Evaluation of Innovative Technology Experiences for Students and Teachers (ITEST) 2017-2017 Grant Activities

For

The Marine Advanced Technology Education (MATE) Center

August 2018

Submitted by:

SESRC

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Evaluation of Innovative Technology Experiences for Students and Teachers (ITEST) Grant Activities

For the Marine Advanced Technology Education (MATE) Center

BY: CANDIYA MANN & YI JEN WANG

SOCIAL & ECONOMIC SCIENCES RESEARCH CENTER, PUGET SOUND OFFICE

WASHINGTON STATE UNIVERSITY

AUGUST 2018

In September 2013, the National Science Foundation (NSF) funded the Marine Advanced Technology Education (MATE) Center's proposal for an Innovative Technology Experiences for Students and Teachers (ITEST) grant. The MATE Center's ITEST program, titled *Scaling up Success: Using MATE's ROV Competitions to Build a Collaborative Learning Community that Fuels the Ocean STEM Workforce Pipeline*, leverages their extensive network of remotely operated vehicle (ROV) student competitions. The project's overarching goal is to encourage multi-year student participation in an effort to deepen student interest and learning and reinforce pathways leading to the STEM workforce.

The evaluation is based on multiple data sources, primarily surveys and interviews, and reflects the input of a variety of stakeholders, including students, teachers, parents, judges, volunteers, regional coordinators, and MATE management and staff. This report covers grant activities that took place between May 16, 2017 and June 30, 2018.

Findings

Project Goal 1: Increase middle and high school students' interest in STEM and STEM careers, as well as their knowledge of STEM and understanding of how science and engineering work together to solve real-world problems.

- **Increased Awareness of STEM Careers:** After building their ROV, over three-quarters of the students (80%, N=1,931) indicated that they knew more about careers in marine STEM.
- **Increased Interest in STEM Careers:** Seventy-seven percent (77%) of the students (N=1,931) stated that their ROV project made them more interested in pursuing a STEM career, and 87% of the teachers (N=345) observed an increase in their students' interest in pursuing a STEM career. Ninety-seven percent (97%, N=340) agreed that the ROV program provided a valuable venue to help prepare their students for STEM careers.

- **Increased Interest in STEM:** Eighty-six percent (86%) of the students (N=1,919) indicated that their ROV project made them want to learn more about STEM. Ninety-six percent (96%) of the teachers (N=345) and 94% of the parents (N=280) observed greater interest among the students in learning STEM.
- **Increased STEM Knowledge & Skills:** The great majority of the students reported increased skills and knowledge due to their ROV project in several subjects: engineering (93%, N=1,918), technology (91%, N=1,907), science (79%, N=1,912), the competition theme (76%, N=1,907), and math (64%, N=1,908). The majority of the teachers (98%, N=340) observed improvements in their students' STEM knowledge and skills. Parents reported that building an ROV contributed to improving their children's grades in engineering/robotics (54%, N=386), science (57%, N=393), math (46%, N=390) and computers (42%, N=388).
- **Increased 21st Century Skills:** Students agreed that participating in the ROV project improved their skills in problem solving (86% agreed or strongly agreed, N=1,913), teamwork (86%, N=1,923), critical thinking (83%, N=1,912), self-confidence (75%, N=1,921), leadership (73%, N=1,918), and organization (68%, N=1,914). Ninety-six percent (96%, N=345) of the teachers observed increases in their students' skills in team building, problem solving, and/or critical thinking. Parents reported that their children were better problem solvers (97%, N=391), critical thinkers (94%, N=390), team members (96%, N=393), and/or leaders (91%, N=392).
- **Overall Rating of MATE Center Support:** After the competition season, 52% of the teachers (N=346) rated the support provided by MATE as excellent, and 37% provided a rating of good, for an overall positive rating of 89%.
- **Overall Opinions of ROV Program:** The ROV program was rated positively (excellent or good) by 91% of the students N=1,936), 98% of the teachers (N=346) and 96% of the parents (N=393).
- **Ability to Apply STEM to Real World Problems:** In the post-competition surveys, 87% of the students (N=1,924) indicated that participating in the ROV project helped them learn to apply STEM to real world problems, and 95% of the teachers (N=345) observed improvements in their students' abilities in this area, as did 94% of the parents (N=389).
- **Ability to Communicate Engineering Process and Designs to a Wide Audience:** Eighty-five percent (85%) of the students **(**N=1,928) stated that participating in the ROV project helped them learn how to communicate their engineering design to other people. Ninety-three percent (93%) of the teachers/mentors (N=344) observed improvements in their students' skills in this area.
- **Influence on Students' Educational and Career Paths:** ROV Competition Student Alumni Survey results include the following:
    - Among the 220 alumni who earned a college degree, 85% earned a degree in a STEM discipline.
    - Among the 236 current college and university students, 85% are studying towards a STEM degree.

- Among the employed alumni (N=320), 73% are currently working a STEM-related job, and 22% currently or previously worked a job related to ROVs or other underwater technologies.
- Two-thirds (67%, N=432) of the alumni credit the ROV competition with influencing their educational or career path "to a great extent" or "somewhat".
- The ROV competition played a role in alumni attaining employment (37%), admittance into educational programs/college/university (36%), internships (30%), awards (21%), and scholarships (21%).

- **Effect of Multi-Year Competition Participation:** Multi-year participants were statistically significantly more likely to report their participation in the ROV program resulted in higher levels of awareness of and interest in pursuing STEM careers, gains in interest in taking STEM courses, improvements in STEM knowledge and skills, increased 21st Century skills, and the receipt of awards, honors, and new educational and career opportunities.
- **Impacts among Underrepresented Groups:** According to the demographic data in the surveys (N=1, 939), the students were 32% female; 39% were of minority backgrounds; 39% came from high poverty areas; and 3% reported that they had disabilities requiring accommodations. Statistically significant differences existed between the groups (gender, ethnicity, socioeconomic status, and disability status) in the following measures: (Note that there were no statistically significant differences between the gains made by students with and without disabilities in any of these measures.)
  - ***Awareness of and Interest in STEM Careers:*** Male participants were more likely than female participants to cite the competition as influencing them towards a STEM career. Minority students were more likely than white students to indicate that the competition led to gains in knowledge of and interest in STEM careers.
  - ***Interest in STEM Topics:*** Males were more likely to report increased interest in computer science and engineering courses. Minority students were more likely to report increased interest in engineering, math, and computer science courses. Students in low poverty areas were more likely to indicate that the competition increased their desire to take hands-on classes or club activities.
  - ***STEM Skills and Knowledge:*** Male students were more likely to report increased skills and knowledge in engineering and technology. Females were more likely to report increased knowledge of the competition theme. Minority students were more likely to report gains in skills and knowledge in science, math, and the competition theme. Students living in a lower poverty areas were more likely to report gains in skills and knowledge in engineering.

Project Goal 2: Provide teachers with professional development, instructional resources, and mentors to support and sustain the delivery of STEM career information and learning experiences.

- **Increased Confidence Facilitating STEM Learning Experiences:** The percentage of workshop survey respondents who rated themselves as "very comfortable" facilitating STEM learning experiences for students rose between the pre (N=131) and post (N=124) workshop surveys in all STEM areas: science (pre: 50%, post: 59%), technology (pre: 40%, post: 45%), engineering (pre: 31%, post: 44%), and math (pre: 40%, post: 42%).
- **The MATE Community:** Among the post-competition surveys, 85% of the teachers (N=334) agreed that they felt they were part of a MATE community that provides support and relevant resources.
- **MATE Robotics Activities/Curriculum Incorporated into Courses and after-School Programs:** Seventy-one percent (71%) of the post-competition teacher survey respondents (N=342) incorporated building ROVs into an after-school club. Twenty percent (20%) built ROVs as part of a course; 22% built ROVs as a voluntary activity; and 4% built ROVs in another venue.
    - Over three-quarters (76%) of the competition teachers (N=341) stated that they used MATE materials and resources to incorporate ROV building into their course or club, and over half (51%) modified their curriculum and teaching based on MATE resources.
    - In the one-year follow-up survey of the week-long, intensive 2017 Summer Institute, eight of 10 participants built ROVs with students. A total of 31 ROVs were built with 125 students.
- **Classroom Mentors:** In several regions, the regional coordinator matched up college and high school students – in many cases, former ROV competitors themselves – with middle school ROV teams to work with them throughout the competition season. For 23% of the post-competition teacher survey respondents (N=331), a classroom/club mentor came to their site to help their teams. Among these teachers, more than half (57%) indicated that the mentor helped them incorporate robotics into their course or club to "a great extent". The majority of the respondents (91%, N=98) indicated that their mentors were adequately prepared to help them and their students through the ROV design and building process.

Project Goal 3: Increase parental involvement in order to support and encourage students to pursue STEM education and careers.

- **Increased Parental Support of Their Children's Interest in STEM:** Eighty-nine percent (89%) of the parents (N=393) indicated that participation in the ROV program changed how they envisioned their child's future, making it easier to picture their child with a STEM career.
- **Enhanced Online Resources:** The online Parent Resource Center was launched in the spring of 2015. It contains competition videos, frequently asked questions, background

information, highlights, and contact information for the MATE Center, along with types of information that the MATE Center can provide upon request. Anecdotal feedback indicates that the parents found the resources helpful.

- **Regional Advisory Committees:** Advisory committees included participation from parents as well as industry representatives, professional organizations, government agencies, 6-12th grade educators, community college faculty, and university faculty. In 2017-2018, 10 regions held advisory committee meetings, and nine of them included parents.

Conclusions

The MATE Center successfully implemented the 2017-2018 year of ITEST grant activities. The 2018 MATE ROV Competition was held, with ITEST funding helping to support 14 of 21 US-based regional events. A total of 410 regional workshops were held for teachers and students, and 20 teachers attended the intensive Summer Institute professional development. The Center disseminated a suite of online instructional materials, including videos, PowerPoints, ROV kits, and an online course.

Evaluation results continue to show strong positive outcomes for students and teachers. Involvement in the ROV competition generated greater awareness of and interest in pursuing STEM careers; increased interest in studying STEM topics; improved STEM knowledge and skills; and increased teamwork, critical thinking, leadership, and problem solving skills. Participating in the ROV competition helped students learn how to apply STEM skills to real world problems. They also learned how to communicate their engineering process and design to a wide audience.

ROV competition student alumni survey results and National Student Clearinghouse match analysis suggest that the majority of ROV competition participants go on to study STEM topics, earn STEM degrees, and work in STEM fields. In fact, roughly one in five former participants have worked in a job related to ROVs or other underwater technologies. The majority of ROV competition alumni credit the ROV competition with influencing their educational and career paths, including playing a role in attaining internships, scholarships, admittance to educational programs, and employment.

These findings suggest that the MATE ROV Competition is effective in increasing the STEM workforce, especially related to underwater technologies.

INTRODUCTION

In September 2013, the National Science Foundation (NSF) funded the Marine Advanced Technology Education (MATE) Center's proposal for an Innovative Technology Experiences for Students and Teachers (ITEST) grant. The MATE Center's ITEST program, titled *Scaling up Success: Using MATE's ROV Competitions to Build a Collaborative Learning Community that Fuels the Ocean STEM Workforce Pipeline*, leveraged their extensive network of remotely operated vehicle (ROV) student competitions. The project's overarching goal is to encourage multi-year student participation in an effort to deepen student interest and learning and reinforce pathways leading to the STEM workforce.

As stated in the proposal, the goals are fourfold:

1. Increase middle and high school students' interest in STEM and STEM careers as well as their knowledge of STEM and understanding of how science and engineering work together to solve real-world problems.
2. Provide teachers with professional development, instructional resources, and mentors to support and sustain the delivery of STEM learning experiences and career information.
3. Increase parental involvement in order to support and encourage students to pursue STEM education and careers.
4. Track students longitudinally to document how participation impacts their education and career path.

This report covers grant activities that took place between May 16, 2017 and June 30, 2018. The MATE Center's ITEST grant evaluation was performed by the Puget Sound Division of the Social and Economic Sciences Research Center at Washington State University.

Methodology

The evaluation connects each of the project goals with evaluation questions and expected outcomes of the project. These goals and evaluation questions are presented below.

Table 1: Project Strategies and Evaluation Questions

Project Goal	Evaluation Questions
1. Increase middle and high school students' interest in STEM and STEM careers as well as their STEM knowledge and understanding of how science and engineering work together to solve real-world problems. • Add SCOUT+ class • Support for students who want to continue competition at next grade/school • Mentoring from students/industry professionals • Career advice/videos	1.1. To what extent did the MATE robotics activities lead to an increase in the students' interest in and knowledge of STEM content and STEM careers? Did educators and parents observe an increase in the students' interest in STEM content and STEM careers as a result of the robotics activities? An increase in the students' STEM knowledge and skills and 21st Century workplace skills?
	1.2. How did the robotics activities affect students' ability to apply STEM knowledge and skills to finding solutions to real-world problems?
	1.3. How did the robotics activities affect students' ability to communicate their engineering process and designs to a wide audience (from engineers and technicians to the general public)?
	1.4. How did participation in the robotics activities influence students' educational and career paths?
	1.5. What effect did multi-year participation have on the above evaluation questions?
	1.6. Did the robotics activities create the same impacts among underrepresented groups (by gender, ethnicity, socio-economic status, disability) as were found among students who traditionally participate in these types of activities?

