

Robofest 2007 Report

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1. Analysis of Robofest Registration Data

A total of 1,413 students, 576 teams from five countries participated in the 8th Annual Robofest student robotics competition. Robofest 2007 featured a warm-up competition, 23 qualifying competitions, and one World Championship. Robofest focused on STEM (Science, Technology Engineering, and Mathematics) education has grown rapidly since its inception in 2000, as shown in Figure 1.

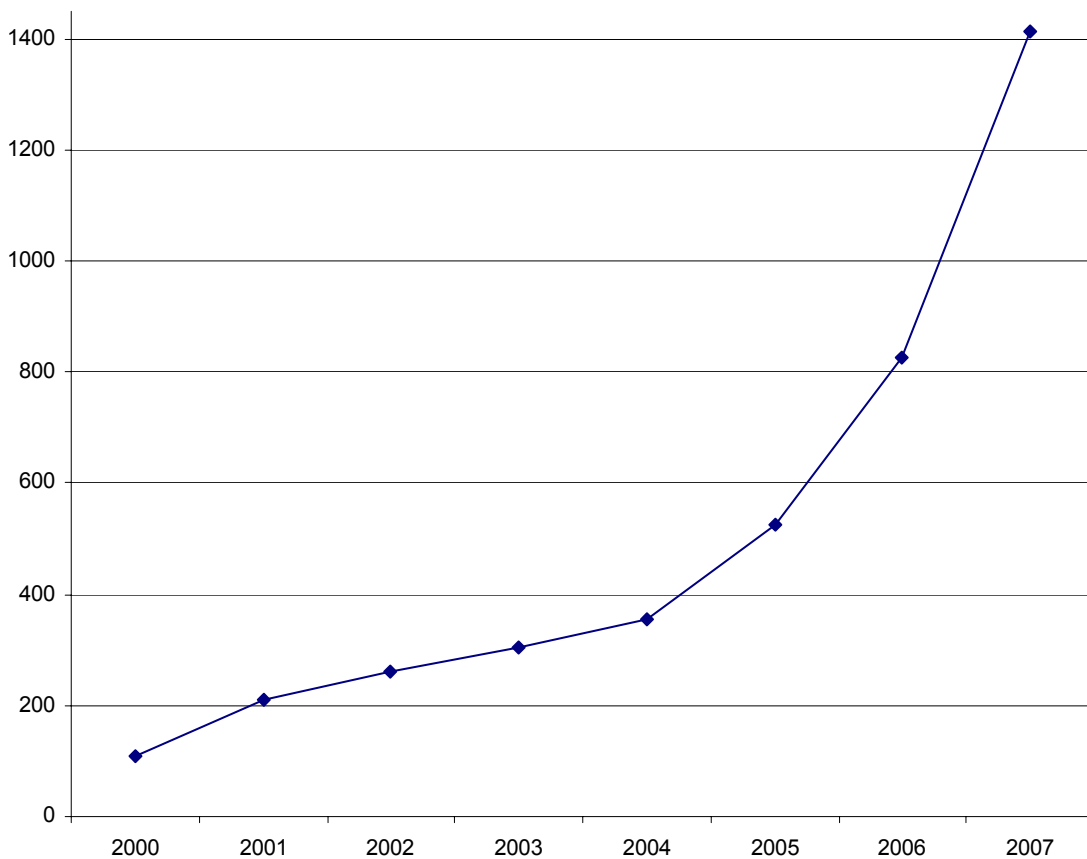


Figure 1. Number of Robofest Student Participants Since 2000

Robofest would not be possible without the help of many dedicated people. The following Table 1 shows the total number of all officially registered people including teachers, mentors, students, coaches, judges, sponsors, and site volunteers for the 2007 Season. Robofest 2007 had its largest number of participants ever, reaching around 3,000 people all together. The increase was possible, due to the new site hosts (see figure 2) as well as the large growth of participants in Korea.

Site/Event	Teams	Players	Coaches	Sponsors	Volunteers	Site Voulnt.	Total
VEX 5thlon, Southfield, MI	5	22	5	4	6	10	47
Houston, TX	6	33	3	18	19	15	88
Flint, MI	17	65	10	12	18	20	125
Monroe, WA	9	28	6	7	18	13	72
RoboSumo, Southfield, MI	11	31	6	6	11	3	57
CollegiateRobofest, MI	11	20	7	5	11	3	46
Detroit Jesuit High, MI	5	31	2	6	5	11	55
Northville, MI	14	55	10	9	18	32	124
Ann Arbor Trail, Detroit, MI	9	43	7	5	15	23	93
Woodland, CA	8	27	4	5	9	14	59
Howell, MI	12	31	4	3	12	10	60
WCC, Ann Arbor, MI	24	108	16	17	35	23	199
CIS, Detroit, MI	11	44	6	8	11	10	79
Austin, TX	7	21	7	2	17	27	74
Warren, MI	13	57	10	17	28	12	124
Withdrawals	15	66	14	11	18	0	109
RoboFashionShow, MI	2	6	2	4	5	2	19
VideoSubmission	3	8	3	3	4	0	18
Canton, MI	20	84	16	19	36	34	189
Marysville, MI	9	34	7	5	15	17	78
ClintonTwp, MI	4	18	4	4	6	12	44
Singapore	48	103	30	10	20	15	178
Windsor, Canada	3	8	3	2	3	10	26
Lethbridge, Canada	6	14	2	2	6	14	38
Seoul, Korea	304	456	200	100	100	50	906
LTU Warmup						26	26
World Championship						54	54
	576	1413	384	284	446	460	2987

