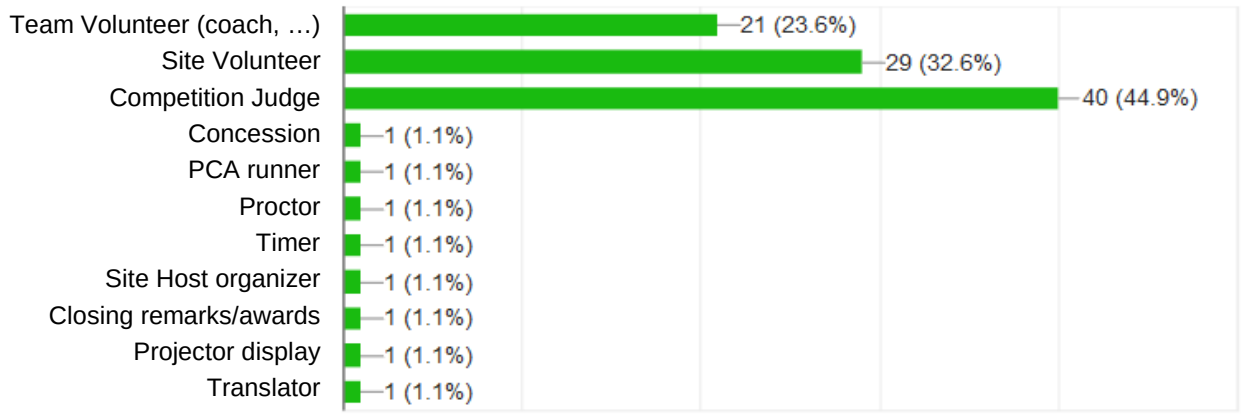



**(Figure 16a)** Coach survey results

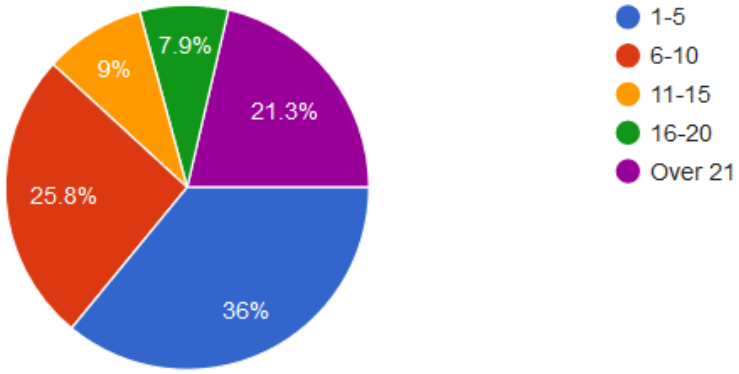
The following (Figure 16b) with 4 questions shows the results of volunteer/Judge surveys.

## Q1. What was your role as a volunteer?

89 responses

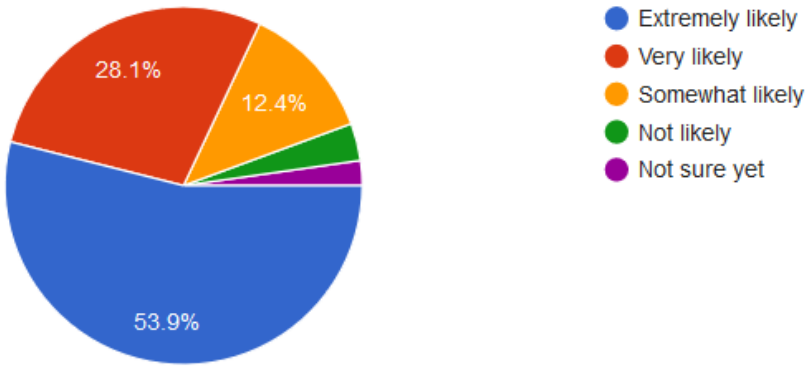


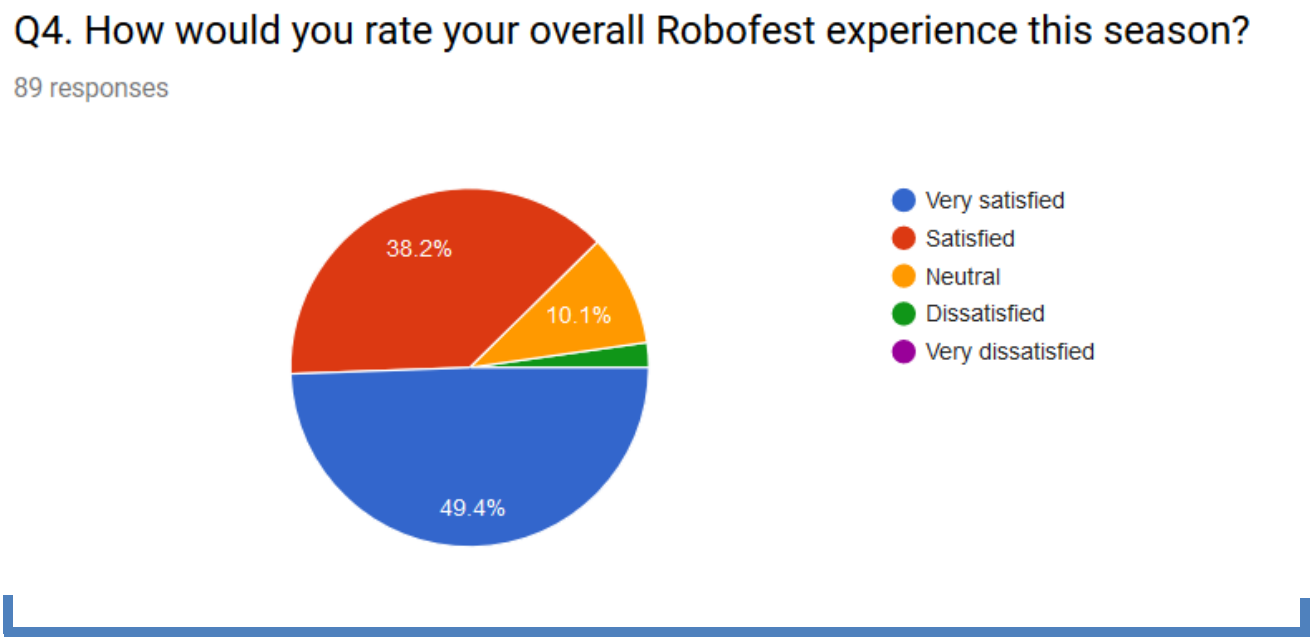

## Q2. How many total number of hours did you volunteer for Robofest competitions this season?




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

89 responses






**(Figure 16b)** Volunteer & Judge survey results

The coach survey included an essay (short answer) question: *Q9. Please write any suggestions, comments, criticism, and encouragement to improve the quality of Robofest.* Comments and corresponding Robofest office's comments can be found on the web at:
http://www.robofest.net/2018/CoachSurvey.pdf

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 on the web at:
http://www.robofest.net/2018/VolunteerSurvey.pdf

We appreciate everyone who participated in the surveys. Please note that the survey was completely anonymous and comments are from 9 US states and 12 other countries.

## 3. Plans for 2019

We have identified various facets of Robofest needing refinement, enhancement and improvement in the coming years based on LTU administrator's requests, outcomes, anonymous on-line surveys, private conversations, self-evaluation, and inputs from coaches, parents, students, volunteers, and site hosts. We know that some items summarized below are existing problems from previous years. Please understand that Robofest is managed without any full-time staff and some issues take time and resources to improve.