2. Provide teachers with professional development, instructional resources, and mentors to support and sustain the delivery of STEM career information and learning experiences. • Curriculum continuum • Progression of ROV kits • Professional development workshops • Regional workshops • Regional teacher-leaders • Increase preparedness of mentors	2.1. Are teachers more confident delivering STEM learning experiences? Delivering career information and outlining career pathways?
	2.2. Do teachers feel they are a part of a larger MATE community that provides support and relevant, necessary resources?
	2.3. Do teachers incorporate MATE robotics activities/curriculum into courses and afterschool programs? Are the courses and/or curriculum adopted by school districts?
	2.4. Are teachers able to access classroom mentors as needed? Do the classroom mentors help them successfully incorporate robotics activities into the course? Are the classroom mentors adequately prepared?
3. Increase parental involvement in order to support and encourage students to pursue STEM education and careers. • Parent online resources/listserv • Regional parent advisory committees	3.1. Did the MATE robotics activities lead to an increase in the parents' support of their children's interest in STEM careers? 3.2. Did the enhanced parent online resources lead to an increase in the parents' ability to provide assistance and support for their children's involvement in the MATE robotics activities? 3.3. Did the regional parent advisory committees provide feedback and advice to help improve the competitions and ensure that the program is inclusive of all participants?

DATA SOURCES

The evaluation relies upon multiple sources of data. The data collection includes input from a variety of stakeholders, including students, teachers, parents, judges/volunteers, regional coordinators, and MATE staff. Below are descriptions of each of the data sources. All of the surveys were developed in collaboration with MATE staff and regional coordinators.

Student Follow-up

The evaluation includes several student follow-up efforts: 1) the Washington State Follow-up, 2) The ROV Competition Student Alumni Survey, and 3) the National Student Clearinghouse Data Match.

WASHINGTON STATE FOLLOW-UP

Background: As part of the ITEST proposal, the Washington State Education Research and Data Center (ERDC) agreed to match the 2006-2013 ROV competition program participants from Washington with the ERDC P-20 data and also to create a comparison group. They agreed to return high school, postsecondary, and workforce data. The economics section of the Washington State Office of Financial Management (OFM) Forecasting division agreed to do the statistical analysis of the ERDC data.

This analysis will explore two main research questions:

1) To what extent are the ROV competition participants the same/different from the general population of students, and

2) What is the impact of the ROV competition on the probability of attending college, studying STEM, persisting, and completing college degrees?

2017-2018 Update: Over the past four years, MATE and the evaluator have coordinated with ERDC to come to an agreement on work and budget. The evaluator has sent student participant data to ERDC several times for matching, and ERDC did preliminary matches in 2014-2015 and 2015-2016. Unfortunately, as of the end of this grant year, we do not have a signed contract, and no substantial work has taken place. We attribute this lack of progress to the fact that the analyst within ERDC at the time of the proposal, who was a strong champion for this research project, passed away unexpectedly shortly after the proposal was funded. ERDC has been extremely busy and has had limited personnel to assign to our project.

ROV COMPETITION STUDENT ALUMNI SURVEY

In June of 2015, we conducted the ROV Competition Student Alumni Survey. The goal of the alumni survey was to answer the questions: "Where are they now?" and, "To what extent did their involvement with MATE influence their trajectory?" The survey included questions about their higher education, employment, internships, scholarships and other opportunities that opened due to their involvement with the ROV competition. We plan to conduct another alumni survey in early fall 2018.

NATIONAL STUDENT CLEARINGHOUSE DATA MATCH

Background: The National Student Clearinghouse (NSC) is a nationwide source of higher education information. Colleges and universities, numbering over 3,400 institutions enrolling over 96% of college students, share their enrollment data with NSC. The NSC database includes over 130 million students. See http://www.studentclearinghouse.org/ for further information about the NSC.

2017-2018 Progress: A total of 3,974 former competition participants (aka "alumni") were identified for matching with National Student Clearinghouse (NSC) data in the May of 2017. These alumni have birthdates that indicate that they are at least 18 years of age as of May 2017, and their addresses suggest that they live within the United States. Two-thirds of the alumni (66%, or 2,633) were found in the NSC database. We plan to conduct another match with the NSC data in early fall 2018.

Curriculum and Online Instructional Resources

PRE-POST KNOWLEDGE TESTS

In the ITEST proposal, the MATE Center proposed creating a complete curriculum, tied to standards, with pre-post knowledge tests corresponding to each module. In 2014-2015, the MATE Center changed focus in response to user feedback in an intensive set of 103 interviews conducted as part of an NSF I-Corps grant. Rather than a complete curriculum, PIs determined that teachers preferred online resources that they could incorporate into their own curricula.

With this information regarding teacher preferences, the MATE Center has changed focus from designing a complete curriculum to designing a well thought out menu of online curriculum modules and supporting resources, such as instructional videos, PowerPoint presentations, and other activities.

In 2016-2017, MATE began transitioning their educational resources to Google Slides, which allow for quick and easy updating. They have continued their transition to the Canvas Learning Management System. At this point, five courses are hosted on Canvas, and 600 educators have enrolled in at least one of these courses. There is one course aligned with each competency/ROV kit level, plus the *Diving into Underwater Sensors and Arduino* course. These courses include quizzes and worksheets.

Canvas offers the capability for educators to clone these courses and offer them to their students. MATE will be able to monitor student performance on the cloned courses. The cloned courses will provide valuable data for the evaluation because they solve the logistical problem of asking teachers to provide their students' test data to MATE. With this approach, the teachers will administer the assessments, and the data will be available to MATE seamlessly.

ROV Competitions

Background: At the ROV competitions, input was solicited from as many stakeholders as possible, including students, teachers, parents, and judges/volunteers. The competition surveys were primarily administered as paper surveys in a "scannable" format; there was a web option as well. Data entry was completed by scanning the surveys and entering the written comments by hand. Data analysis was performed with the Statistical Package for the Social Sciences (SPSS). Student and parent surveys were offered in Spanish as well.

POST-COMPETITION SURVEYS: STUDENTS

At the ROV competitions, students were asked to complete surveys. The survey protocol was a modified version of the student survey that has been administered to more than 7,657 students over the past nine years at regional and international ROV competitions. The survey covered the following topics: awareness and interest in ocean STEM careers, increased desire to take STEM courses due to involvement in the program, awards/honors received as a result of competition experience, and self-assessment of change in STEM knowledge.

POST-COMPETITION SURVEYS: TEACHERS

Teachers also completed surveys at the ROV competitions. The survey protocol was a modified version of the faculty/mentor survey that has been administered to more than 1,593 respondents over the past nine years at ROV competitions. The survey addressed topics such as the value of the competition, incorporation of competition into course curriculum, interest in participating in future competitions, assessment of change in their students' STEM knowledge and skills, 21st Century skills, interest in STEM careers, and related topics.

POST-COMPETITION SURVEYS: PARENTS

In contrast to the student and teacher surveys, which have been conducted for years at MATE ROV competitions, the 2010 competition season was the first time parent input was solicited. Parents responded enthusiastically and seemed to appreciate the opportunity to provide input. Parent surveys

addressed the topics of parental support of their children's interest in STEM and STEM careers, the value of the competition, and changes they have observed in their children since they became involved in the program.

POST-COMPETITION SURVEYS: JUDGES

In the 2011 competition season, input was solicited for the first time from industry representatives serving as judges at the competitions. This survey collects information on the judges' experience at the competition, whether they feel it was a worthwhile use of their time, the skills of the students they observed, and their opinions on the usefulness of the competition in preparing future employees.

PSYCHOMETRIC ANALYSIS: VALIDATION OF SCORING RUBRICS, IMPROVING INTERNAL CONSISTENCY OF POST-COMPETITION SURVEYS

2017-2018 Update: In 2017-2018, the MATE Center continued the valuable collaboration with Dr. Min Li, Associate Professor at the University of Washington's Department of Education. In this grant year, Dr. Li focused on aligning the competition scoring rubrics with the competition manual and the standards from the engineering portion of the Next Generation Science Standards.

Regional Workshops

PRE AND POST TEACHER WORKSHOP SURVEYS

Pre and post paper surveys were administered to teacher workshop attendees at the beginning of the workshop day and at the end of the training. The surveys addressed issues of teacher confidence facilitating STEM learning experiences, commitment to bringing a team to competition, concerns about mentoring students in designing and building an ROV, expectations of the workshops, and additional ways that the regional coordinators and the MATE Center could support the participants.

Summer Institute

IMMEDIATE FEEDBACK AND SIX-MONTH FOLLOW-UP SURVEYS

The evaluation of the Summer Institute is a two-step process, collecting feedback from the participants immediately after the Institutes (using the Institute feedback surveys) then again a year later (using the Institute follow-up surveys). The follow-up surveys intend to measure the Institutes' longer-term impact and, in particular, to compare participants' actions once they returned to their classrooms with the

intentions they had expressed at the close of the Institute. Because of the timing of the Summer Institute and the evaluation reporting, this evaluation covers the 2017 Summer Institute.

Other Data Sources

Additional data sources informing the evaluation include the annual reports turned in by the regional coordinators to the ITEST grant PI, observations of the Pacific Northwest regional competition and international competition, review of participation data, unsolicited letters sent from students, parents and teachers, website review and document review, including supporting technical materials and the MATE Center's annual report.

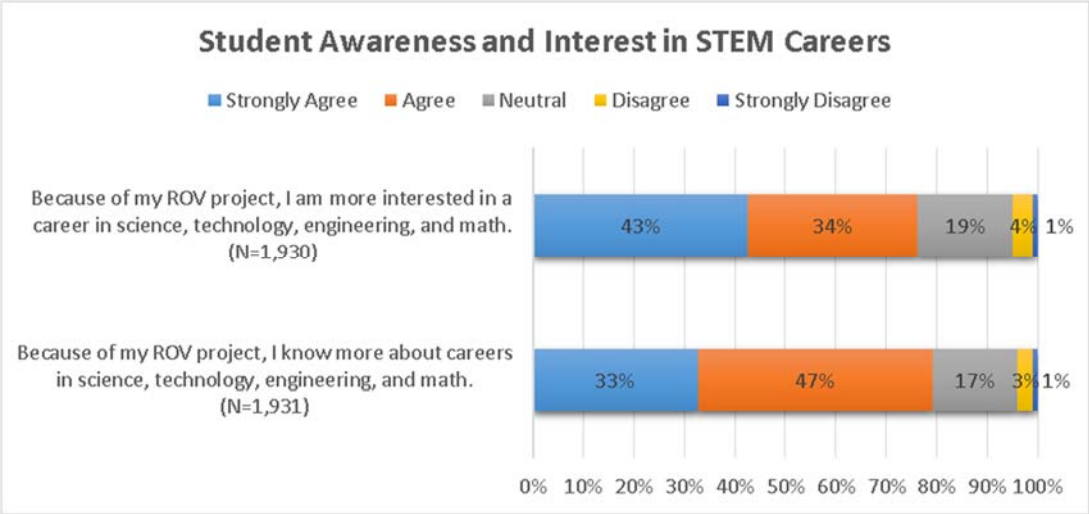
FINDINGS

Project Goal 1: Increase middle and high school students' interest in STEM and STEM careers, as well as their knowledge of STEM and understanding of how science and engineering work together to solve real-world problems

Evaluation Question(s) 1.1. To what extent did the MATE robotics activities lead to an increase in the students' interest in and knowledge of STEM content and STEM careers? Did educators and parents observe an increase in the students' interest in STEM content and STEM careers as a result of the robotics activities? An increase in the students' STEM knowledge and skills and 21st Century workplace skills?

Increased Awareness of and Interest in STEM Careers: In the post-competition surveys, over three-quarters of the students (80%, N=1,931) indicated that due to their ROV project, they knew more about careers in science, technology, engineering, and math (STEM), and 77% (N=1,930) stated that their ROV project made them more interested in pursuing a STEM career.

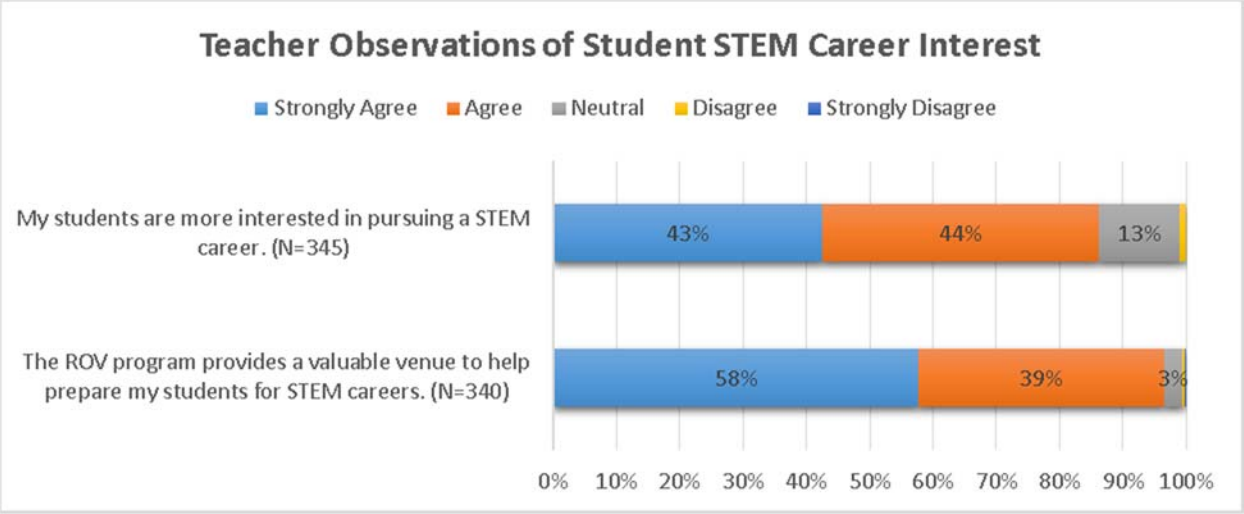
Figure 1: Effect of ROV Project on Students' Awareness and Interest in STEM Careers



Overall, 79% of the students (N=1,915) were interested in a STEM career; 17% were not sure, and 4% were not interested in a career in these fields. Students mentioned wanting careers such as computer engineer, cyber security, robotics engineer, mechanical engineer, biomedical engineer, aeronautical engineer, airplane engine engineer, and astronaut. Students noted that their experience in the ROV program sparked their interest in STEM careers, with comments such as the following: "I really enjoyed the experience of building and driving robot because it taught me new skills in dealing with technology and evoked my interest in STEM overall," and "I'm looking forward to a career in STEM because of MATE."