Table 1. Total Number of Registered Participants for Each Robofest 2007 Competition Location

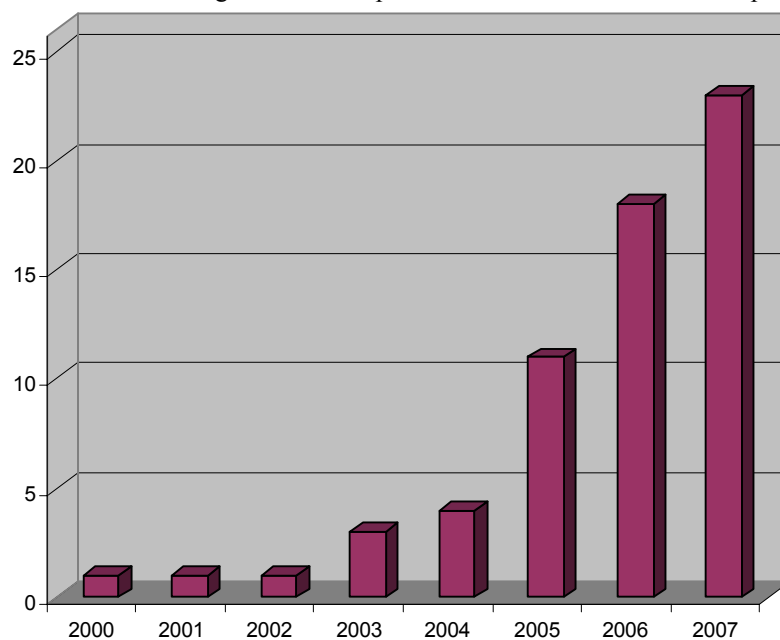


Figure 2. Number of qualifying sites

As shown in figure 3, the Robofest Game was the most popular category. 60% (47% + 13%) of Robofest teams participated in the Miner Rescue Challenge game. 30% (25% + 5%) of Robofest Teams participated in the Exhibition Competitions. In 2007, we started new categories such as Sumo, Fashion Show, and the Mini Urban Challenge. Sumo and Fashion Show seemed like good categories to attract rookie students. Mini Urban Challenge was very effective to attract advanced students in computer science and computer programming. We thank Cranbrook Schools for organizing the 2nd Annual Vex Pentathlon.

Robofest was popular for 6th through 8th grade students. 46% of the student participants were from Middle Schools as seen in figure 4. Furthermore, 19% of students were 5th grade level while 6% of student participants were below 5th grade. By submitting a age waiver request, those 82 students below 5th grade level were permitted to participate. Note that the data does not include Korean and Singapore students.

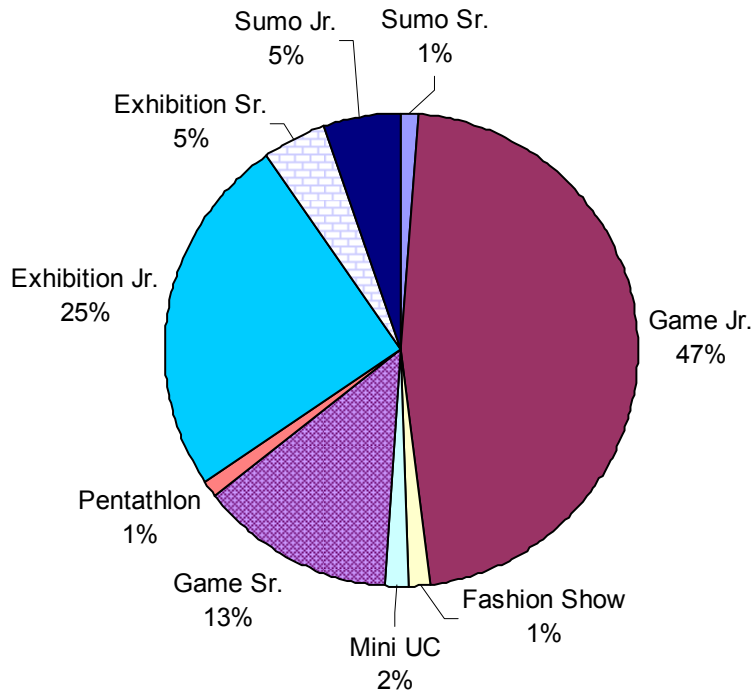


Figure 3. Percentages of Teams by Age Division and Competition Category

Figure 5 shows gender ratios of Robofest 2007 students. Robofest 2007 had the same percentages of female participants as that of 2006. (The data does not include the students participating at the Korean and Singapore site, since they were using their own registration system and we were not able to get the data from them).