### 3.1 General Administration

**Competition levels and how to advance to the World Championship**

In Michigan, we introduced "Invitational" competitions to give Michigan teams a 2nd chance to qualify for World Championship. Teams that took advantage of the opportunity showed marked improvement and increased the population in the middle-class of the Game score histogram. This year's results are summarized in a WISER presentation at

https://www.robofest.net/2018/AnalysisRobofestGameData.pdf We will continue the "MI Invitational Competitions" and give 2nd chances via video submissions to non-Michigan teams. Robofest will continue to work to improve the balance between difficulty and attainability to maximize students' learning.

As in previous years, we will maintain different competition structure for the 3 groups, USA Michigan, USA Non-michigan, and International teams. We plan to have a Latin American Robofest competition in Mexico for teams from Latin American Countries. Detailed rules for the World Championship advancement will be announced in the 2018 General rules on the kick-off day.

## World Championship

For the 2018-2019 academic year, the World Championship will be held at Lawrence Technological University in Southfield, Michigan. A tentative schedule can be found at: https://robofest.net/images/1819/WC19schedule.pdf Note that Open Category BottleSumo competitions are held on two days and final matches will be held on the last day. The Drawing Contest and WISER mini conference will not be held this coming year.

## Site Host Administration

During the 2018 season, in most cases when there were fewer than five (5) teams registered for a specific category/age division of competition, the division or site was cancelled. The decision was usually made three weeks before the actual qualifying date. We suggested displaced teams move to another site or use video submissions.

We also plan to maintain a "Pre-registration-in-Michigan" site for teams who do not have preference for site location & date and for administration flexibility as Sites register. Coaches as well as the Robofest office can move the team to a Site later.

As we have done with past years, efforts will be made to proactively schedule dates next year so that there are not as many events on one day. It is strongly suggested that sites outside of Michigan plan for earlier dates, as time is needed to fund travel to the World Championship. The development of committees for each state to coordinate events is needed, especially when there are multiple site hosts from a region. The hope is to alleviate scheduling conflicts outside of Michigan and to provide geographic distribution as well. We will be using improved Site Host application and letter of agreement forms to make responsibilities of both parties clear.

## Registration Fees and Check-In Fees

We are proud of our cost-effectiveness and efficient management to minimize the cost for teams to participate in inexpensive Robofest robotics programs for everyone. We did not charge check-in fees for World Championship in 2018.

## Communications

- There is a way for coaches to get information on other teams including the email addresses of other team coaches at their qualifying site on Robofest coach login account. However, we found that few coaches were using this function. If you are a coach, please log on to your account to find email addresses of peer coaches.
- We encourage teams to use Facebook for communicating and networking with other teams. The Robofest Facebook page is at www.facebook.com/robofest. Please post rule related questions there.
- We will actively use more Webinars. Recorded Webinars will be available later on the web.
- Although there were Robofest articles in several publications, Robofest was not well publicized in major media outlets. This is a shame, as students were doing advanced competitions and their achievements should be well publicized. We hope to improve media coverage next year.

Please send your teams' achievements to your local newspapers and TV stations! We will send articles to newpapers and magazines too.
- We are invesigating the use of messaging apps such as WhatsApp, FB Messenger, Hangout, and others, for each competition category.

**Robofest Website**

We are proud of keeping almost all data/information/pictures from the 19 years of our history. However, it is true that it is not easy for (new) teams to find all the needed information on the web. We are fully aware that the current website is not well structured to navigate. Web pages are not consistent with design styles and color themes. There are some broken links. We are working on improving/renovating the website, however, we have learned that without full-time dedicated staff who has experience in Joomla, it is not an easy task.

**Online Registration Systems**

- To comply with GDPR (General Data Protection Regulation), our privacy policy is posted at: https://www.robofest.net/2018/LTU-Robofest-Privacy-Policy-v2.1.pdf
- We are working on improving team registration processes such as online release form. Coaches are to provide parents' email address. Our system will automatically send out online release form to parents. We will also provide ways to use traditional paper forms.
- Currently we are facing a problem to find a qualified staff member to maintain/improve the system. We are looking for a professional Joomla, Java Servlets, JSP, Ajax, Tomcat and mySQL programmer who is willing to work part-time.
- Still less than half of teams uploaded team pictures this year (2006 – 68%, 2007 – 53%, 2008 – 55%, 2009 – 50%, 2010 – 50%, 2011 – 41%, 2012 – 34%, 2013 – 44%, 2014 – 36%, 2015 – 23%, 2016 – 19%, 2017 – 25%, 2018 – 16%).

**Free Technical Support and Workshops (See also section 7)**

Some of the workshops were available on the web through real-time or recorded webinars. Most of the workshop files were posted on the web "Tech Resources" page for free. The URL was sent only to registered coaches. However, there were concerns from non-Michigan teams who could not attend workshops in Michigan. We encourage each site host to utilize our webinars or organize their own workshops using our materials.

## 3.2 Competition Rules

Draft of the rules for 2018-19 season will be available online in October. We will coniine to set the maximum team size at five students. We will again introduce "surprise" unknown tasks for World Championship game competitions. We will make it clear that the official language of the Exhibition competition is English. Categories for beginners like BottleSumo and RoboParade are recommended for sites to host throughout the year across the nation. We created and will maintain the BottleSumo Sr. division that allows only Lego based robots.

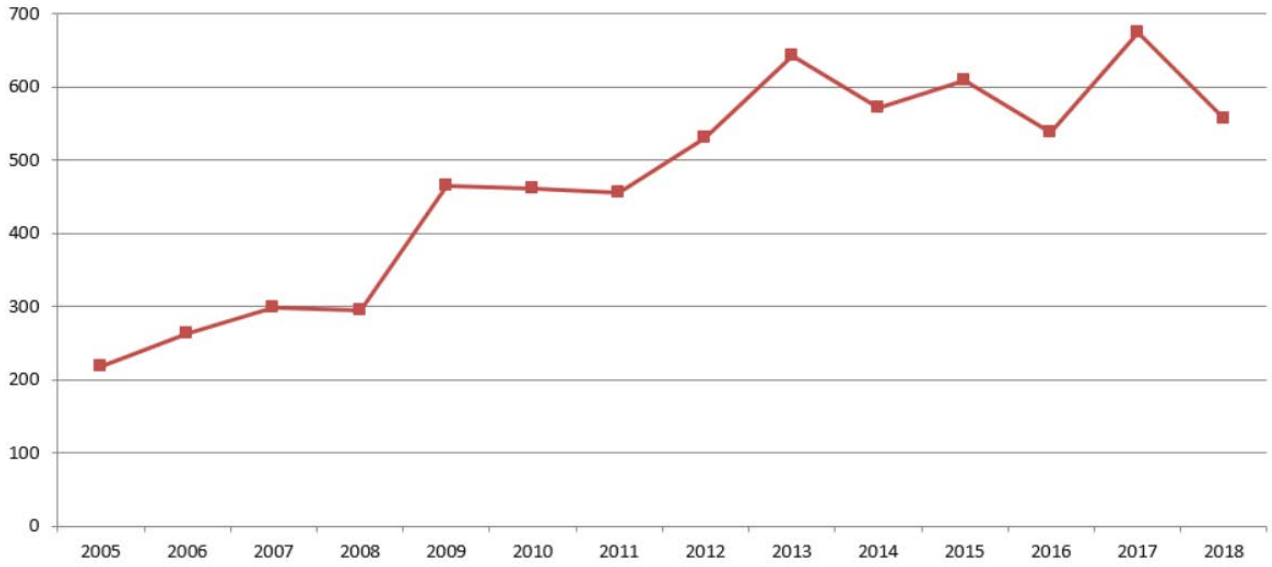
Regarding the Game category, it required that each Site Host will ask all spectators and coaches to leave the competition area during the 30 min work-time as well as the check-in time. It is imperative to protect the impounding table, since there were incidents of touching/damaging other team's robots.