Among the teachers/mentors who completed post-competition surveys, 87% (N=345) indicated that they had observed that their students were more interested in pursuing a STEM career since they began designing and building their ROVs. Ninety-seven percent (97%, N=340) agreed that the ROV program provided a valuable venue to help prepare their students for STEM careers.

Figure 2: Teacher Observations of Student STEM Career Interest



Parents also noted an increased awareness and interest in STEM careers; 89% (N=396) agreed or strongly agreed that due to the ROV project, their child(ren) know more about STEM careers (51% strongly agreed, 38% agreed, 10% neutral, 1% disagreed, 0% strongly disagreed, and 1% don't know).

Also, 85% (N=395) agreed that participating in the ROV project has led their children to be more interested in pursuing a STEM career (54% strongly agreed, 31% agreed, 14% neutral, 1% disagreed, 0% strongly disagreed, 0% don't know). Parents described their children's interest in STEM careers in comments such as the following: "He has switched career course from marine biology to environmental engineering."

Increased Interest in STEM: Eighty-six percent (86%) of the students (N=1,919) stated that their ROV project made them want to learn more about science, technology, engineering, and math (50% strongly agreed, 36% agreed, 12% neutral, 1% disagreed, and 1% strongly disagreed). As one student explained his experience, "This program has raised my outlook on building and engineering dramatically. I would love to work more and learn more about underwater ROV's."

Students indicated that their ROV projects increased their desire to take courses in engineering (75%, N=1,923), science (72%, N=1,921), computer science (68%, N=1,916), math (61%, N=1,910), and other hands-on classes or club activities like robotics, electronics and shop courses (86%, N=1,916). (See *Figure 3* below.) One student saw the connection between the competition and his or her courses in the following quote: "It's an amazing experience that has helped me succeed in other classes. It's been outstanding."

In the post-competition survey, 96% of the teachers/mentors (N=345) indicated that their students were more interested in learning about science, technology, engineering and math (53% strongly agreed, 43% agreed, 4% neutral, 0 % disagreed, 0% strongly disagreed).

ROV Program Testimonials

Students

The world is become a place full of the wonders of science and engineering, and for me to have the opportunity to meet aspiring engineers and to learn about ROVs in my own school was wonderful.

It has showed me much ado about who I am, what I like and my interests for the future.

Parents

My child is a confident, well-traveled problem solver now. His engineering and technology skills have improved, and his connection to real-world businesses and sponsors is awesome.

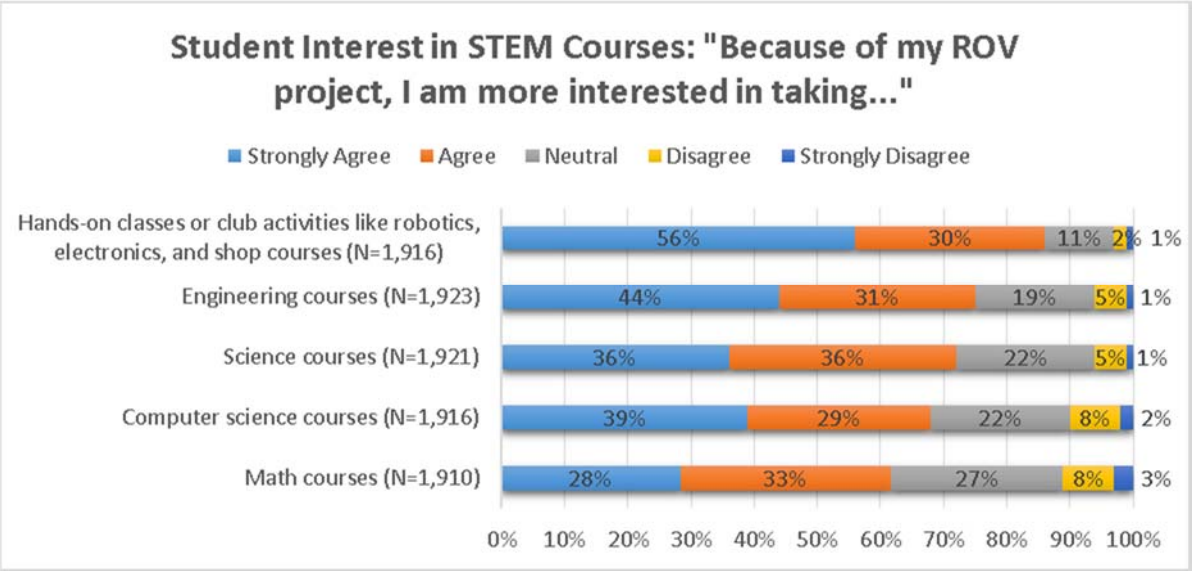
As a parent, I love getting to see my son apply what he is learning. It makes math and science feel relevant, meaningful, and purposeful, which motivates lifelong learners.

She joined "for a boy" and lack of interest in the other electives... 6 weeks ago she told me she wants to lead next year and loves doing this. Thank you!

Faculty/Mentors

This competition actually does create the opportunities for learning that we want all of our students to have: collaboration with peers, communication of your work and process, problem solving, overcoming obstacles, dealing with setbacks/failure.

Figure 3: Effect of ROV Project on Students' Interest in STEM Courses

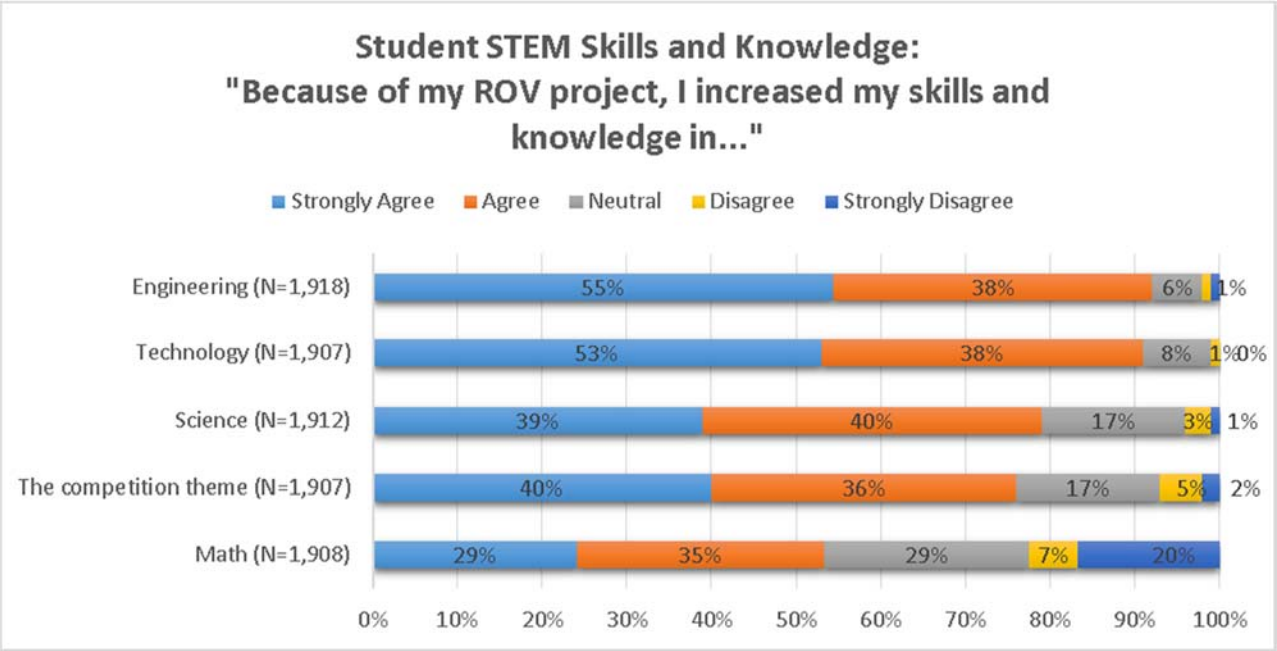


Parents concurred with the other sources reporting increased student interest in STEM. Ninety-four percent (94%) of the parents surveyed (N=280) stated that building an ROV has made their child more interested in learning about science, technology, engineering or math (62% strongly agreed, 33% agreed, 5% neutral, 0% disagreed, 0% strongly disagreed).

Increased STEM Knowledge and Skills: In the post-competition surveys, students reported increased skills and knowledge due to their ROV project in several subjects: engineering (93%, N=1,918), technology (91%, N=1,907), science (79%, N=1,912), the competition theme (76%, N=1,907), and math (64%, N=1,908). Students noted their increased STEM skills in comments such as the following:

> *This is a great experience that really taught me about engineering.*
>
> *The program has strengthened my leadership skills, math, engineering, and it makes me excited about my future career.*
>
> *Being on my ROV team has allowed me to get hands-on experience before I begin to study engineering this fall at NCSU. I am so grateful for the MATE program and competition for providing me a platform for young STEM students.*

Figure 4: Effect of ROV Project on Students' STEM Skills and Knowledge



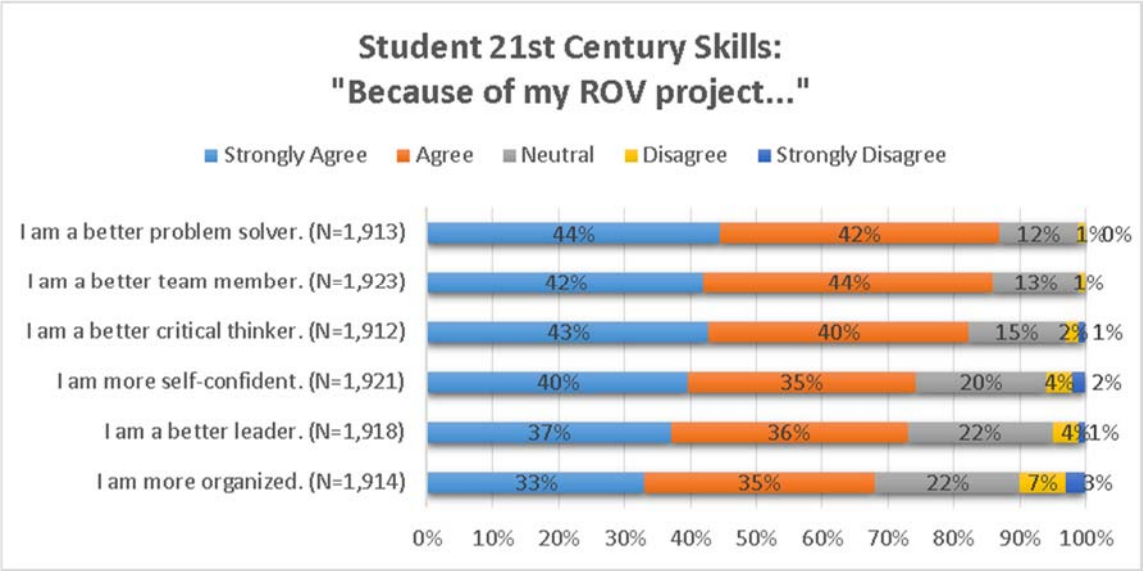
Among the teachers/mentors who completed post-competition surveys (N=340), 98% of the respondents reported that they observed improvements in their students' STEM knowledge and skills (70% strongly agreed, 28% agreed, 1% neutral, 0% disagreed or strongly disagreed).

Parents reported that building an ROV contributed to improving their children's grades in engineering/robotics (54%, N=386), science (57%, N=393), math (46%, N=390) and computers (42%, N=388).[1]

Increased 21st Century Skills: Students reported that participating in the ROV project improved their problem solving (86% agreed or strongly agreed, N=1,913), teamwork (86%, N=1,923), critical thinking (83%, N=1,912), self-confidence (75%, N=1,921), and leadership (73%, N=1,918). Students also reported increased organization skills (68%, N=1,914).

[1] Percentages are calculated among students studying each topic.