One quarter of all Robofest student participants are of ethnic diversity. Specifically, 10% of Robofest 2007 students were African American, 14% were others as shown in figure 6. However, even if we added two new site hosts in Detroit, the percentage of African American has decreased from 14% to 10%. Figure 7 shows the changes in percentage from 2005. Robofest will work hard to encourage students from under served communities to participate in learning STEM areas. Figure 6 and 7 data exclude Korean and Singapore students.

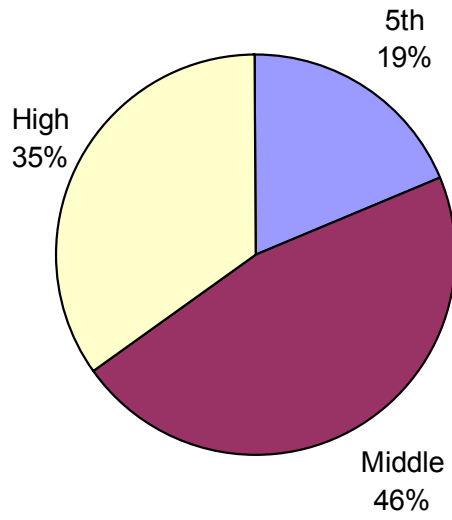


Figure 4. Student Participant School Grade

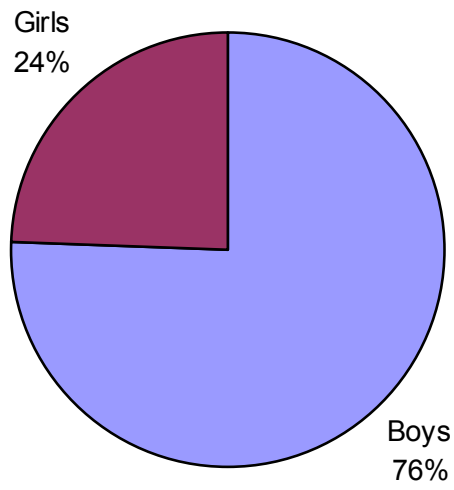


Figure 5 Gender Ratios of Robofest 2007 Students

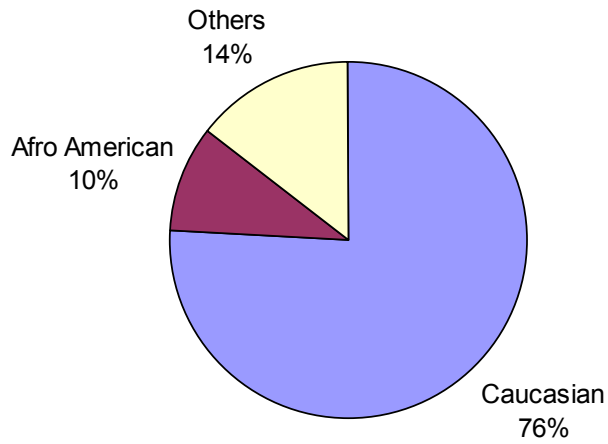


Figure 6 Robofest 2007 Student Participant Ethnicity Data

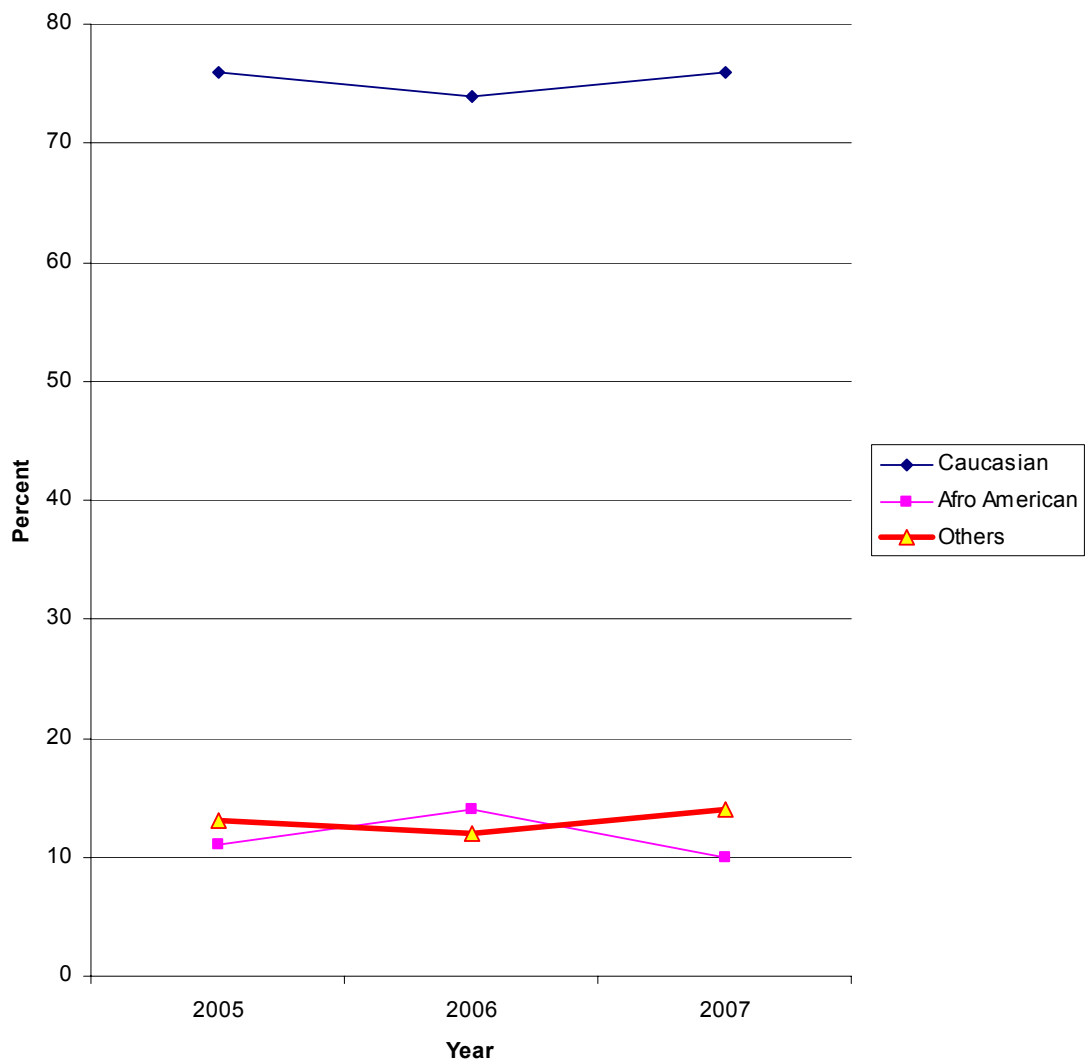


Figure 7 Robofest Ethnicity Data since 2005

Robofest allows the use of any robotics platforms. Figure 8 shows the data on robotics kits used by teams in North America and teams at the World Robofest. We do not have detailed data on teams in Korea and Singapore. 29% of robot kits were LEGO NXTs that were used for the first time. Even if it is using a powerful 32-bit micro processor, the performance of LEGO NXTs was almost similar to that of the other kits using 8-bit micro processors. Robofest remains focused on student participants learning computer programming. The programming languages used in Robofest 2007 are graphed in Figure 9. Student teams continue to use advanced and varied forms of programming languages. Allowing students to use any programming language they prefer is one of many unique features of Robofest. Robofest provides opportunities to learn professional programming languages, and helps to prepare our students for future career paths. Many of this year's game teams were using custom made sensors for short range object detection. Robofest students continue to show high technical skills and advancements in their abilities. We understand that this was possible because of many dedicated coaches and mentors.

How are Robofest teams formed? Figure 10 shows that most Robofest teams (37%) were learning and preparing for competition through after school programs. We found that a large portion of teams (17%) were from home schools.