## 3.3 Competition Event Organization

**Volunteer Organization**

Some qualifying sites still did not fully use our online volunteer system. Volunteer recruitment must be started earlier. We had 556 people this year registered on the web database and we deeply thank all

the site volunteers. See Figure 18 for the number of registered site volunteers since 2005. We need more careful planning since some sites had more volunteers than needed. We also need partnerships with volunteer groups.




**(Figure 18)** Number of yearly registered site volunteers since 2005

## Hours of competitions

The timing of the larger qualifying sites / championships has always been an issue. We must work harder to fine tune the schedule to ensure that events end on time. We need to simplify competition & award procedures and be well prepared.

## Playing Fields/Tables

We may continue to use the plastic folding tables for Games similar to the ones for AtBC game.

## Judging

Judge training must be conducted professionally, since some judges were not familiar with the Robofest 2018 rules. The Chief Judge's role is critical and he/she needs to be trained properly early on. We need to recruit more qualified & unbiased Exhibition Judges. Publishing Judges Bio at World Championship worked well. Judging errors occurred in some competitions mainly due to simple human errors or lack of training. Impounding tables must not be accessed by students as mentioned in the previous section.

## Miscellaneous

- LTU's $3,000 scholarship opportunity is now available to every student who participated in any Robofest event.
- We are planning research components in competition categories with HHMI grant. Details will be announced at kick-off.
- Strengthening the mentorship program is necessary. We encourage high school students to mentor Jr. Division students.
- Robofest students can help with World Championship as Robofest Ambassadors
- We are *considering special awards* for the following new technical components in Robofest:
    - The use of 3D printing for teams to design and produce parts for their robots
    - The use and promotion of Arduino or Raspberry PI.

## 4. Revenue/Expense Summary

Robofest financial results for the 2017-18 academic year (August 7, 2017 ~ August 13, 2018) were as follows: **$110,246.03** in cash revenue including the transferred balance from 2016-2017 year. **$80,236.13** in expense of Robofest account, and **$61,671.76** LTU cash support, which resulted in an overall loss of **$31,661.86**. (LTU is asking fully self-sustainable for direct costs as early as possible.) Tables 3 ~ 5 show the summary of cash revenue and expenditure. $30,009.90 will be transferred to Robofest's account for 2018-19 year from Robofest 2017-18 account. We are in need of more revenue next year since we are planning special events to celebrate our 20th anniversary.

| | |
|---|---|
| Transfer from 2016-17 | $34,333.19 |
| Individual donors | $1,020.00 |
| Corporate/Org. *Cash* Sponsorship (*) | $35,474.00 |
| Team registration fees & other income | $39,418.84 |
| Total net cash income without transfer from last year | $75,912.84 |
| Total revenue including transfer from last year | **$110,246.03** |

*(*) In-kind donations not included.* Some college research project sponsorship included

**(Table 3)** 2017-2018 Cash Revenue

| | |
|---|---|
| Parttime staff & workshop lead instructor wage | $15,773.16 |
| Student assistants' wage | $12,173.15 |
| LTU Student Scholarship | $2,520.00 |
| Trophies and plaques | $12,183.63 |
| Qualifier and Championship Medals | $3,955.72 |
| Supplies (playing fields, office supplies, signs, flags, banners, give away, etc) | $2,919.25 |
| Table & chair rental for World Championship | $2,406.75 |
| Advertisements & poster printing | $2,795.45 |
| T-shirts & Vests for Judges, volunteers & teams | $4,328.95 |
| Robofest Staff Travel & team travel support funded by a sponsor | $6,544.48 |
| Workshop support in FL | $780.00 |
| Robot kits & parts (EV3, VEX IQ, WeDo, L2Bots, Tetrix, Arduino, etc.) | $9,553.29 |
| UPS and USPS mailing | $2,265.49 |
| MI Invitational & World Championship food | $2,036.81 |
| **Total** | **$80,236.13** |

**(Table 4)** 2017-2018 Robofest Account Expense Summary

| | |
|---|---|
| Parttime staff wage support from College of Arts & Sciences | $44,229.60 |
| Student assistant wage support from College of Arts & Sciences | $17,442.16 |
| **Total LTU Cash Support** | **$61,671.76** |

**(Table 5)** LTU Direct Support Expense Summary in 2017-2018

Note that Table 5 above does not include Lawrence Tech's indirect monetary support (overhead expenses) that includes: marketing, fundraising, and special events support by Univ Advancement; help desk laptop support; audio & visual equipment; teaching release time for Dr. Chung (Robofest Director), Dr. Christopher Cartwright, and Prof Gordon Stein; MCS Department administrative support; general office supplies (papers); printing; copying, phone and fax; office space; utilities; mailing and USPS postage by Math & Computer Science department; campus facilities; video taping and editing –

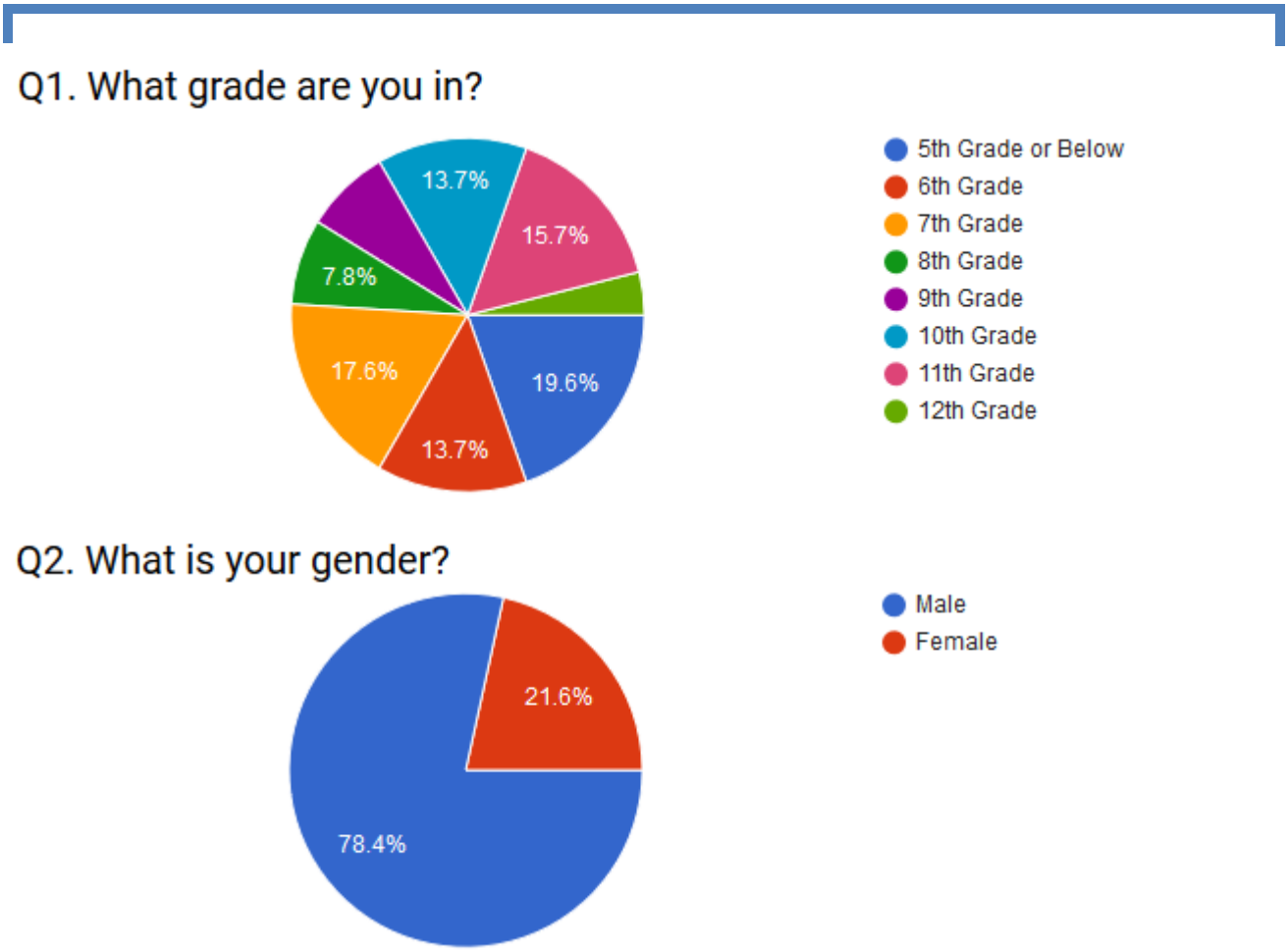
eLearning Services; use of office computers, laptops, computer network services on campus, Internet, etc. We greatly appreciate LTU's continued support for STEM education through robotics for all students. Table 6 shows cost per student data history since 2008.