Figure 5: Effect of ROV Project on Students' 21st Century Skills



In responses to open-ended survey questions, students also described gaining 21st Century skills through their experiences building an ROV, such as the following:

> *I have learned teamwork, problem-solving, and have enriched my interests in STEAM.*
>
> *It helped me learn how to handle failure.*
>
> *This program has allowed me to not only expand my creativity, but I've learned to also work as a team member and leader.*

In the post-competition surveys, 96% of the teachers/mentors (N=345) mentioned that they observed increases in their students' skills in team building, problem solving, and/or critical thinking (67% strongly agreed, 28% agreed, 4% neutral, 0% disagreed, 0% strongly disagreed). Teachers/mentors saw skill development in many areas, as evidenced by their written comments:

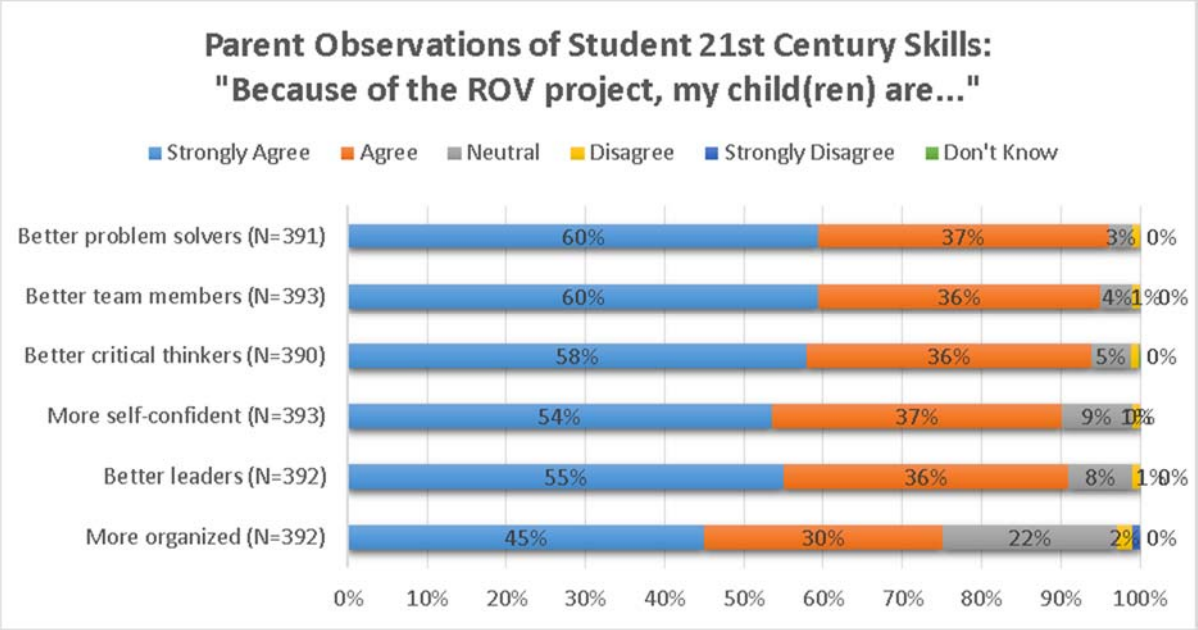
> *Watching the kids grow and learn: project management, troubleshooting, proper and safe tool use, public speaking/presentations has been fantastic. This program has helped develop life skills that will help their futures.*

Parents were asked about their observations of changes in their children due to the ROV program. The vast majority agreed or strongly agreed that because of the ROV program, their children were better problem solvers (97%, N=391), critical thinkers (94%, N=390), team members (96%, N=393), and/or leaders (91%, N=392). Ninety-one percent (91%) of the parents (N=393) reported increased self-

confidence in their children. In the open-ended comments, parents noted other changes that they observed in their children, including public speaking, leadership, prioritizing, working under pressure, resiliency, focus, time management, and self-confidence. Comments in this theme include the following:

> *They have shown a good sense of dedication and commitment.*
>
> *Our daughter has demonstrated a higher degree of confidence and more effective communication skills.*
>
> *A confidence to speak up about the technical aspects that he understands.*

Figure 6: Parent Observations of Effect of ROV Competition on Students' 21st Century Skills



Overall Opinions of ROV Program: Overall, students (N=1,936) rated their experiences building and competing with their ROV very positively, with 48% rating their experience as excellent, and 43% providing a rating of good. Eight percent (8%) thought their experience was fair. One percent (1%) gave the experience a poor rating, and 0% rated it as very poor. (See MATE is a wonderful program, and I now want to consider a career in engineering.

Figure 7) In the post-competition surveys, students wrote comments such as the following:

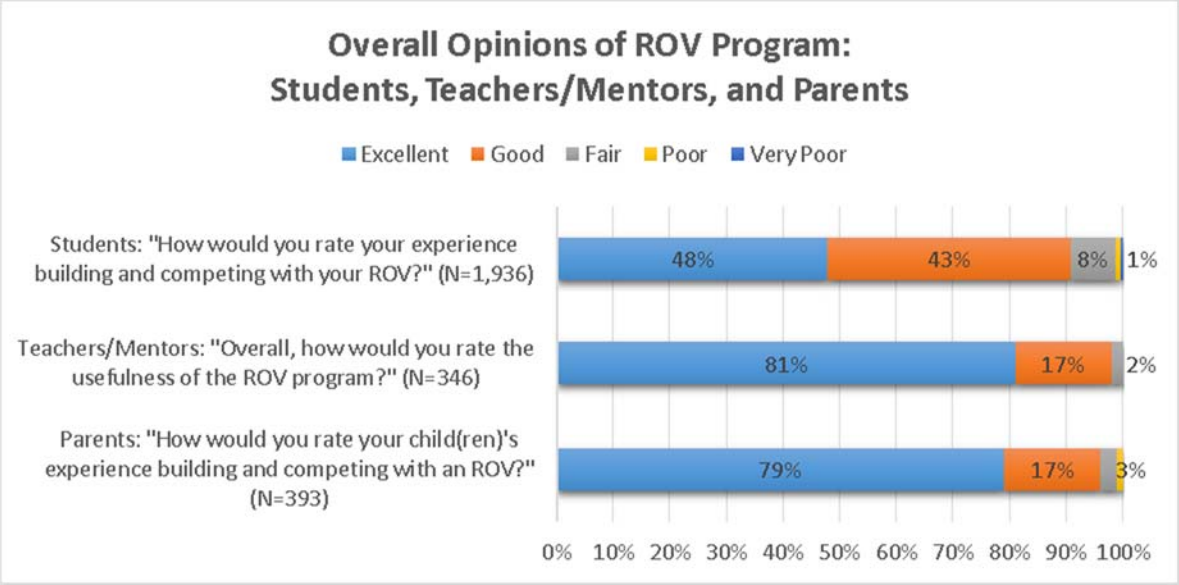
> *I enjoy ROV, and it is a great experience. Although, it is very challenging at times, I think it makes me better.*

It expanded my horizons.

I absolutely loved it! I learned so much this year from MATE! To quote the last line of my presentation, "MATE has allowed us to soar to greater heights in our achievements and dive to greater depths in the ocean of life!"

MATE is a wonderful program, and I now want to consider a career in engineering.

Figure 7: Overall Opinions of the ROV Program from Students, Teachers/Mentors, and Parents



Teachers/mentors (N=346) gave nearly uniformly positive ratings of the usefulness of the competition, with 81% stating that it was excellent and 17% indicating that it was good (2% rated the competition as fair.) Teachers/mentors also rated the support provided by the MATE program highly (52% excellent, 37% good, 10% fair, 2% poor, and 0% very poor). Teachers/mentors stressed the importance of the program in comments such as the following:

> *The experience was eye-opening. Not only is it a complete STEM project, it demonstrates the importance of application of concepts in all STEM areas. Everyone should partake in this experience, whether you decide to enter a STEM-related career or not, the experiences that happen can be used for any 21st century skill that can be expressed.*

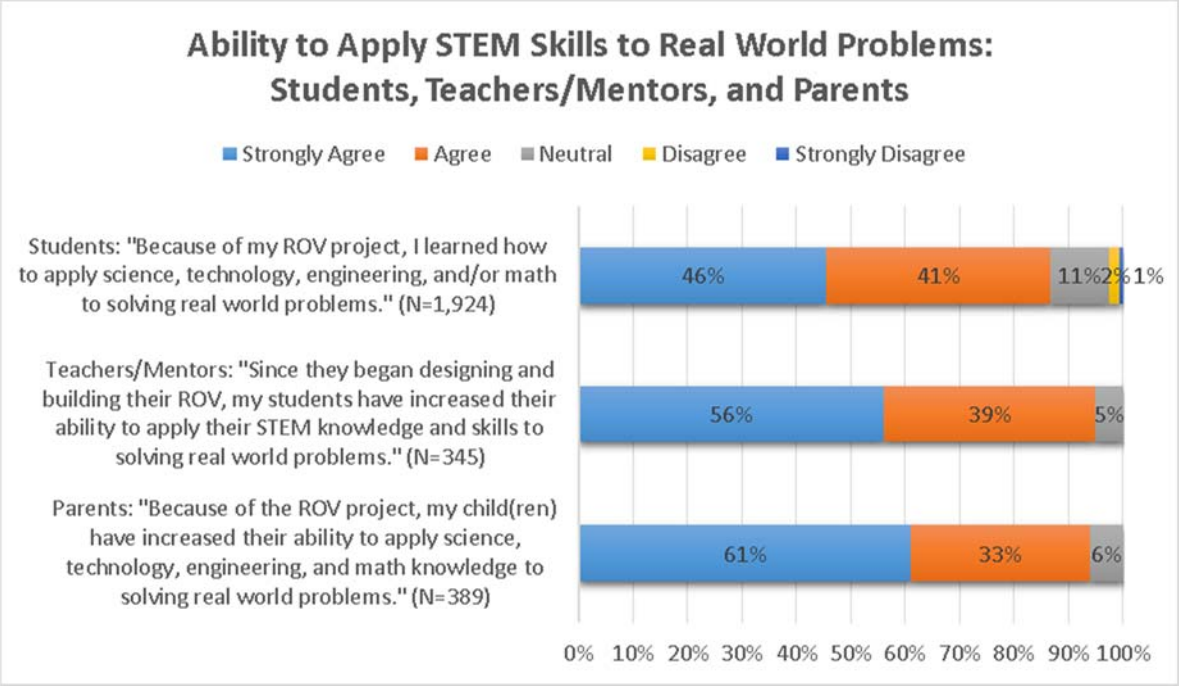
Overall, parents gave extremely positive ratings to their children's experience building and competing with an ROV. Seventy-one percent (79%, N=393) rated it as excellent, 17% gave a rating of good, 3% marked fair, and 1% were poor. When asked whether the competition has been valuable for the

educational development of their child, 74% strongly agreed that it was (N=394), 24% agreed with the statement, and 2% were neutral. No respondents disagreed or strongly disagreed.

Evaluation Question 1.2. How did the robotics activities affect students' ability to apply STEM knowledge and skills to finding solutions to real-world problems?

In the post-competition surveys, 87% of the students (N=1,924) indicated that participating in the ROV project helped them learn to apply STEM to real world problems. Ninety-five percent (95%) of the teachers/mentors (N=345) observed improvements in their students' ability to apply STEM knowledge and skills to real world problems, as did 94% of the parents (N=389). (See Figure 8)

Figure 8: Effect of ROV Program on Ability to Apply STEM Skills to Real World Problems: Students, Teachers/Mentors, and Parents



Students recognized the connection between the competition and real-world application of their science and technology skills in comments such as the following:

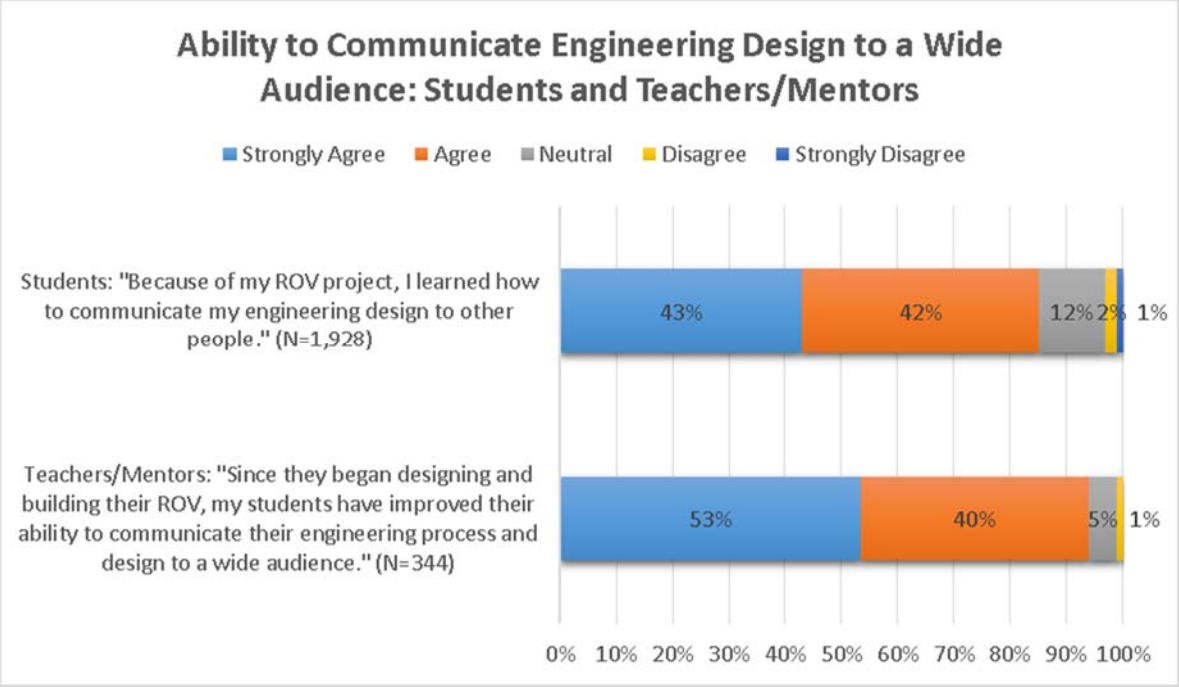
> *Great experience in robotics application to real world. Thank you!*
>
> *It has given me real world experience.*

Evaluation Question 1.3. How did the robotics activities affect students' ability to communicate their engineering process and designs to a wide audience (from engineers and technicians to the general public)?

Eighty-five percent (85%) of the students in the post-competition surveys (N=1,928) stated that participating in the ROV project helped them learn how to communicate their engineering design to other people.