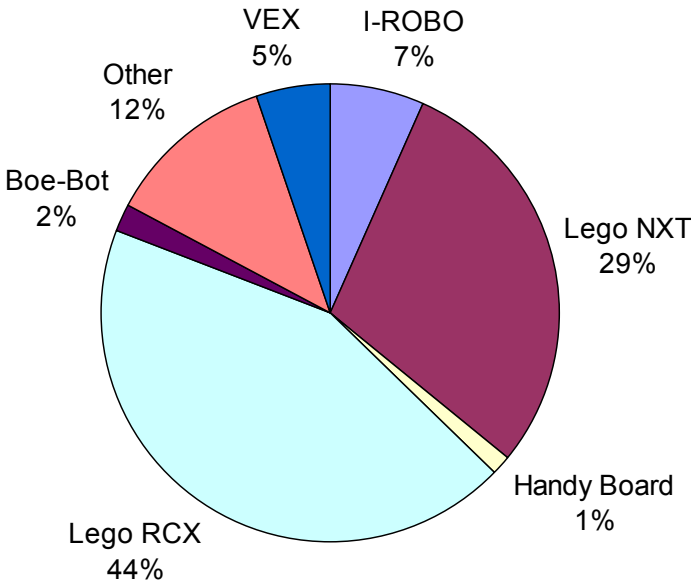


Figure 8 Robot Kits Used by teams

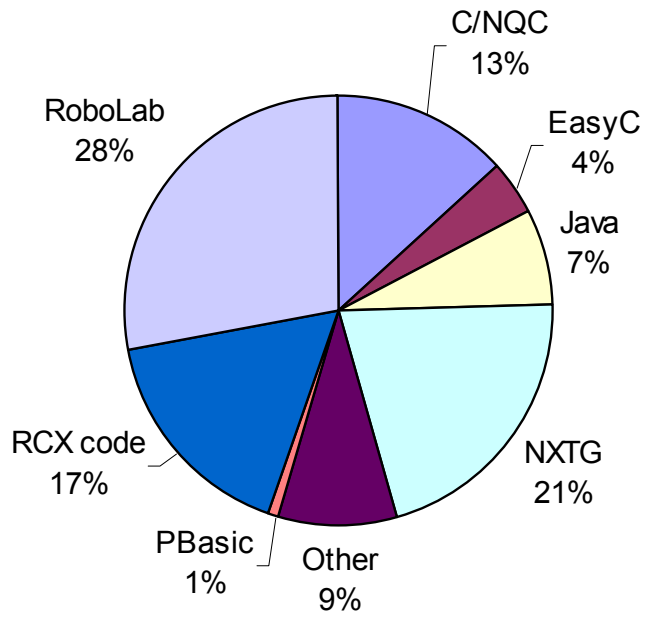


Figure 9 Programming languages used

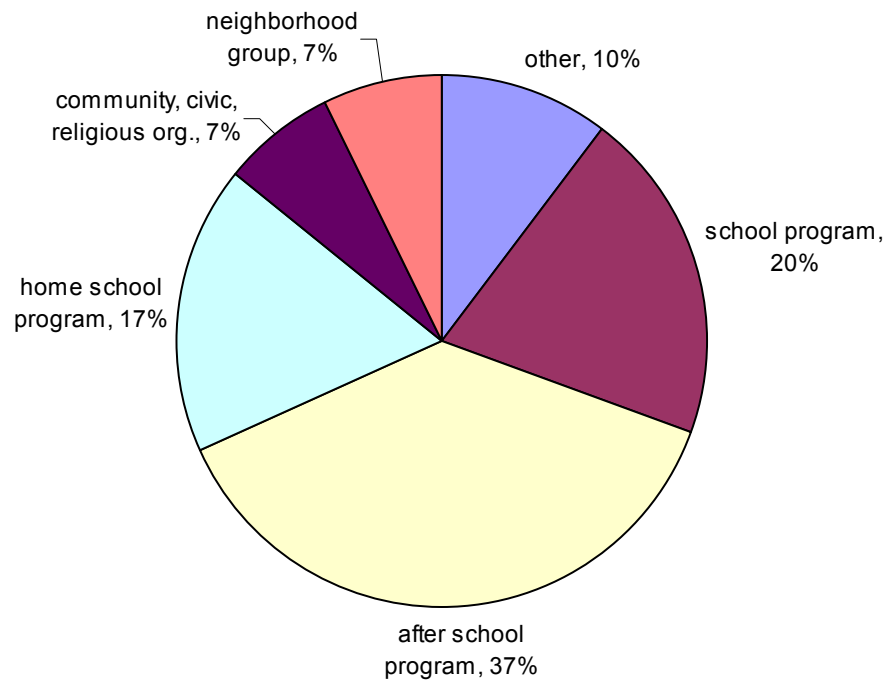


Figure 10 Team organization

2. Robofest 2007 Coach Survey Results

This section shows the results of the anonymous web survey conducted in September, 2007. 40 coaches participated in the survey.

Q: What area do you think is enhanced (or will be enhanced) through Robofest robotics?

other	0%
science/engineering	10%
computer technologies	7%
math	0%
creativity / entrepreneurship	0%
teamwork / leadership	2%
all areas listed above	81%

Q: For whom do you think the Robofest program should be designed?

other / not sure	7%
Students who demonstrate exceptional talent	7%
Only for students who are interested in science and engineering area	20%
every student	66%

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

not sure yet	10%
not likely	2%
Somewhat likely	12%
likely	10%
Very likely	65%

Figure 11 shows funding sources for teams. Still parents are the driving force of Robofest teams.

Answer a Question made an improvement. In 2006, 8% of coaches were unsatisfied. This year no one who participated in the anonymous survey was unsatisfied, but still it needs improvement as shown in figure 12. UP (Unknown Problem) was a new trial in 2007 season. An independent small programming challenge was given to the team prior to the start of the games. Even though 47% said excellent, relatively large teams (16%) were not satisfactory (see figure 13). We will review the UP methodology to provide better learning and assessment environment for every team. Figure 14 shows the overall satisfaction percentages this year. Figure 15 shows the change of overall satisfaction rates since 2005. When organizing a competition, it is not easy to satisfy everyone. However, we will try hard to maximize satisfaction rate for every team.