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Direct expense** | $84,509.58 | $76,940.45 | $95,573.22 | $108,256.64 | $85,520.10 | $108,095.32 | $158,356.19 | $155,302.73 | $168,784.36 | $146,085.27 | $141,907.89 |
| **# Stu. Served** | 1,647 | 1,763 | 1,443 | 1,641 | 1,706 | 1,809 | 1,962 | 2,017 | 2,575 | 2,846 | 2,464 |
| **Cost / Stu.** | **$51.31** | **$43.64** | **$66.23** | **$65.97** | **$50.13** | **$59.75** | **$80.71** | **$77.00** | **$65.55** | **$51.33** | **$57.59** |

**(Table 6)** Cost per student data since 2008

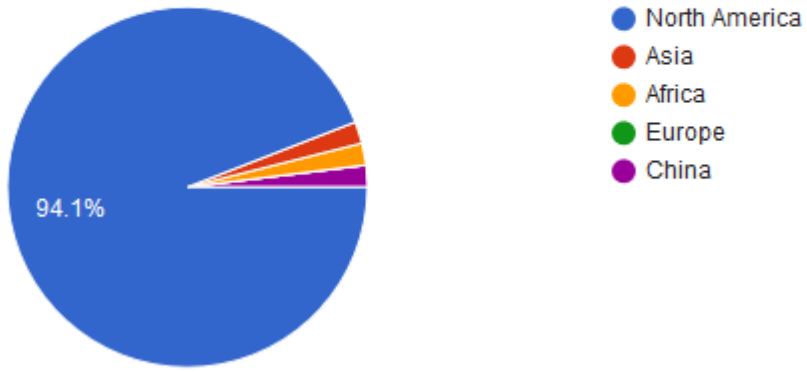
## 5. Assessment

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. 51 students participated in the pre-assessment survey anonymously when teams were registered before starting Robofest work. 80.4% students were very or somewhat interested in career in STEM fields in the beginning. Figure 19 summarizes the results of the student pre-assessment survey.

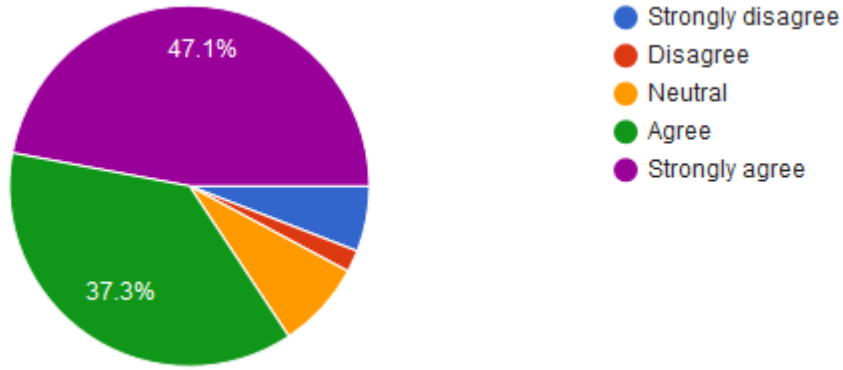


## Q3. Where do you live?

51 responses

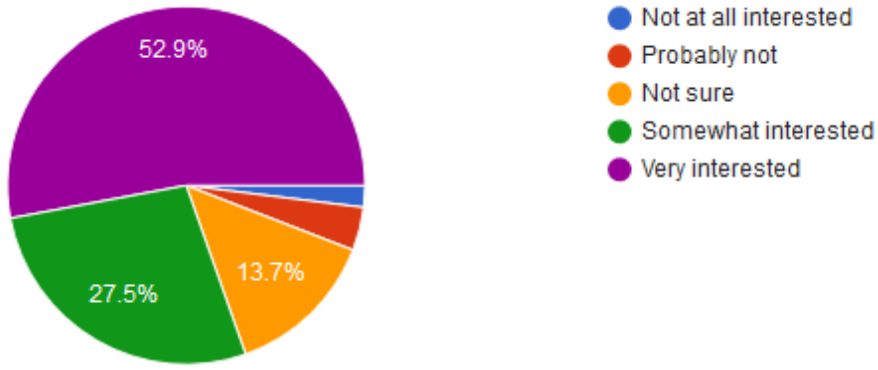



## Q4. I like Coding, Science, Technology, Engineering, and Math related classes.




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

51 responses

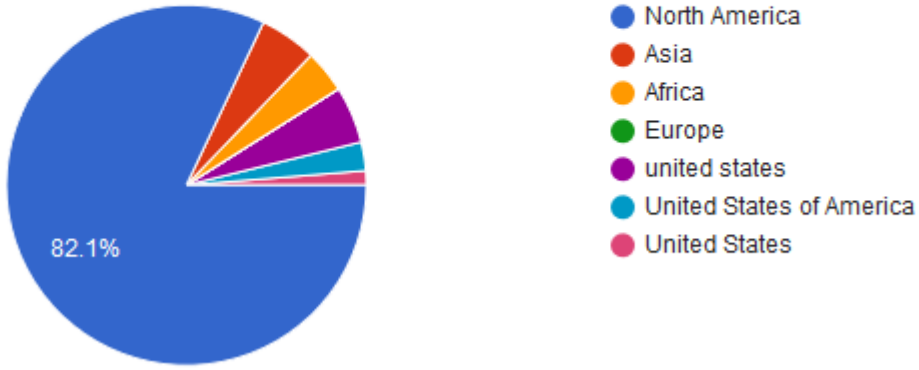



**(Figure 19)** Summary of pre-assessment student survey

After the World Championship was completed, a post-assessment survey was conducted. 78 students participated in the survey anonymously and the summary is shown in Figure 20 below.

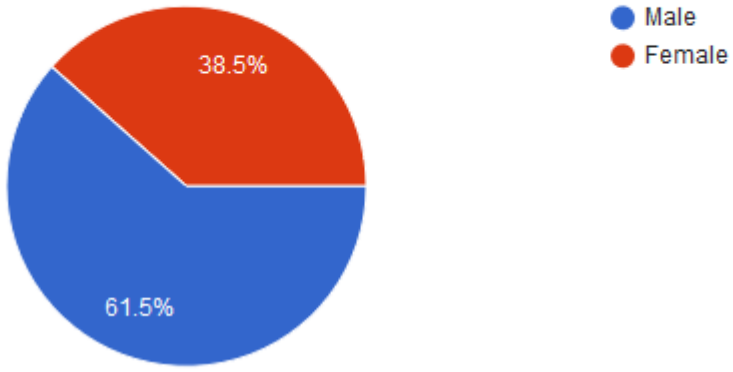
## Q1. Where do you live?