Ninety-three percent (93%) of the teachers/mentors (N=344) indicated that their students had improved their ability to communicate their engineering process and design to a wide audience. (See Figure 9)

Figure 9: Effect of ROV Program on Ability to Communicate Engineering Process and Design



Evaluation Question 1.4. How did participation in the robotics activities influence students' educational and career paths?

There are two sources of educational and career information on former competition participants: 1) the ROV Competition Student Alumni Survey and 2) the National Student Clearinghouse match.

ROV COMPETITION STUDENT ALUMNI SURVEY

ROV Competition Student Alumni Survey results include the following:

- Among the 220 alumni who earned a college degree, 85% earned a degree in a STEM discipline.
- Among the 236 current college and university students, 85% are studying towards a STEM degree.
- Among the employed alumni (N=320), 73% are currently working a STEM-related job, and 22% currently or previously worked a job related to ROVs or other underwater technologies.
- Two-thirds (67%, N=432) of the alumni credit the ROV competition with influencing their educational or career path "to a great extent" or "somewhat".
- The ROV competition played a role in alumni attaining employment (37%), admittance into educational programs/college/university (36%), internships (30%), awards (21%), and scholarships (21%).

Please see the 2014-2015 evaluation report for further results from the ROV Competition Student Alumni Survey.

NATIONAL STUDENT CLEARINGHOUSE MATCH

Background

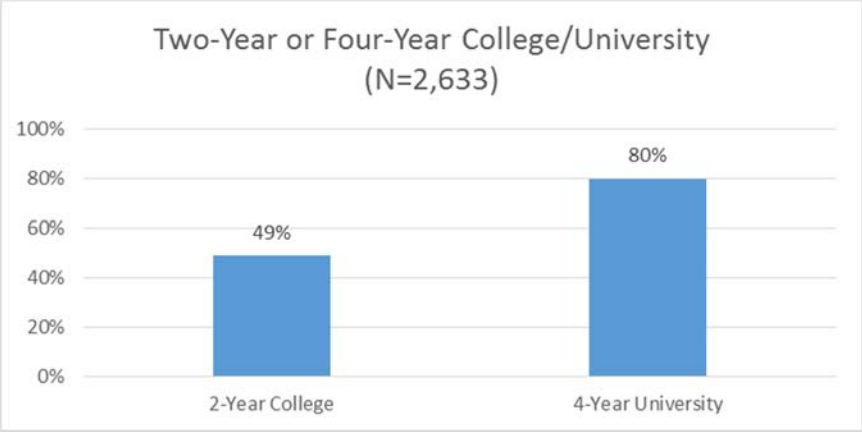
The National Student Clearinghouse (NSC) is a nationwide source of higher education information. Colleges and universities, numbering over 3,400 institutions enrolling over 96% of college students, share their enrollment data with NSC. The NSC database includes over 130 million students. See http://www.studentclearinghouse.org/ for further information about the NSC.

A total of 3,974 former competition participants (aka "alumni") were identified for matching with National Student Clearinghouse (NSC) data in the May of 2017. These alumni have birthdates that indicate that they are at least 18 years of age as of May 2017, and their addresses suggest that they live within the United States. Two-thirds of the alumni (66%, or 2,633) were found in the NSC database.

Two-Year or Four-Year Colleges/Universities

Among the 2,633 alumni who were found in the NSC database, 49% attended a 2-year college, and 80% attended a 4-year college or university. Note that this is not unduplicated. Some alumni attended both.

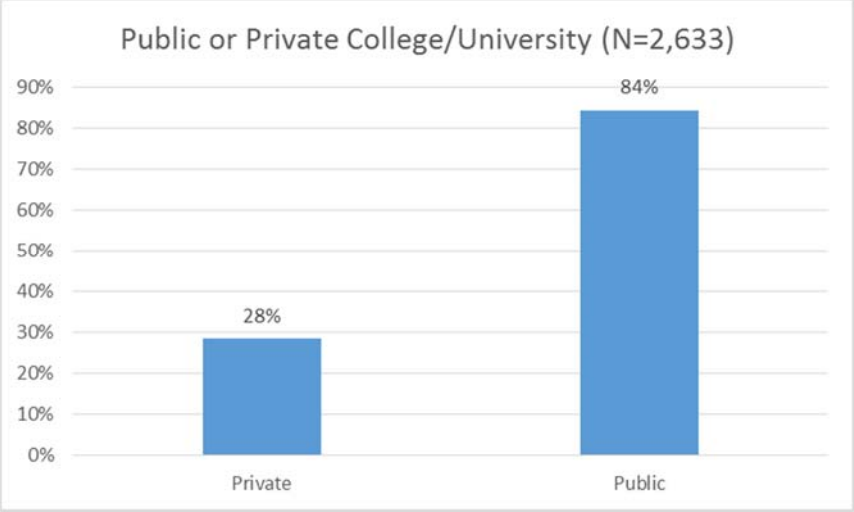
Figure 10: NSC Data: Two-Year or Four-Year University Attendance



Public or Private Colleges/Universities

Among the 2,633 alumni in the NSC database, 84% attended a public college/university, and 28% attended a private college/university. Note that this is not unduplicated, and students may have attended both public and private institutions.

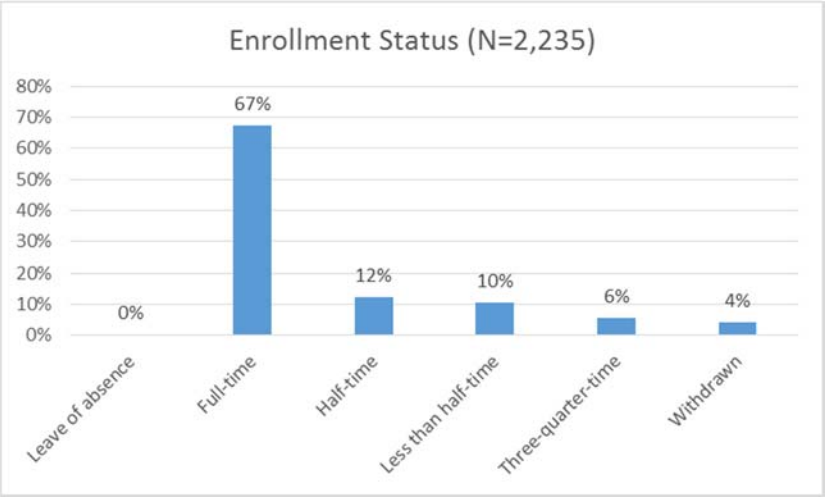
Figure 11: NSC Data: Public or Private College/University Attendance



Enrollment Status

Examining the most recent enrollment status reported per alumni (N=2,235), 67% of the alumni were attending college or university full-time. Six percent (6%) were enrolled three-quarter-time. Twelve percent (12%) were attending half-time, and another 10% attended less than half-time.

Figure 12: NSC Data: Most Recent Enrollment Status

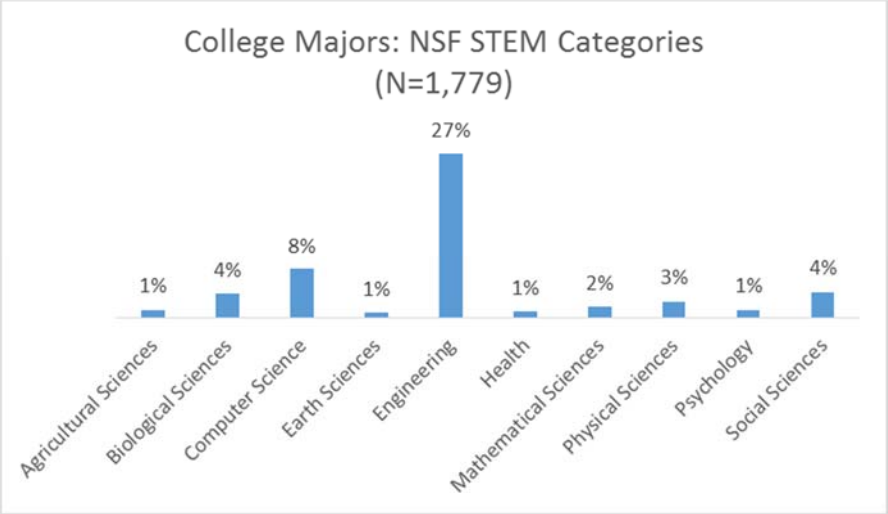


Majors

A total of 1,779 alumni had a major of study in the database, and 1,668 had a Classification of Instructional Programs (CIP) code. The majors were explored with two methods. First, the CIP codes were matched to a list of NSF-designated STEM CIP codes. [2] With this approach, 901 (51%) were designated as having a STEM CIP code. The most common NSF STEM Categories were engineering, with 27% of the alumni, and computer science, with 8%.

[2] See http://aaude.org/documents/public/reference/crosswalk-nsf-cip.xls for CIP code list.

Figure 13: NSC Data: College Majors: NSF STEM Categories

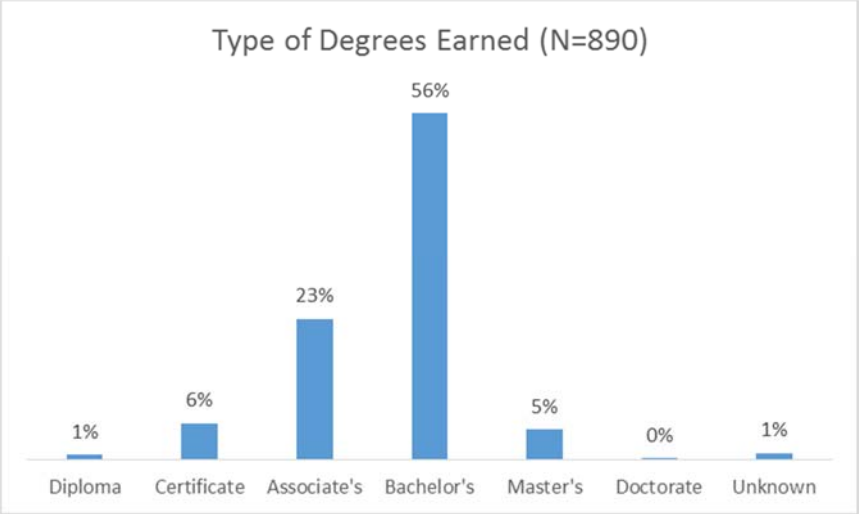


The downside to using the NSF STEM CIP Codes is that certificates and applied associate of science degrees are not included in this list, and these types of completions are common among two-year community and technical colleges, which are a particular area of focus among ATE Centers. Therefore, a second analysis method was employed: the evaluator hand-coded the majors as STEM or non-STEM. With this approach, 66% of the 1,798 competition alumni were enrolled in a STEM major.

Degrees

A total of 708 alumni earned 975 degrees and certificates. Within the degree names, it was possible to determine the type of degree for 890 degrees. The most common type of degree earned by the alumni was Bachelor's degree (56%), followed by Associate's degree (23%). Six percent (6%) of the degrees were certificates, and another 5% were Master's degrees. Two individuals earned doctorates. (See Figure 14)

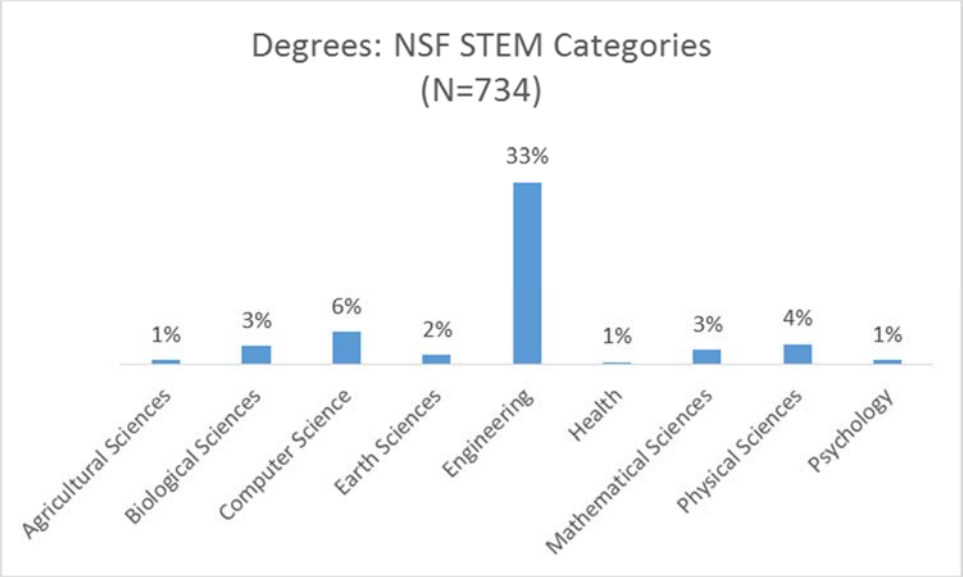
Figure 14: NSC Data: Type of Degrees Earned



The same two analysis methods were used for the degrees as the majors. First, the CIP codes were matched to a list of NSF-designated STEM CIP codes. There were 734 degrees with CIP codes. With this approach, 416 (57%) were designated as having a STEM CIP code. The most common NSF STEM Categories were engineering, accounting for 33% of the degrees with CIP codes, and computer science, with 6%. In comparison, according to the National Center for Education Statistics, in 2013-2014, only 1% of the Bachelor's degrees were in engineering technologies.[3]

[3] SOURCE: U.S. Department of Education, National Center for Education Statistics, Higher Education General Information Survey (HEGIS), "Degrees and Other Formal Awards Conferred" surveys, 1970-71 through 1985-86; Integrated Postsecondary Education Data System (IPEDS), "Completions Survey" (IPEDS-C:91-99); and IPEDS Fall 2000 through Fall 2014, Completions component. (This table was prepared September 2015.) http://nces.ed.gov/programs/digest/d15/tables/dt15_322.10.asp?current=yes

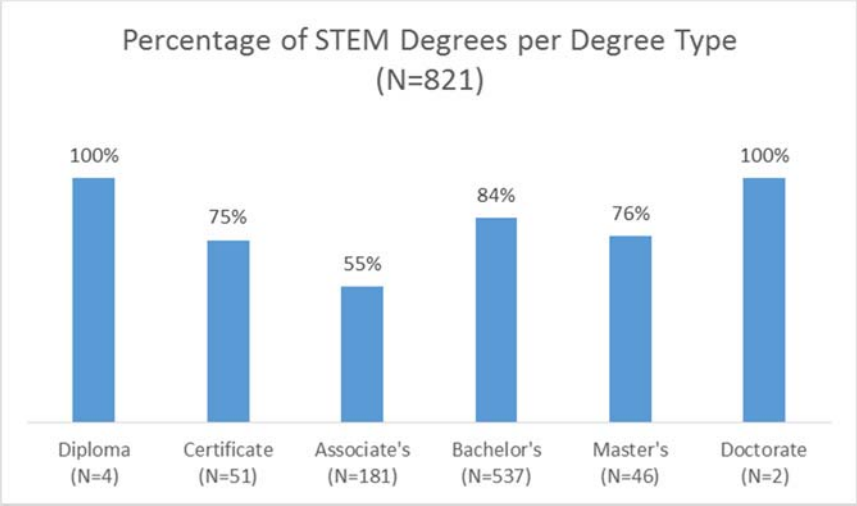
Figure 15: NSC Data: Degrees: NSF STEM Categories



With the hand-coding degrees into STEM and non-STEM, a total of 76% of the degrees (N=828) were in STEM disciplines.