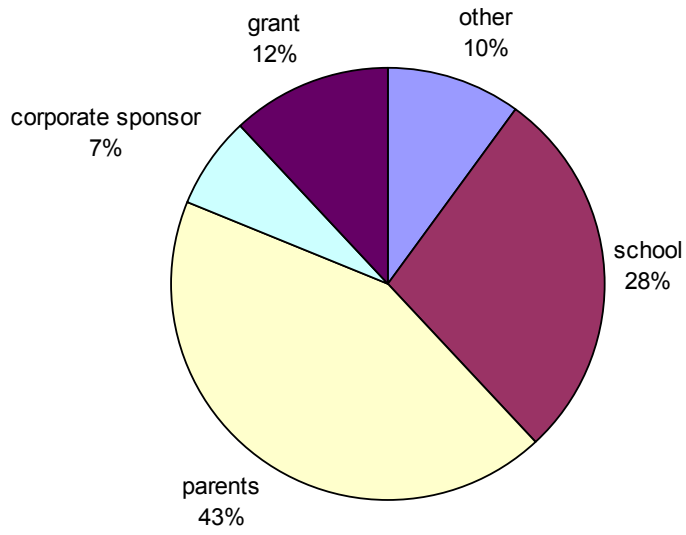


Figure 11. Team Funding Source

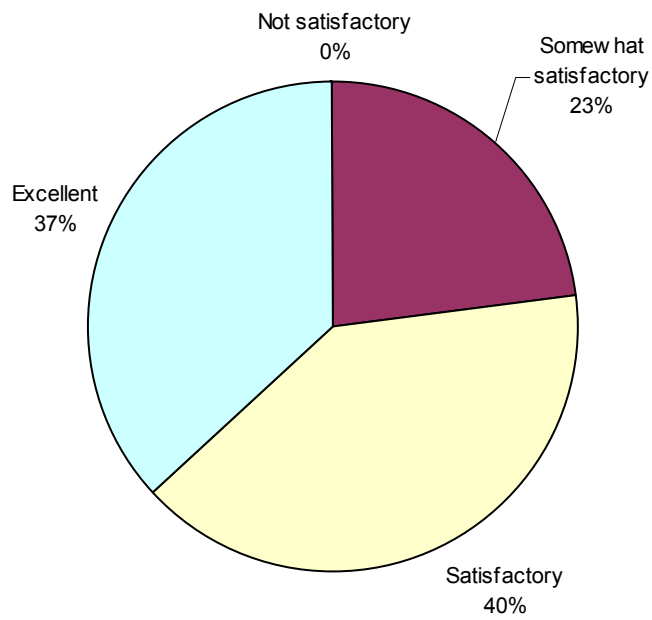


Figure 12. Answer a question survey result

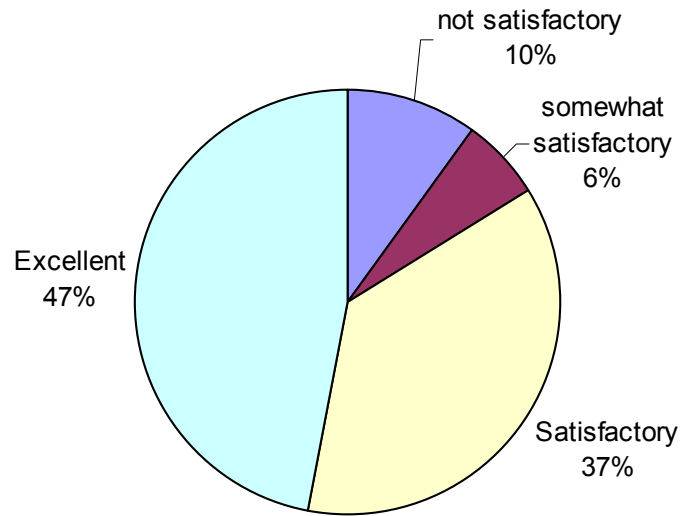


Figure 13. Unknown problem survey result

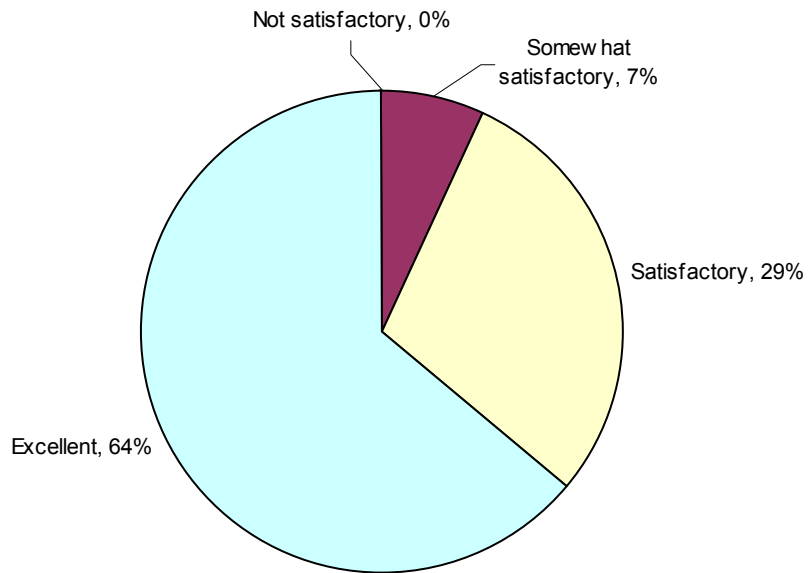


Figure 14. Overall Robofest Satisfaction

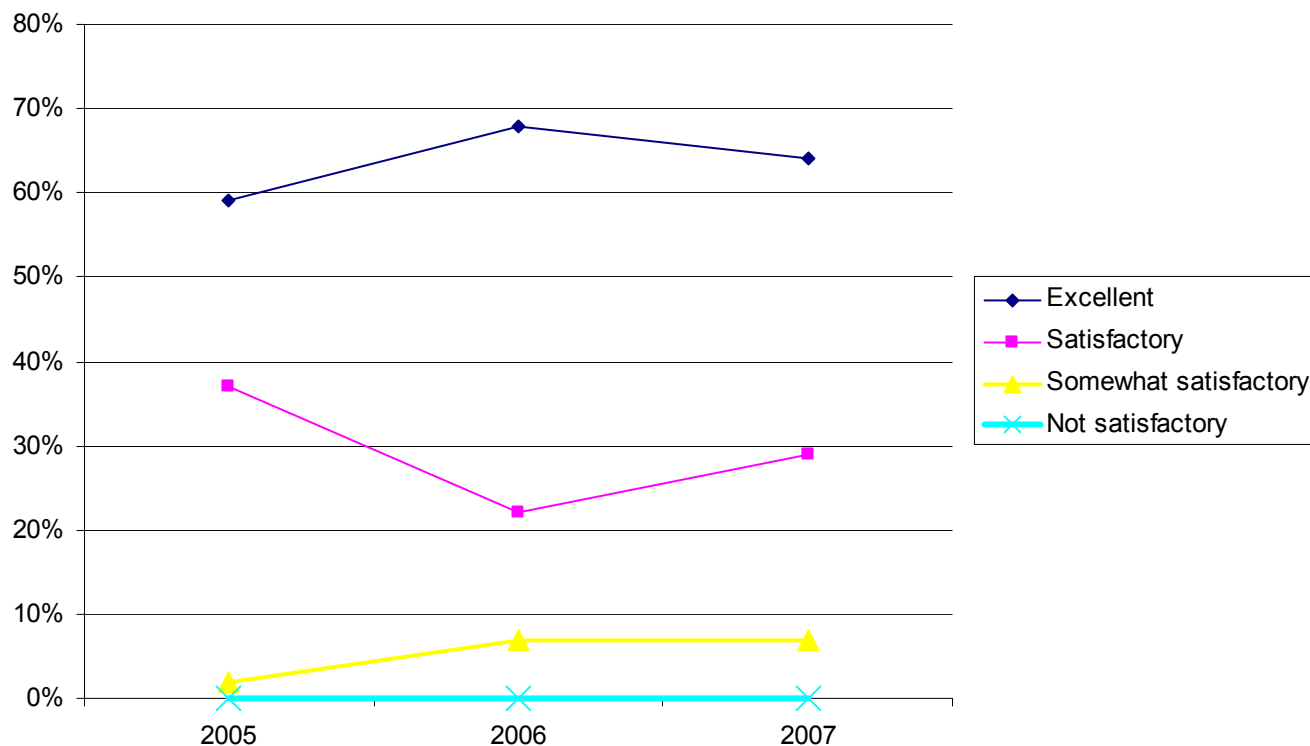


Figure 15. Overall satisfaction rate changes since 2005

3. Areas That Need Improvement

There were some glitches and problems during 2007 season. In order not to repeat the same mistakes again, we have identified the various facets of Robofest for enhancement and improvement in the coming years. In addition, I apologize that the publication of this report is late.

Rules for Advancing from Qualifiers

Some coaches were concerned about the rule to decide teams to qualify to advance from qualifiers. The general rule was: the number of teams to qualify is proportional to the number of total teams registered at that site. Also, we gave additional invitation tickets to the sites that hosted the event early. Some coaches suggested reserving some slots to make sure high scoring teams can advance when all site results are in. We plan to adopt this rule.

Judging

Judging rules were still complex and unclear in some cases. Some judges were not familiar with Robofest game rules. Judging was not completely open. Judging was not well recorded. In some cases, judging was not consistent. Some score sheet files were lost and not sent to Lawrence Tech. Head Judges need to be trained properly early on.

Some teams were very interested in knowing what the judges liked about their oral presentation and what they didn't like, so they could do a better job the next time. However, Robofest did not fully satisfy them.

Venue and Setup

High quality multimedia projector we rented did not work at Worlds!

The exhibition venue at the Worlds was still too dark, even though we prepared some lamps.

It was hard to see/hear the exhibition presentations and demonstrations, especially at the World. Playing fields setup was not consistent. Pit area at the world was too crowded.

Communications

- It was still not easy for new teams to find all the needed information on the web. We will work on a 2008 coach/team manual and publish it early.

- Teams need ways to share, interact, and collaborate with other teams.
- We must provide a way for coaches to network or communicate with other coaches
- 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 very advanced competitions and their achievements should be well publicized. We hope to improve media coverage for 2008.
- Need ways to publicize Robofest exhibitions.