78 responses



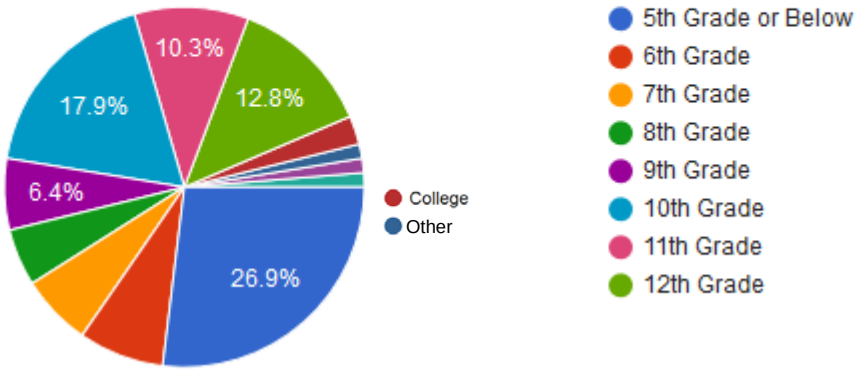

## Q2. What is your gender?

78 responses



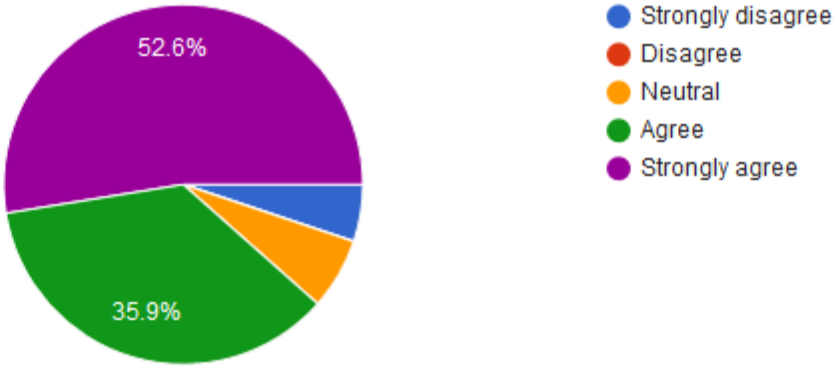
## Q3. What grade are you in?