The hand-coded STEM degrees were examined by degree type. (See Figure 16) Compared to other degrees and certificates, it was less common for Associate's Degrees to be in a STEM discipline (55%). Some of this difference is due to the fact that many Associate's degrees were given generic names that did not designate a specific discipline, such as General Studies Associate Degree or Oregon Transfer Associate of Arts.

Figure 16: NSC Data: Percentage of STEM Degrees per Degree Type



Evaluation Question 1.5. What effect did multi-year participation have on the above evaluation questions?

There were several statistically significant differences between the first year and multi-year competition participants. Multi-year participants reported that their participation in the ROV program resulted in higher levels of awareness of and interest in pursuing STEM careers, gains in interest in taking STEM courses, improvements in STEM knowledge and skills, increased 21st Century skills, and the receipt of awards, honors, and new educational and career opportunities.

Specifically, multi-year participants were significantly more likely to report the following:

Table 2: Statistically Significant Differences between First-Year and Multi-Year Participants

	First-Year Participants: Percentage Strongly Agreeing	Multi-Year Participants: Percentage Strongly Agreeing
Increased awareness of STEM careers due to ROV program**	30.1%	38.1%

Increased interest in pursuing a STEM career due to ROV program**	40.0%	48.6%
Learned how to apply STEM knowledge to solving real world problems due to ROV program**	43.0%	52.5%
Learned how to communicate their engineering designs due to ROV program**	40.7%	48.0%
More interested in taking engineering courses due to ROV program**	41.8%	47.6%
More interested in taking science courses due to ROV program*	35.3%	38.2%
More interested in taking math courses due to ROV program**	26.0%	33.0%
Increased skills and knowledge in math due to ROV program**	25.8%	33.6%
Increased skills and knowledge in technology due to ROV program*	51.2	56.8%
Increased teamwork skills due to ROV program**	39.8%	47.1%
Increased leadership skills due to ROV program**	33.0%	44.3%
Increased problem solving skills due to ROV program**	41.0%	49.9%
Increased critical thinking skills due to ROV program**	39.7%	49.0%
More self-confident due to ROV program**	37.7%	44.0%
Received an award or honor due to ROV program**	25.7%	50.5%
ROV program participation opened educational or career opportunities**	32.4%	48.8%

* $p < 0.05$
** $p < 0.01$

DEMOGRAPHIC BREAKDOWNS OF FIRST-YEAR AND MULTI-YEAR PARTICIPANTS

There were statistically significant differences between the first-year and multi-year participants in gender (first-year: 35.8% female; multi-year: 25.6% female) and ethnicity (first-year: 60.1% white; multi-year: 65.2% white).

There were no statistically significant differences between the first-year and multi-year participants in whether the participants had a disability that required accommodations (first-year: 2.4%, multi-year: 3.1%) or whether they live in a low socioeconomic status neighborhood (first-year: 60.8%, multi-year: 60.7%)

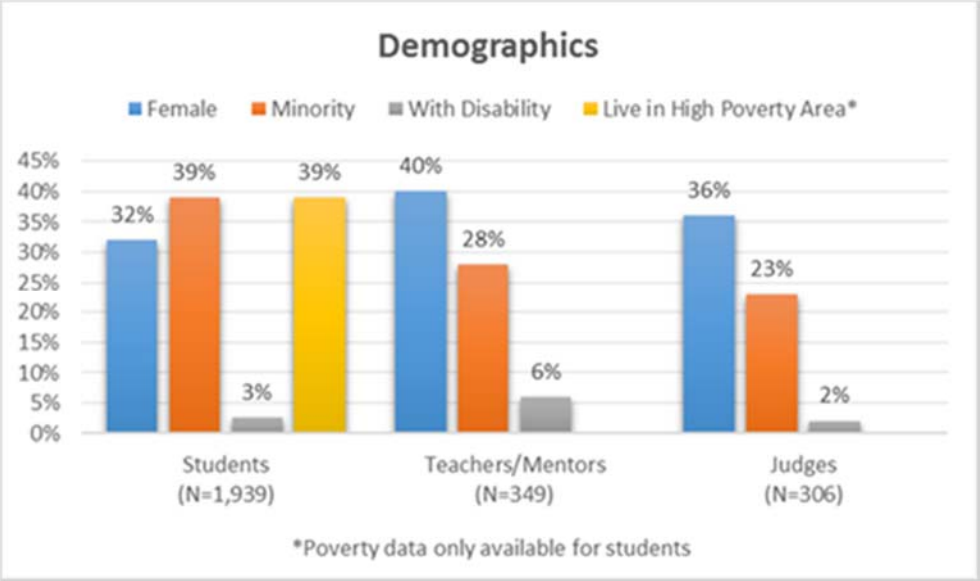
Compared to the multi-year participants, a greater proportion of the first-year participants were in the SCOUT (entry-level) competition class (first-year: 38.5%, multi-year: 17.6%). The bulk of the multi-year students were in the RANGER (intermediate) class (first-year: 38.1%, multi-year: 54.6%) and NAVIGATOR (beginner-intermediate) classes (first-year: 9.8%, multi-year: 12.3%). Thirteen percent (13.1%) of the first-year participants were in the EXPLORER (advanced) competition class, as were 15.5% of the multi-year competitors.

Evaluation Question 1.6. Did the robotics activities create the same impacts among underrepresented groups (by gender, ethnicity, socio-economic status, disability) as were found among students who traditionally participate in these types of activities?

BACKGROUND: DEMOGRAPHICS OF STUDENTS, TEACHERS AND INDUSTRY REPRESENTATIVES

According to the demographic data in the surveys, the students (N=1,939) were 32% female; 39% were of minority backgrounds[4]; 39% came from high poverty areas[5]; and 3% reported that they had disabilities requiring accommodations. (See Figure 17)

Figure 17: Student, Teacher/Mentor, and Judge Demographics



The project has made efforts to include the participation of teachers, college students, staff, and competition judges (industry professionals) of diverse backgrounds who can serve as role models for the

[4] The sample size of participant surveys from each ethnicity was not large enough to do analysis by individual ethnicity. Instead, all non-white respondents were coded as "minority", and results were analyzed by this "minority status" variable.

[5] High poverty areas were defined as zip codes where the percentage of families with children under age 18 in poverty was higher than the nationwide average of 18.1%. This calculation is based on data from the 2014 American Community Survey at the ZTCA level.

middle school students. Forty percent (40%) of the teachers (N=349) were female, 28% were of minority backgrounds, and 6% indicated that they had a disability.

Among the judges completing surveys (N=306), 36% were female, 23% were of minority ethnic backgrounds, and 2% marked that they had a disability.

ANALYSIS

As the MATE Center is a longstanding center, the evaluation has improved over time. In the 2009-2010 evaluation report, preliminary results presented the trends by gender and ethnicity only. In 2010-2011, the analysis took a different approach. Rather than simply look at trends, the changes in survey administration methods helped us produce a dataset more suitable for more sophisticated analysis. Thus, we looked for statistically significant differences between the under-represented students and the students who more typically participate in these types of STEM events.

This new analysis begged the question: how should success be defined? In consultation with project managers, the evaluators decided that the measure of successfully engaging under-representative students would be that their results were not statistically different from the other students' results. In other words, the under-represented students made the same gains as the other students.

FINDINGS BY STUDENT DEMOGRAPHICS

The analysis focuses on whether there were statistically significant differences between the groups (gender, ethnicity, socioeconomic status, and disability status) in the following topics:

- Awareness of and interest in STEM careers
- Interest in STEM topics
- STEM skills and knowledge

Statistically significant differences existed between the groups in the following measures:

Awareness of and Interest in STEM Careers

- **Gender:** Between the male and female students, there were no statistically significant differences in gains in knowledge about STEM careers (male: 34% strongly agreed, female: 31% strongly agreed); however, male students were significantly more likely to cite the competition as influencing them towards a STEM career (male: 46% strongly agreed; female: 40% strongly agreed).

- **Ethnicity:** Minority students were more likely to report increased career awareness (white: 29% strongly agreed, minority: 39% strongly agreed) and interest in pursuing a STEM career (white: 39%, minority: 49%).
- **Socioeconomic status:** There were no significant differences in STEM career awareness or interest by whether the students lived in a low or high poverty area.
- **Disability status:** There were no significant differences in gains in knowledge of or interest in STEM careers by disability.

Interest in STEM Topics

- **Gender:** Male students were more likely to report increased interest in computer science (male: 43% strongly agreed, female: 31% strongly agreed) and engineering (male: 47%, female: 37%) courses. There were no significant differences between the genders in the interest in taking science courses, math, or hands-on classes or clubs like robotics, electronics, or shop.
- **Ethnicity:** Minority students were significantly more likely to report that their ROV project created increased interest in engineering (white: 42%, minority: 47%), math (white: 27%, minority: 31%), and computer science (white: 38%, minority: 42%). There were no significant differences in interest in science or hands-on classes by ethnicity.
- **Socioeconomic status:** Students in low poverty areas were more likely to indicate that the competition increased their desire to take hands-on classes or club activities (low poverty: 60%; high poverty: 53%). There were no significant differences between the responses of the students living in high and low poverty areas in the increased interest in other STEM topics.
- **Disability status:** There were no significant differences between the responses of the students with and without disabilities in regards to interest in STEM courses.

STEM Skills and Knowledge

- **Gender:** Male students were more likely than female students to report increased skills and knowledge in engineering (male: 57% strongly agreed, female: 52% strongly agreed) and technology (male: 55%, female: 50%.). Females were more likely than males to report increased knowledge of the competition theme (male: 38%, female: 46%). There were no significant differences by gender in gains in knowledge in science or math.
- **Ethnicity:** Minority students were more likely to strongly agree that due to the ROV competition, they increased their skills and knowledge in science (white: 37%; minority: 42%), math (white: 27%, minority: 31%), and the competition theme (white: 39%, minority: 42%). There were no significant differences by ethnicity in increased skills in other STEM topics.
- **Socioeconomic status:** Students living in a low poverty area were more likely to report gains in skills and knowledge in engineering (low poverty: 57%, high poverty: 51%). There were no other significant differences in the STEM skills and knowledge according to socioeconomic status.

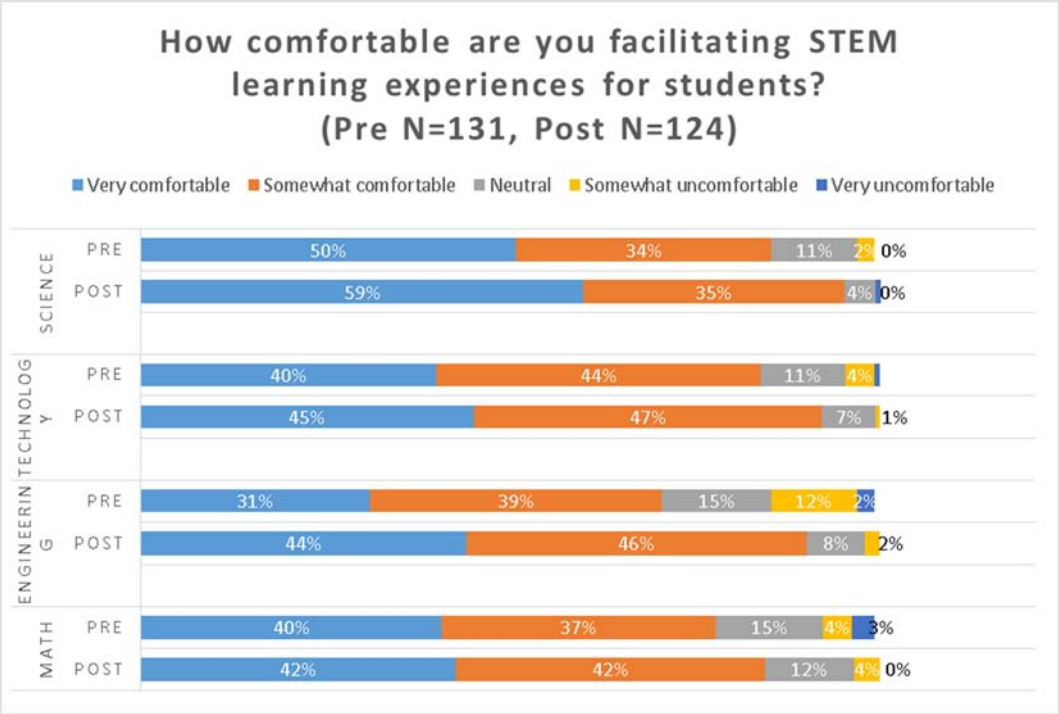
- **Disability status:** Students without disabilities were more likely to indicate that they gained skills in science (with disabilities: 31% strongly agree, without disabilities: 40% strongly agree) and technology (with disabilities: 40%, without disabilities: 54%). There were no significant differences in increased skills and knowledge in other STEM topics by disability status.