Assessment

We did not do well in quantifying how much students improved their STEM knowledge and skills through Robofest. We plan a rigorous assessment methodology and web tools for the coming years.

Technical Support

More training sessions were needed or more multimedia online training materials must be developed.

Web Systems

- The operation of the registration system was not performed well. For example, less percentage of teams uploaded team pictures this year.
- There are inefficiencies caused by the team registration system, mailing list system, and volunteer system not being integrated. For example, some coaches receive too many same emails generated from the systems, if the coach registered for multiple roles.
- The connection between our registration system and PayPal was not reliable. As a result, our database was not updated accordingly even if the fee was paid. We had to manually check for maintaining the consistencies.
- The website must be more user friendly. Many files and information about the Robofest competition are still scattered on the web site. We must enhance our website by improving our navigation and search mechanism.

Budget

- Robofest Budget results for the 2007 season were as follows: \$33,457 in revenue, \$38,161 in expense which resulted in an overall loss of \$4,704. The revenue does not include the salary for half-time Robofest coordinator or LTU student assistants;
- Balance carried over from previous year was negative \$10,303. The current balance is negative \$15,007 as of June 30, 2007. We borrowed the deficit from LTU, but we must pay back sooner or later.
- Some Robofest teams did not pay registration fees. We plan to enhance the registration process for 2008

Event organization and scheduling

- The time gap between the challenge announcement and the competition was too long, especially at the World Championship.
- Few people had chance to watch demonstrations of exhibition teams; exhibitions were not so publicized.
- Exhibition judging and award ceremony were not well organized at the World Championship.
- More time (whole year) to work on the challenge; We may need to announce the game rules in the fall.
- The time length of the larger qualifying sites has been an issue. We must work harder to fine tune the contest schedule to ensure finishing on time. We need to simplify competition procedures.
- The complexity, size, logistics, and the cost of hosting outside Michigan teams was apparent for 2007 again.

4. Plans for Robofest 2008

- Pilot program for an assessment will begin using the web.
- We will strongly recommend exhibition teams to upload video clips to a site such as YouTube.com; We will require judges to watch the video before coming to the competition sites.
- Team registration fee will be increased for game and exhibition teams.
- We are considering a new program for the recognition of long time Robofest participants when they go to colleges.
- Provide tools for better communication between teams and coaches.
- New game materials may be considered instead of the multipurpose white boards.

5. Achievement and recognition

Data presented in previous sections strongly shows that we accomplished our intended objectives as listed below through Robofest 2007 season:

- To spark young students' interest in science, engineering and technology
- To promote imaginative, creative and innovative thinking and ideas
- To build globally competitive engineering work force of the future

Robofest had teams participating from five countries this year: USA, Canada, South Korea, Mexico, and Singapore. A team from Mexico participated in Video Submission Division. We wish they could grow more and send a team to the World Robofest next year. New categories such as Sumo, Fashion Show, and Mini Urban Challenge were successful and we plan to continue them.



Figure 16. World Robofest Championship Participants at Lawrence Technological University

For the third time since 2005, personalized individual trophies (see figure 17) were given to each student participant at the World Robofest Championships. This was possible due to our web-based team registration system that included individual student team player names. We thank all the coaches who entered their student names correctly and uploaded team/robot photos. As far as we know, Robofest is the only competition who recognizes each student's efforts by providing a trophy with student name engraved on a permanent metal plate. If your team member did not receive the personalized trophy at the World Robofest or framed certificate from the qualifying site, please let me (chung@LTU.edu) know.



Figure 17. Personalized Individual Trophies at the World Robofest

Robofest was blessed this year to have 17 corporate/foundation and nine individual sponsors. Without their support, Robofest would not be possible. Especially, we thank IEEE Region 4 PACE and SEM (Southeastern Michigan Section) for their sponsorship for IEEE medals of achievement (see Figure 18) that were awarded all the registered participants of Robofest 2007. List of all the sponsors can be found at www.robofest.net.



Figure 18. IEEE medal of achievement

We were very pleased to recognize five year coaches during the World Robofest. They include the following:

- Julie Braverman, 2003-2007
- Scott Eisele, 2003-2007
- Michael Wallis, 2003-2007

Robofest thanks Cranbrook Schools, Betsy Lamb, and Elmer Santos for their dedicated volunteer work for organizing and developing the VEX Pentathlon.

This year's game "Miner Rescue Challenge" was very difficult. Last year nine teams at regional qualifier sites and eight teams at the World Championships were able to achieve perfect performance scores at least one time. But this year only a team during the qualifying, and four teams during the championship were able to achieve perfect scores.

We are proud of Robofest that it is still low-cost and inexpensive, but provides relatively high quality environment for STEM education. We deeply thank everyone who has hosted, sponsored, volunteered for, and participated in Robofest 2007 season.

If you find any errors in this report, please let me know.

Respectfully,

CJ Chung,

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 September, 2007