78 responses



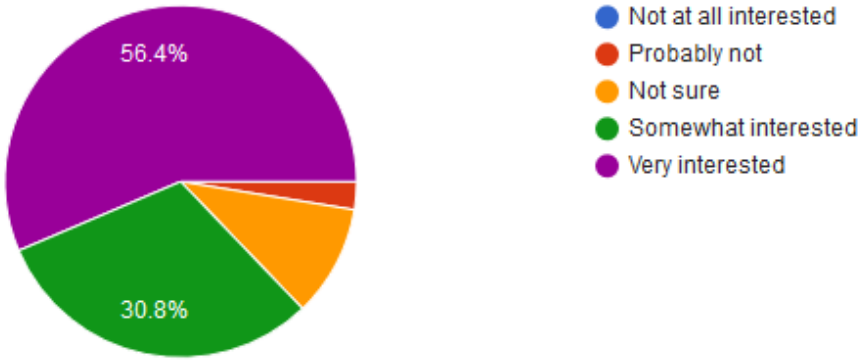

## Q4. I like Science, Technology, Engineering, and Math related classes.

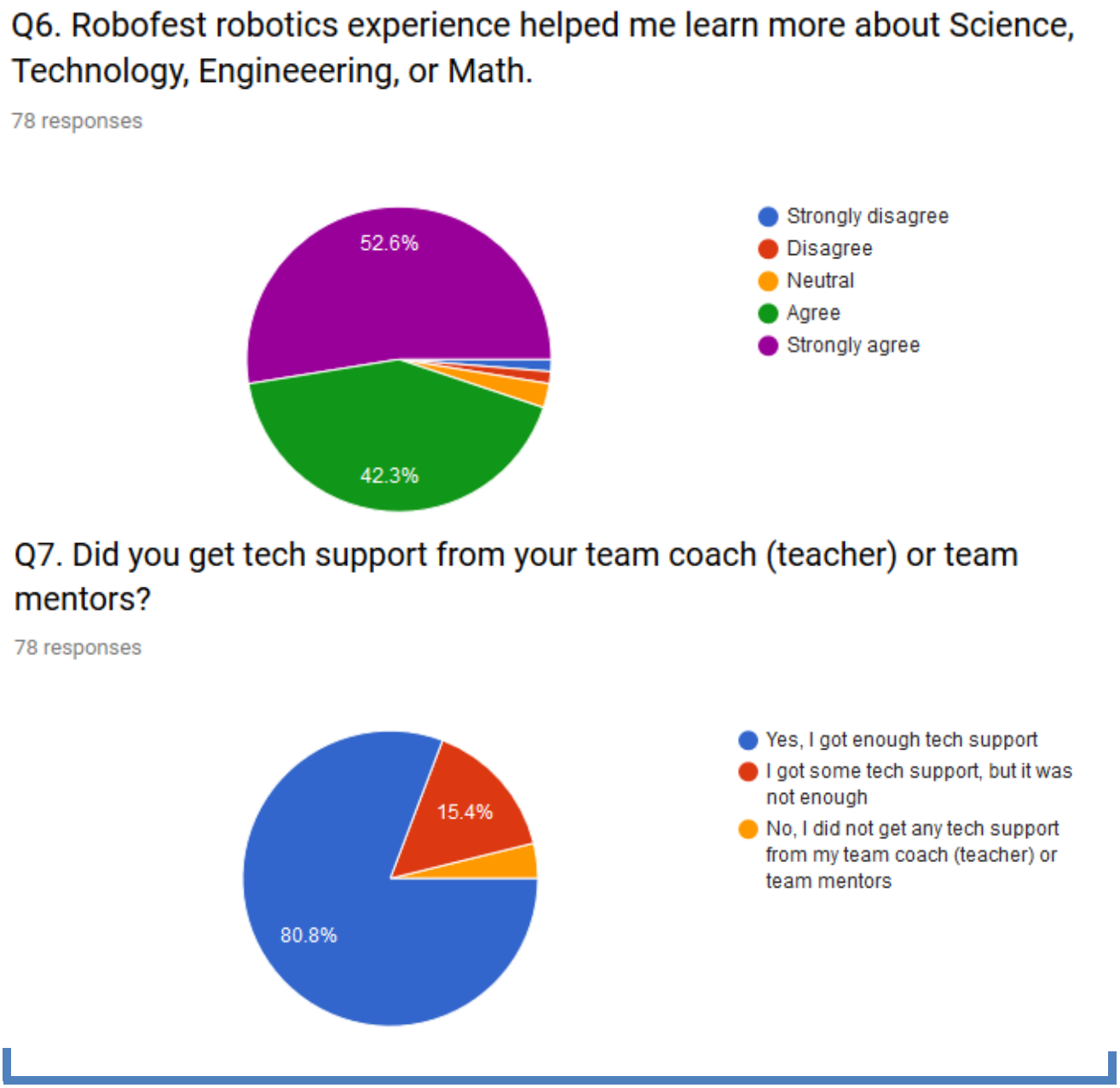
78 responses




## Q5. Are you interested in a career involving Science, Technology, Engineering, or Math (S.T.E.M.)?

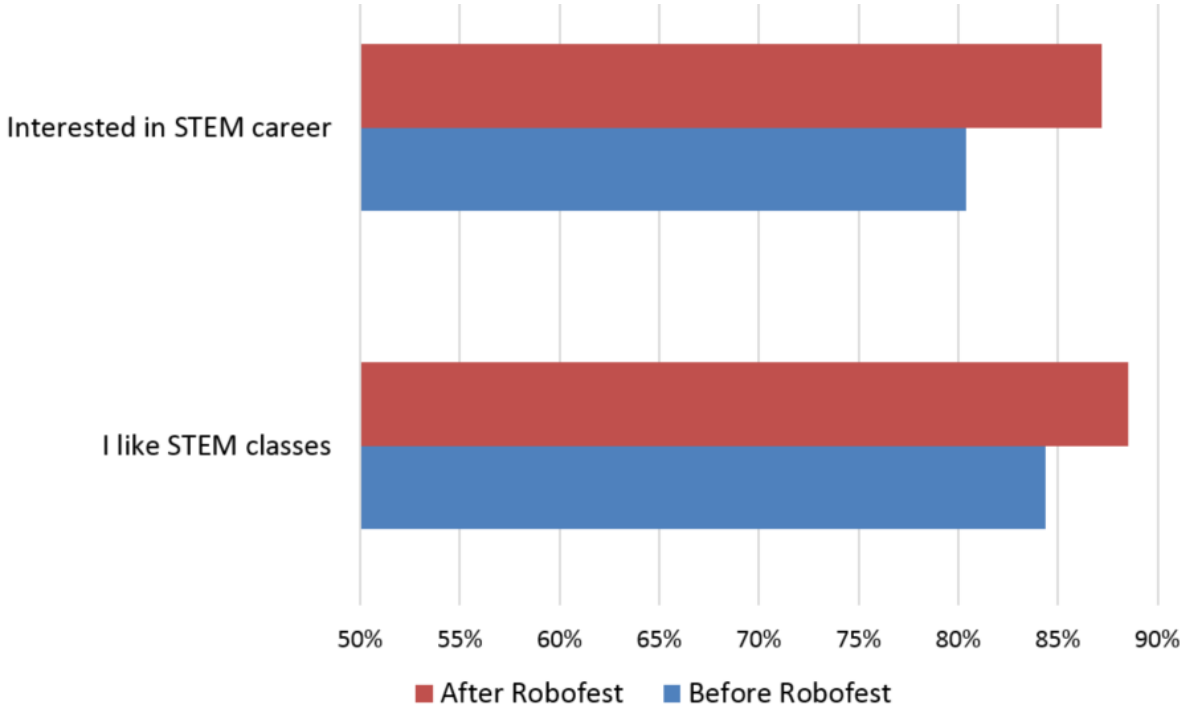
78 responses






**(Figure 20)** Summary of post-assessment student survey

A majority (87.3%) of students indicated that the Robofest robotics experience helped them learn more about Science, Technology, Engineering, or Math (STEM). 90% of students liked STEM classes and 92% of students also expressed that they would now consider a career involving Science, Technology, Engineering, or Math after their Robofest exposure as shown in Figure 21.




**(Figure 21)** Assessment Summary

## 6. Workshops, Events, and Research

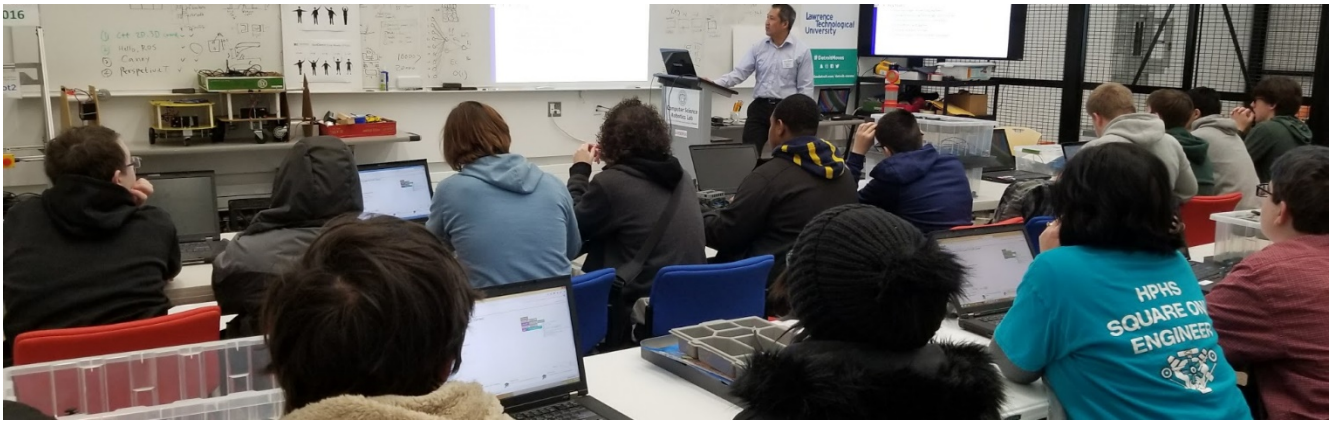
We held 17 technical hands-on workshops of which three were webinars. Table 7 shows six instructors and their classes during the 2017~2018 academic year. Total number of workshop attendees was 308. We thank all the Robofest official sponsors and the Lawrence Tech helpdesk for providing laptops for the workshops. Most of the workshop materials were posted on the web for on-site and online participants.

| Sate | Time | Workshop Topic | # attendees | Lead Instructor |
|---|---|---|---|---|
| 10/6/17 | 9am ~ 1pm | MathDance with Scratch (University Prep Science & Math Middle School) | 18 | Mark Kocherovsky |
| 10/27/17 | 9am ~ 1pm | MathDance with Scratch (University Prep Science & Math Middle School) | 16 | Mark Kocherovsky |
| 1/18/2016 | 9am ~ Noon | Vex IQ RobotMesh Studio (Python) workshop | 22 | Elmer Santos |
| 1/20/2016 | 9am ~ Noon | EV3 workshop for AtBC Game | 7 | Joe DeRose |
| 1/20/2018 | 1pm ~ 4pm | EV3 workshop for AtBC Game | 6 | Fred Brauchler |
| 1/23/2018 | 7pm ~ 9pm | EV3 workshop for AtBC Game (Webinar) | 12* | Keith Bozin |
| 1/27/2018 | 9am ~ Noon | EV3 workshop for AtBC Game | 17 | Chris Cartwright |
| 1/27/2018 | 1pm ~ 4pm | RobotC workshop for AtBC Game | 22 | Joe DeRose |
| 2/3/2018 | 9am ~ Noon | EV3 workshop for AtBC Game | 23 | Chris Cartwright |
| 2/3/2018 | 2pm ~3:30pm | EV3 workshop for AtBC Game (Webinar) | 12* | Keith Bozin |
| 2/24/2018 | 9am ~ Noon | EV3 workshop for Exhibition | 29 | Elmer Santos |
| 2/27/2018 | 7pm ~ 9pm | EV3 workshop for Exhibition (Webinar) | 25* | Elmer Santos |
| 3/3/2018 | 9am ~ 4pm | L2Bot workshop | 18 | Gordon Stein |
| 6/22/18 | 9am ~ noon | BottleSumo Camp workshop | 24 | Elmer Santos |
| 6/29/18 | 9am ~ noon | BottleSumo Camp workshop | 20 | Chris Cartwright |

| | | | | |
|---|---|---|---|---|
| 7/6/18 | 9am ~ 1:30pm | RoboParade Camp workshop | 22 | Chris Cartwright |
| 7/23/2018 | 9am ~ 1pm | BottleSumo Workshop and mini competition at AL Holmes Academy in Detroit | 15 | Chris Cartwright |

(*) Estimated

**(Table 7)** 2017-2018 Workshops




**(Figure 22-a)** AtBC Game workshop with Robot Mesh programming at LTU, January 18, 2018

Robofest especially thanks the generous donation from DENSO, our platinum sponsor. We continued to maintain over 20 L2Bots with the DENSO logo this year. The participants took the Denso sponsored L2Bot after the workshop to prepare for Vision Centric Robot Challenge 2018. Figure 22-b shows L2Bot workshop participants on March 3, 2018. The workshop technical video can be found at https://youtu.be/VrhTid2EtfI . Another STEM outreach event was to teach Scratch programming to create a simple game at Denso's "Bring Your Child to Work Day" on April 26, 2018. After World Championship, we offered four camps to introduce basic robotics and coding targeting under represented students. See Figures 22-c ~ 22-f.