Project Goal 2: Provide teachers with professional development, instructional resources, and mentors to support and sustain the delivery of STEM career information and learning experiences.

Evaluation Question 2.1. Are teachers more confident delivering STEM learning experiences? Delivering career information and outlining career pathways?

Pre and post workshop surveys, post competition surveys, and Summer Institute feedback surveys demonstrate that the participants gained confidence facilitating STEM learning experiences through the training and support provided by MATE. The percentage of respondents who rated themselves as "very comfortable" facilitating STEM learning experiences for students rose between the pre and post workshop surveys for science (pre: 50%, post: 59%), technology (pre: 40%, post: 45%), engineering (pre: 31%, post: 44%), and math (pre: 40%, post: 42%). (See Figure 18)

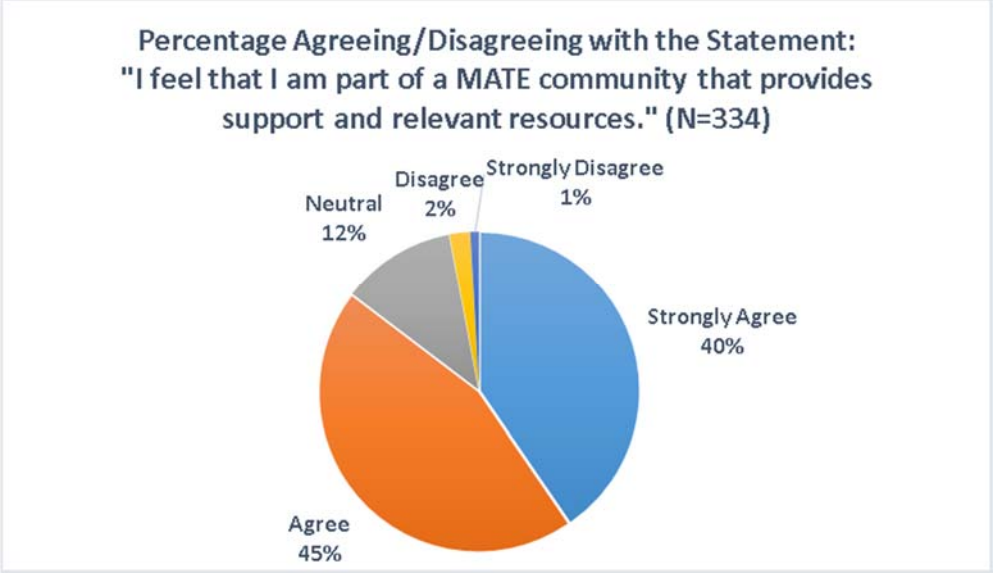
Figure 18: Level of Teacher Confidence Facilitating STEM Learning Experiences: Pre and Post Workshops



Evaluation Question 2.2. Do teachers feel they are a part of a larger MATE community that provides support and relevant, necessary resources?

Among the post-competition surveys, 40% of the teachers (N=334) strongly agreed and 45% agreed that they felt they were part of a MATE community that provides support and relevant resources. Twelve percent (12%) felt neutral about the statement; 2% disagreed, and 1% strongly disagreed. (See Figure 19)

Figure 19: Percentage Agreeing/Disagreeing that They Feel a Part of a MATE Community

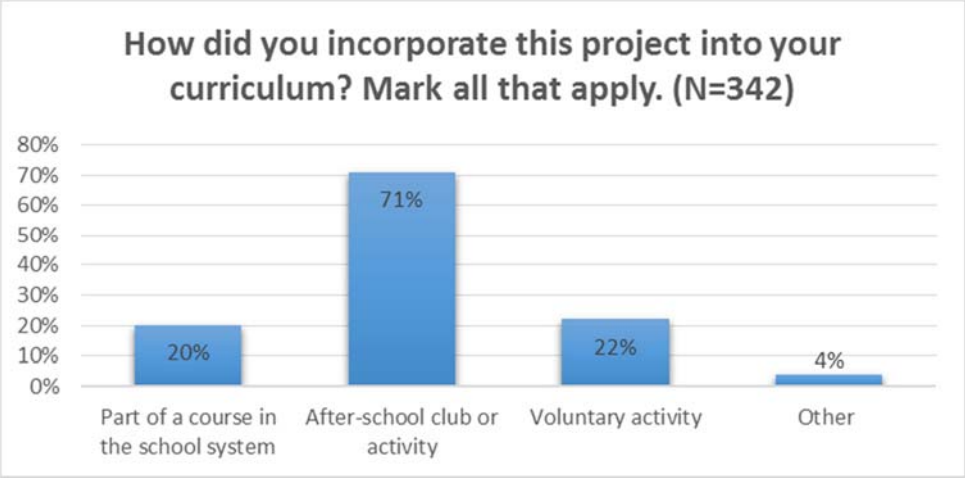


Evaluation Question 2.3. Do teachers incorporate MATE robotics activities/curriculum into courses and afterschool programs? Are the courses and/or curriculum adopted by school districts?

In the post-competition surveys, over three-quarters (76%) of the teachers (N=341) stated that they used MATE materials and resources to incorporate ROV building into their course or club, and over half (51%) modified their curriculum and teaching based on MATE resources.

Seventy-one percent (71%) of the post-competition survey respondents (N=272) incorporated building ROVs into an after-school club. Seventeen percent (17%) built ROVs as part of a course; 22% built ROVs as a voluntary activity; and 5% built ROVs in another venue.

Figure 20: ROV Projects in Courses, After-School Clubs, Voluntary Activities, and Other Activities



In the teacher post-workshop surveys, 20% of the respondents (N=157) were planning to incorporate ROVs into 47 courses in the school system. According to the teachers, these courses fall into the categories of engineering, science, technology, physics, math, and Electronics. The course names include the following, as written by the respondents:

- Engineering design
- Physics
- Technology system
- Advanced STEM
- Aquatic Biology, Fisheries Tech, Sr. Research
- Biology, Physical Science, Marine Biology
- Foundations of Engineering
- Geometry
- Gifted/advanced science
- Grade 5 STEAM
- Intro to robotics
- Intro to Robotics and Graphic Design
- Physical Science
- Autonomous Learning model (ALM)
- Robotics
- Robotics team
- Robotics, Computer Science, Innovative Technology
- Science
- Science/Engineering-elementary
- STEAM lab
- STEM
- Underwater Robotics

In the one-year follow-up survey of the week-long, intensive 2017 Summer Institute in Arizona, 8 out of 10 respondents built ROVs with students. A total of 31 ROVs were built with 125 students. Fifteen (15) of the ROVs were used in the 2018 MATE ROV competition.

Evaluation Question 2.4. Are teachers able to access classroom mentors as needed? Do the classroom mentors help them successfully incorporate robotics activities into the course? Are the classroom mentors adequately prepared?

In several regions, the regional coordinator matched up college and high school students – in many cases, former ROV competitors themselves – with middle school ROV teams to work with them throughout the competition season. College students also acted as helpers at the workshops. In some cases, the college students received a small stipend (though they stated that they would have done the work without it), and in other cases they received service learning credit, Presidential Volunteer Service Awards, or simply volunteered their time with no recompense. This arrangement worked well for the regional coordinators, college students and middle school students and teachers.

Anecdotal reports suggest that the involvement of college students as mentors can lead to profound experiences for both the college and middle school students. Many sources reported that the middle school students found the college students to be approachable representatives of science. These young adults modeled the paths that the middle school students could take to a STEM career.

For 23% of the post-competition teacher survey respondents (N=331), a classroom/club mentor came to their site to help their teams. Among these teachers, the mentor helped them incorporate robotics into their course or club to “a great extent” for 57% of the respondents, a “moderate extent” for 26% of the respondents, and a “small extent” for 12% of the respondents; 2% stated that the mentors were not helpful at all, and 2% were not sure.

The majority of the respondents (91%, N=98) indicated that their mentors were adequately prepared to help them and their students through the ROV design and building process. Three percent (3%) marked that the mentors were not adequately prepared, and 6% were unsure.

Project Goal 3: Increase parental involvement in order to support and encourage students to pursue STEM education and careers.

Evaluation Question(s) 3.1. Did the MATE robotics activities lead to an increase in the parents' support of their children's interest in STEM careers?

Eighty-nine percent (89%) of the parents surveyed (N=393) agreed or strongly agreed that participation in the ROV program changed how they envisioned their child's future, making it easier to picture their child with a STEM career (64% strongly agreed, 25% agreed). Nine percent (9%) were neutral, two percent (2%) disagreed, and one percent (1%) strongly disagreed.

Evaluation Question 3.2. Did the enhanced parent online resources lead to an increase in the parents' ability to provide assistance and support for their children's involvement in the MATE robotics activities?

The online Parent Resource Center (http://www.marinetech.org/parent-resource-center) was launched in the spring of 2015. The resource center offers a "welcome" note for to parents, as well as links to information and resources. Resources include links to videos from the international and regional competitions, links to information such as competition timeline and costs, links to student learning objectives for ROV building, and "Getting Started with MATE Underwater Robotics," a section aimed at helping newcomers navigate finding information (e.g. what kit to purchase, what competition class to enter, etc.) on the MATE web site.

Anecdotal evidence indicates that parents found the resources to be helpful, such as comments including the following from 2015:

> *Great overall experience, I have no experience with ROV's but the MATE educational PowerPoints really helped!*
>
> *This was a great first year. The online resources were very helpful.*

Evaluation Question 3.3. Did the regional parent advisory committees provide feedback and advice to help improve the competitions and ensure that the program is inclusive of all participants?

Advisory committees were broadened to invite participation from parents as well as industry representatives, professional organizations (e.g., Marine Technology Society), government agencies (e.g., NOAA) 6-12th grade educators, community college faculty, and university faculty. The committees were implemented at the regional level so the recommendations would be applicable to the local community needs.

In 2017-2018, 10 regions held advisory meetings, and nine of the 10 included parents on their committees. A total of 22 parents participated in the advisory committees. Advisory groups communicated face-to-face, and via video meetings (e.g., ZOOM), and email. Some regions opted to meet in smaller groups to gather feedback throughout the year.

Broader Impacts

The MATE Center's ITEST activities have been leveraged by regional coordinators and participants in ways that were unanticipated during the writing of the proposal. Thus, they don't fit under any particular evaluation question. Since the evaluation was not set up to monitor these activities, the findings presented here should be considered preliminary. Next year, the evaluation tools will be modified to capture more of this data.

These "broader impacts" fall into three main categories:

1. Leveraging ITEST activities/funding to raise additional funding by regional coordinators, teachers, schools, and student teams;
2. Using ROVs and ROV-based activities outside of the competition by teachers and students;
3. Broader impacts on teachers and institutions: new careers, new classes, deeper relationships with students, improved STEM knowledge, increased motivation and engagement with their discipline, and increased professional development opportunities.

LEVERAGING ITEST ACTIVITIES/FUNDING

Faculty who led ROV teams and/or attended the Summer Institute reported that they have applied for and won funding from grants and school boards and have received equipment donations from local

industry. Additionally, ROV competition regions outside of the United States have leveraged news of the ITEST grant to raise additional funds.

USING ROVS OUTSIDE THE COMPETITION

Many faculty have reported using ROVs or ROV-based activities outside of the competition, incorporating these tools and topics into their classes or clubs in order to bring science to life.

BROADER IMPACTS ON TEACHERS AND INSTITUTIONS

Teachers report a broad variety of positive results from their participation in the ROV competition and professional development, including the following:

- New careers
- New classes
- Deepened relationships with students
- New collaborations with industry, research orgs, and other educational institutions
- Improved STEM knowledge
- Increased motivation and engagement with their discipline
- Increased professional development opportunities (in addition to that offered by MATE)

CONCLUSIONS

Overall, the MATE Center successfully implemented the 2017-2018 year of ITEST grant activities. The 2018 MATE ROV Competition was held, with ITEST funding helping to support 14 of the 21 US-based regional events. A total of 410 regional workshops were held for teachers and students, and 20 teachers attended the intensive Summer Institute professional development. The focus on a formal curriculum was changed to development of a suite of online instructional materials, which were disseminated, including videos, PowerPoints, ROV kits, and an online course.

Overall, evaluation results continue to show strong positive outcomes for students and teachers. Involvement in the ROV competition generated greater awareness of and interest in pursuing STEM careers, increased interest in studying STEM topics, improved STEM knowledge and skills, and increased 21st Century skills, including teamwork, critical thinking, leadership, problem solving and self-confidence. Participating in the ROV competition helped students learn how to apply STEM skills to real world problems. Students also learned how to communicate their engineering process and design to a wide audience.