**(Figure 22-b)** L2Bot workshop participants at LTU, March 3, 2018


**(Figure 22-c)** BottleSumo camp workshop participants at LTU, June 22, 2018


**(Figure 22-d)** BottleSumo camp workshop participants at LTU, June 29, 2018


**(Figure 22-e)** RoboParade camp workshop participants at LTU, July 6, 2018


**(Figure 22-f)** BottleSumo camp workshop participants at AL Holmes in Detroit, July 23, 2018

## 7. Recognition & Acknowledgement

Figure 1 on the first page of this report shows some of the 400+ students who participated in the World Robofest Championship this year at LTU in Michigan. Each student who partipated in our main category Game, Exhibition and Vcc received a small personalized trophy sponsored by our Platinum sponsor DENSO, shown in (Figure 23-a) left. World Championship BottleSumo contestants received personalized medals sponsored by Hyundai MOBIS shown in (Figure 23-a) center. All other Open category participants received personlaized medals sponsored by IEEE shown in (Figure 23-a) right.


**(Figure 23-a**) World Championship Individual Trophies sponsored by DENSO (left), World Championship BottleSumo medals sponsored by Hyundai MOBIS (center), and World Championship Open Category medals sponsored by IEEE Region 4 PACE and Southeast Michigan Section (right)

Note that all the individual trophies as well as medals were personalized with the student's names. Especially, we thank IEEE Region 4 PACE and SEM (Southeastern Michigan Section) for their sponsorship of IEEE medals (Figure 23-a right, figure 23-b left and center) since 2005.


**(Figure 23-b**) Michigan Invitational competition medals sponsored by IEEE(left), Michigan Qualifying competition medals sponsored by IEEE (center), and Qualyfying competition medals for non-Michigan sites sponsored by LTU (right)

All the winning teams of Robofest World Championship competitions can be found on the web at
https://www.robofest.net/2018/ListOfWinners2018mainWC.pdf
https://www.robofest.net/2018/ListOfWinners2018openWC.pdf

It is worthwhile noting that teams from Africa performed well. For example, "Right to Dream (Shut Up and Code) is the first African team in Robofest history to place in the Top 10 of Senior Game."

Three teams submitted videos of real-world application of AtBC game. Two teams received plaques of excellence for the special challenge. Their videos can be accessed at:

- Team 2737 – Jammin' Awesome Blockies: https://www.facebook.com/robofest/videos/1903403359681514/
- Team 2913-9 Gluten Free: https://youtu.be/gO2R40BBie8

Score sheets of each competition category at the World Championship can be found on this web page under the Archive section at: https://www.robofest.net/index.php/current-competitions/world-championship

Especially, we would like to thank all the Championship Exhibition & RoboArts Judges. Their short bios can be found at: https://www.robofest.net/2018/WC_Exh_RoboArts_Judge_Bios.pdf

Robofest was again very fortunate this year to have 10 corporate/foundation Bronze or higher sponsors and 11 Friends level sponsors. Without their support, Robofest 2018 would not have been possible. Figure 24 shows all the logos of the corporate/foundation sponsors which were displayed on a large screen during the Championships. The logos or names of the sponsors were also printed on the warmup, qualifying, Michigan Invitational and championship programs (see Figure 25). Bronze level or higher sponsor logos were printed on our official posters (see Figure 26). A list of all the sponsors can be found at www.robofest.net.


www.aramark.com
CJ Chung
Dieter Giese
Wei Jiang
Erik Rosvold
Howard Davis
Robin G. Leclerc
Dennis J. Howie
Joel Stein, ART/DESIGN Group
Wei & Yan Liu
BigRentz: The Nation's Largest Equipment Rental Network

**(Figure 24)** Official Sponsors of Robofest 2017-2018


**(Figure 25)** Some of official Robofest programs with official sponsor logos

The following, 15, 10 and 5 year anniversary coaches were recognized this year. We deeply thank them for their dedication and hard work. If we missed any coach reaching anniversary years, please contact Dr. Chung at cchung@LTU.edu.

10 year
Mark Brudnak, Bethany Christian School Robotics Club
Brian S. Kincheloe, Bethany Christian School Robotics Club

6 year (missed last year)
Brenda Kikuyama, August Ahrens Elementary School Waipahu, HI (13~)
Andrew Dassing, SHMS Robotics, Safety Harbor, FL (13~)
Paul Weaver, Westlake Christian School, Palm Harbor, FL (13~)

5 year
Betty Recker, Home School Connection, Ypsilanti (2009, 2010, 2012, 2016, 2018)
Srinivas Bommidi, LEGO LEGION, NOVI, since 2014
T.J. Ray, South Ridge Panthers Robotics, Culver, MN
Philip Bigos, Southfield Christian, Farmington Hills, MI
Ellen Shimko, A.I. Root Middle School, Medina, OH
Alyssa Shon, Palisades Elementary, Pearl City, HI
Cameron Lindner, Cloquet Robotics, Cloquet, MN
Hoa Pham, Discovery MS Students, Canton, MI
Ariel Villanueva, Kapolei Middle School, Kapolei, HI
Karen Martin, OLV School, Northville, MI
Kamilla Schulte, OLV School, Northville, MI
Mike Monticello, OLV School, Northville, MI
Randall Taketa, Nanakuli Elementary, Waianae, HI
Alan Oates, St Pete Beach Rec Center, St Pete Beach, FL
Michael Wilson, McLane Middle School, Brandon, FL (13, 14, 16, 17, 18)
Veeresh Nama, Nano Penguins and SMART labs, Auburn Hills, MI

Robofest cannot reach our students without site hosts. We would like to applaud all the work done by our great site host organizers in table 8 on page 32. Without their leadership, dedication and sacrifice, the Robofest 2017-18 season would not have been possible.


**(Figure 26)** Robofest 2018 official poster

| Site | Site Host Organizer Name(s) |
|---|---|
| Alexandria_SiliconWaha_EGYPT | Farid Hussein / Mr. Ayman El Kabbany |
| Bangalore_ChristJrCollege_India | Imtaiz Ahmed Khan / Sathish R |
| Beaverton_Mathletics_tech4kids_OR | Shirley Ma |
| BloomfieldHills_Cranbrook_MI | Katie Bis |
| BloomfieldHills_Cranbrook_MI_BottleSumo | Katie Bis |
| BoomfieldHills_Roeper_MI | David Feldman |
| Brazoria_TX | Margaret Baugh |
| Canton_Achieve_MI | Elizabeth Gaecke / Jennifer Conley |
| Canton_CCA_MI | Don Wilson |
| Canton_Gallimore_MI | Cara Wegrzyn / Aimee Bell |
| CenterLine_MCS_MI | Becky Branch / Dr. Margie Baldwin |
| Chicago_HolyTrinity_IL | Patrick Kelly / Tim Bopp |
| Cloquet_MN | Cameron Lindner |
| Coimbatore_HindusthanCollege_India | Imtaiz Ahmed Khan / Arun Rajeev |
| Detroit_UDJH_MI | Jennifer Wint |
| Houston_UrbanSTEM_TX* | Dr. Monique Micheaux |
| IEEE_HTD_East_Lansing_MI | Robofest Office |
| International_Video_Qualifier | Robofest Office |
| Medina_AIRoot_OH | Shayna Samosky |
| Monastir_SciencePalace_Tunisia* | Selmi Hamdi |
| Ocala_Cornerstone_FL | Joe Moseley |
| Oldsmar_Nielsen_FL | Emma Alaba |
| ParkHills_LabRevolution_MO* | Ann Boes |
| PearlCity_HIFusionED_HI | Lynn Fujioka / Sandy Ahu |
| Pensacola_PCHS_FL* | Dana Lupton / Sister Kiersten Martin |
| Rabat_BibliothequeNationale_Morocco* | M Imane Borzoubaa |
| Rochester_Baldwin_MI* | Erik Rosvold / Catherine Kochanski |
| StPeteBeach_FL_Parade | Emma Alaba / Jenifer McMahon |
| Troy_Bethany_MI | Dr. Mark Brudnak / Dr. Mark Wood |
| USA_Video_Qualifier | Robofest Office |
| Vanderbijlpark, South Africa | Pieter Pretorius |
| Vanderbijlpark_SouthAfrica_Parade_BottleSumo | Pieter Pretorius |
| WestBloomfield_WBHS_MI | Sally Unrath / Gerald D. Hill |
| Westland_FordCareerTechCtr_MI | Zachary MacLean / Mr. Steven Kay |
| China | Zhao Yang |
| Ghana | Dr. Yaw Okraku-Yirenkyi |
| HongKong | Yau Ka Chun |
| Korea | Stephen Seungdong Baek |
| Macau | Yau Ka Chun |
| Mexico | Dr. Ramiro Marrero |
| SouthAfrica | Pieter Pretorius |
| Wolfville_Acadia_Canada | Jenna Watson-Findlay / Gary Walsh |
| World_Championship | Robofest Office |

(*) Sites were canceled last minute

**(Table 8)** Site Host Organizers (Sites organized by Lawrence Tech are excluded)

LTU Math and Computer Science Department administrative assistant Marilyn Wiseman provided dedicated services for handling purchasing & reimbursement requests, employment related paper work, food preparation, among others. Tracy Kash, CAS Dean's Office assisted to plan and manage an LTU budget account. Joyce McKissen, Dept of Humanities, Social Sciences, and Communication who has been assisting Robofest for years retired this year. Kayla Bottrell, LTU Career Services was everywhere to assist World Championship events.

LTU administrators who directly supported Robofest this year include: President Virinder Moudgil (World Championship Opening Remarks), Interim Dean Prof. Glen Bauer (World Championship

Closing remarks & Awards), President Emeritus Dr. Richard Marburger (Michigan Invitational Opening Remarks), Marburger STEM Center Director Dr. Sibrina Collins (WISER conference moderator), Matt Roush (World Chamionship Emcee and press releases), Nadia Fadel-Bazzi (Sponsorships), Renee Tambeau & Sofia Lulgjuraj (Official Poster publication), Dr. Gladys M. Avilés, Director of Zaven Margosian Academic Achievement Center (Translator), and Thomas "Sam" Vukonich (Audio/Visual).

Dr. Yawen Li, Chair of LTU's Biomedical Engineering Department and her students, Ahron Wayne and Sumaiyya Rahman, gave great helping hands when we were in desperate need.

Prof. Dr. Chris Cartwright assisted Robofest as Chief Game Judge including Supprise Game and many other functions. He has been acctively invloved in Robofest management since 2009, now for 10 years.

Prof. Gordon Stein participated in Robofest when he was a middle school student and became a Senior Lecturerer at LTU after getting his Master's degree in CS. He continued the maintenace of our webserver and Tomcat server systems. He will be studying PhD in CS at Vanderbilt University beginning this fall 2018. We wish him very good luck with his studies and endeavor.

A brand new Computer Science Professor, Dr. Destiny Anyaiwe jumped in to assist with RoboParade and Drawing Contest. We anticipate a greater role from him in the coming years.

Prof. Keith Bozin was the Chairperson for World Championship Jr. BottleSumo group B. Before joining LTU, he was a Robofest Exhibition coach in 2005. He will be a test engineer for an automotive company from this Fall 2018. He will try to assist us whenever he is available. We thank him for his great contributions to Robofest since 2005.

Prof. Joe DeRose who works for Ford Motor Company and Adjuct Professor in the Department of Mechanical Engineering at LTU was the chairperson of UMC. He played a great part in many aspect of Robofest rules.

Prof. Keith Nagara, Director, BS Industrial Design + BS Transportation Design, was in charge of the Drawing contest. Many of his students assisted with the contest.

Prof. Mirit Shamir helped with Robofest for important tasks such as legal advising, assisting instruction, and grant writing.

LTU Alum and Robofest PT staff David Carbery served as a Chairperson for Sr. BottleSumo Classic divsion. He also went to Mexico's Robofest conference to give remarks as an official representative of LTU Robofest. He also gave a plenary talk on "Comparing skills needed to compete in Robofest vs those needed for a career in Industrial Robotics".

Dr. Fred Brauchler, Robofest Workshop Instructor, was the Chief Judge for Sr. BottleSumo Unlimited division. He provided us valuable comments for our Game rules.

LTU alumni Nate Johnson and Emily Trudell were in charge of Vcc judging.

Doug Oliver, Ford Motor Company, assisted the broadcast of streaming videos through Zoom.

Former Robofest coordinators Lynn Garrison and Katie Bis were so kind enough to volunteer for World Championship events.

We are so happy to announce that Robofest 2017-18 season was completed without any full-time staff. Part-time staff members in the 2017-18 year were Elmer Santos (Assistant Director), Shannan

Palonis (Coordinator), Teresa & Don Dubois, Chris Deloren Parker, Judith Williams, David Carbery, Jon Ruszala, and Jasmine Lauch. Elmer Santos was in charge of technical & judging issues in Robofest as well as muliple World Championship categories: RoboParade, Jr. BottleSumo group A, Exhibition, and RoboArts. Shannan Palonis was in charge of team, site host, site materials, and volunteer management.

Part-time student assistants include Candace Byrnes, Nick Paul, Daniel R. Oliver, Charles Faulkner, Zhen Liu, Mark Kocherovsky, Nirmit Changani, Devson Butani, and Gitae "Joe" Jeon. Candace Byrnes, LTU Media Communication major, successfully launched the first Friendship night - Talent Show event. We were so grateful to see a former student assistant, Prathik Mouli Akunuri, came back to help with the World Championship events.

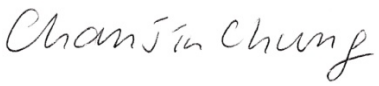
There are so many other people to recognize, but I must applogize to stop here since this space is not enough to mention all the volunteers and Judges.

Finally, I would like to deeply thank Dean Dr. Hsiao-Ping Moore who stepped down from the Dean position this Feb, 2018. Without her leadership, advice, and support since 2005-2006 academic year, today's Robofest would not be possible.

In summary, 2017-18 general data as well as assessment data in section 5 shows that Robofest has achieved its primary missions: inspring students into STEM fields and supporting them. We are proud that Robofest has been continuously inexpensive since its inception in 2000, while providing proven quality STEaM education environments for students. Once again, we deeply thank everyone who has hosted, sponsored, supported, volunteered, worked, and participated in the 19th Robofest for the 2017-2018 year.

If you find any errors or have comments on this report, please let me know (cchung@LTU.edu). We are looking forward to seeing you during the 20th annual Robofest 2018-19 season. Robofest is 20 years young.

Respectfully,
August 23, 2018



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