Parents were passionate supporters of their children's involvement in the program, with comments such as, "Awesome experience that can only benefit all who participate!" Educational research has stressed the importance of family support in a student's choice to follow a STEM career path. Evaluation results show that the ROV program impacted the participants' parents as well, making it easier for them to picture their child in a STEM career.

ROV competition student alumni survey results and National Student Clearinghouse match analysis suggest that the majority of ROV competition participants go on to study STEM topics, earn STEM degrees, and work in STEM fields. In fact, roughly one in five former participants have worked in a job related to ROVs or other underwater technologies. The majority of ROV competition alumni credit the ROV competition with influencing their educational and career paths, including playing a role in attaining internships, scholarships, admittance to educational programs, and employment.

These findings suggest that the MATE ROV Competition is effective in increasing the STEM workforce, especially related to underwater technologies.

APPENDIX

At NSF's request, the 2017 evaluation report was written before the 2017 international competition results were available. The updated 2017 competition student survey results, including the international competition, are provided below.

How would you rate your experience building and competing with your ROV?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Excellent	921	49.8	50.2	50.2
	Good	716	38.7	39.0	89.3
	Fair	166	9.0	9.1	98.3
	Poor	23	1.2	1.3	99.6
	Very poor	8	0.4	0.4	100.0
	Total	1834	99.2	100.0	
Missing	No answer	14	0.8		
Total		1848	100.0		

Was this your first time building an ROV?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	956	51.7	52.1	52.1
	No	878	47.5	47.9	100.0
	Total	1834	99.2	100.0	
Missing	No answer	14	0.8		
Total		1848	100.0		

Because of my ROV project...I know more about careers in science, technology, engineering, and math

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	636	34.4	34.8	34.8
	Agree	810	43.8	44.4	79.2
	Neutral	317	17.2	17.4	96.5
	Disagree	46	2.5	2.5	99.1
	Strongly disagree	17	0.9	0.9	100.0
	Total	1826	98.8	100.0	
Missing	Partial complete	6	0.3		
	No answer	16	0.9		
	Total	22	1.2		
Total		1848	100.0		

Because of my ROV project...I am more interested in a career in science, technology, engineering, and math

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	784	42.4	43.0	43.0
	Agree	639	34.6	35.0	78.0
	Neutral	313	16.9	17.2	95.1
	Disagree	67	3.6	3.7	98.8
	Strongly disagree	22	1.2	1.2	100.0
	Total	1825	98.8	100.0	
Missing	Partial complete	6	0.3		
	No answer	17	0.9		
	Total	23	1.2		
Total		1848	100.0		

Because of my ROV project...I want to learn more about science, technology, engineering, and math

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	933	50.5	51.1	51.1
	Agree	636	34.4	34.8	85.9
	Neutral	215	11.6	11.8	97.7
	Disagree	32	1.7	1.8	99.5
	Strongly disagree	10	0.5	0.5	100.0
	Total	1826	98.8	100.0	
Missing	Partial complete	6	0.3		
	No answer	16	0.9		
	Total	22	1.2		
Total		1848	100.0		

Because of my ROV project...I learned how to apply science, technology, engineering and/or math to solving real world problems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	912	49.4	50.1	50.1
	Agree	646	35.0	35.5	85.6
	Neutral	224	12.1	12.3	97.9
	Disagree	28	1.5	1.5	99.5
	Strongly disagree	10	0.5	0.5	100.0
	Total	1820	98.5	100.0	
Missing	Partial complete	6	0.3		
	No answer	22	1.2		
	Total	28	1.5		
Total		1848	100.0		

Because of my ROV project...I learned how to communicate my engineering design to other people

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	772	41.8	42.3	42.3
	Agree	712	38.5	39.1	81.4
	Neutral	284	15.4	15.6	97.0
	Disagree	36	1.9	2.0	99.0
	Strongly disagree	19	1.0	1.0	100.0
	Total	1823	98.6	100.0	
Missing	Partial complete	6	0.3		
	No answer	19	1.0		
	Total	25	1.4		
Total		1848	100.0		

Because of my ROV project...I am more interested in taking engineering courses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	811	43.9	44.5	44.5
	Agree	631	34.1	34.6	79.1
	Neutral	282	15.3	15.5	94.6
	Disagree	78	4.2	4.3	98.8
	Strongly disagree	21	1.1	1.2	100.0
	Total	1823	98.6	100.0	
Missing	Partial complete	6	0.3		
	No answer	19	1.0		
	Total	25	1.4		
Total		1848	100.0		

Because of my ROV project...I am more interested in taking science courses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	701	37.9	38.5	38.5
	Agree	677	36.6	37.2	75.7
	Neutral	335	18.1	18.4	94.1
	Disagree	83	4.5	4.6	98.7
	Strongly disagree	24	1.3	1.3	100.0
	Total	1820	98.5	100.0	
Missing	Partial complete	6	0.3		
	No answer	22	1.2		
	Total	28	1.5		
Total		1848	100.0		

Because of my ROV project...I am more interested in taking math courses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	576	31.2	31.7	31.7
	Agree	614	33.2	33.8	65.5
	Neutral	417	22.6	23.0	88.5
	Disagree	142	7.7	7.8	96.3
	Strongly disagree	67	3.6	3.7	100.0
	Total	1816	98.3	100.0	
Missing	Partial complete	6	0.3		
	No answer	26	1.4		
	Total	32	1.7		
Total		1848	100.0		

Because of my ROV project...I am more interested in taking computer science courses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	711	38.5	39.2	39.2
	Agree	589	31.9	32.5	71.7
	Neutral	368	19.9	20.3	92.0
	Disagree	112	6.1	6.2	98.2
	Strongly disagree	33	1.8	1.8	100.0
	Total	1813	98.1	100.0	
Missing	Partial complete	6	0.3		
	No answer	29	1.6		
	Total	35	1.9		
Total		1848	100.0		

Because of my ROV project...I am more interested in taking hands on classes or club activities like robotics, electronics, and shop courses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	1060	57.4	58.5	58.5
	Agree	547	29.6	30.2	88.6
	Neutral	169	9.1	9.3	98.0
	Disagree	22	1.2	1.2	99.2
	Strongly disagree	15	0.8	0.8	100.0
	Total	1813	98.1	100.0	
Missing	Partial complete	6	0.3		
	No answer	29	1.6		
	Total	35	1.9		
Total		1848	100.0		

Because of my ROV project...I increased my skills and knowledge in engineering

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	988	53.5	54.5	54.5
	Agree	681	36.9	37.6	92.1
	Neutral	127	6.9	7.0	99.1
	Disagree	12	0.6	0.7	99.7
	Strongly disagree	5	0.3	0.3	100.0
	Total	1813	98.1	100.0	
Missing	Partial complete	6	0.3		
	No answer	29	1.6		
	Total	35	1.9		
Total		1848	100.0		

Because of my ROV project...I increased my skills and knowledge in science

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	718	38.9	39.7	39.7
	Agree	739	40.0	40.9	80.6
	Neutral	294	15.9	16.3	96.8
	Disagree	43	2.3	2.4	99.2
	Strongly disagree	14	0.8	0.8	100.0
	Total	1808	97.8	100.0	
Missing	Partial complete	6	0.3		
	No answer	34	1.8		
	Total	40	2.2		
Total		1848	100.0		

Because of my ROV project...I increased my skills and knowledge in math

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	535	29.0	29.7	29.7
	Agree	569	30.8	31.6	61.4
	Neutral	513	27.8	28.5	89.9
	Disagree	143	7.7	7.9	97.8
	Strongly disagree	39	2.1	2.2	100.0
	Total	1799	97.3	100.0	
Missing	Partial complete	6	0.3		
	No answer	43	2.3		
	Total	49	2.7		
Total		1848	100.0		

Because of my ROV project...I increased my skills and knowledge in technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	978	52.9	54.2	54.2
	Agree	662	35.8	36.7	91.0
	Neutral	138	7.5	7.7	98.6
	Disagree	17	0.9	0.9	99.6
	Strongly disagree	8	0.4	0.4	100.0
	Total	1803	97.6	100.0	
Missing	Partial complete	6	0.3		
	No answer	39	2.1		
	Total	45	2.4		
Total		1848	100.0		

Because of my ROV project...I know more about the competition theme: Port Cities of the Future: Commerce, Entertainment, Health, and Safety

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	754	40.8	42.1	42.1
	Agree	630	34.1	35.1	77.2
	Neutral	313	16.9	17.5	94.6
	Disagree	63	3.4	3.5	98.2
	Strongly disagree	33	1.8	1.8	100.0
	Total	1793	97.0	100.0	
Missing	Partial complete	6	0.3		
	No answer	49	2.7		
	Total	55	3.0		
Total		1848	100.0		

Because of my ROV project...I am a better team member

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	797	43.1	43.9	43.9
	Agree	759	41.1	41.8	85.7
	Neutral	216	11.7	11.9	97.6
	Disagree	28	1.5	1.5	99.1
	Strongly disagree	16	0.9	0.9	100.0
	Total	1816	98.3	100.0	
Missing	Partial complete	8	0.4		
	No answer	24	1.3		
	Total	32	1.7		
Total		1848	100.0		

Because of my ROV project...I am a better leader

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	726	39.3	40.0	40.0
	Agree	599	32.4	33.0	73.1
	Neutral	402	21.8	22.2	95.3
	Disagree	57	3.1	3.1	98.4
	Strongly disagree	29	1.6	1.6	100.0
	Total	1813	98.1	100.0	
Missing	Partial complete	8	0.4		
	No answer	27	1.5		
	Total	35	1.9		
Total		1848	100.0		

Because of my ROV project...I am a better problem solver

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	846	45.8	46.9	46.9
	Agree	696	37.7	38.6	85.4
	Neutral	223	12.1	12.4	97.8
	Disagree	33	1.8	1.8	99.6
	Strongly disagree	7	0.4	0.4	100.0
	Total	1805	97.7	100.0	
Missing	Partial complete	8	0.4		
	No answer	35	1.9		
	Total	43	2.3		
Total		1848	100.0		

Because of my ROV project...I am a better critical thinker

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	813	44.0	45.1	45.1
	Agree	668	36.1	37.1	82.2
	Neutral	275	14.9	15.3	97.4
	Disagree	36	1.9	2.0	99.4
	Strongly disagree	10	0.5	0.6	100.0
	Total	1802	97.5	100.0	
Missing	Partial complete	8	0.4		
	No answer	38	2.1		
	Total	46	2.5		
Total		1848	100.0		

Because of my ROV project...I am more organized

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	644	34.8	35.7	35.7
	Agree	581	31.4	32.2	67.9
	Neutral	420	22.7	23.3	91.2
	Disagree	99	5.4	5.5	96.7
	Strongly disagree	60	3.2	3.3	100.0
	Total	1804	97.6	100.0	
Missing	Partial complete	8	0.4		
	No answer	36	1.9		
	Total	44	2.4		
Total		1848	100.0		

Because of my ROV project...I am more self-confident

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	729	39.4	40.6	40.6
	Agree	623	33.7	34.7	75.2
	Neutral	331	17.9	18.4	93.7
	Disagree	67	3.6	3.7	97.4
	Strongly disagree	47	2.5	2.6	100.0
	Total	1797	97.2	100.0	
Missing	Partial complete	8	0.4		
	No answer	43	2.3		
	Total	51	2.8		
Total		1848	100.0		

Are you interested in a career in science, technology, engineering, or math?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1442	78.0	79.1	79.1
	No	88	4.8	4.8	84.0
	Not sure	292	15.8	16.0	100.0
	Total	1822	98.6	100.0	
Missing	Partial complete	8	0.4		
	No answer	18	1.0		
	Total	26	1.4		
Total		1848	100.0		

What career would you like to have when you finish school?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Comments	1659	89.8	100.0	100.0
Missing	Partial complete	12	0.6		
	No comment	177	9.6		
	Total	189	10.2		
Total		1848	100.0		

Have you or your school received an award or honor as a result of your ROV project?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes -- Please describe	596	32.3	33.8	33.8
	No	1165	63.0	66.2	100.0
	Total	1761	95.3	100.0	
Missing	Partial complete	10	0.5		
	No answer	77	4.2		
	Total	87	4.7		
Total		1848	100.0		

Has your ROV project opened up other education or career opportunities for you (e.g., strengthened college application, scholarship, internship, job offer)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes -- Please describe	664	35.9	37.5	37.5
	No	1105	59.8	62.5	100.0
	Total	1769	95.7	100.0	
Missing	Partial complete	11	0.6		
	No answer	68	3.7		
	Total	79	4.3		
Total		1848	100.0		

What is your grade level? (If you are completing this during the summer, please mark the grade you attended in the school year that just finished.)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1st grade	2	0.1	0.1	0.1
	2nd grade	1	0.1	0.1	0.2
	3nd grade	7	0.4	0.4	0.6
	4th grade	31	1.7	1.7	2.3
	5th grade	57	3.1	3.2	5.5
	6th grade	133	7.2	7.5	13.0
	7th grade	201	10.9	11.3	24.3
	8th grade	228	12.3	12.8	37.1
	Freshman	213	11.5	12.0	49.0
	Sophomore	233	12.6	13.1	62.1
	Junior	263	14.2	14.8	76.9
	Senior	242	13.1	13.6	90.5
	Year 1	18	1.0	1.0	91.5
	Year 2	13	0.7	0.7	92.2
	College Freshman	28	1.5	1.6	93.8
	College Sophomore	33	1.8	1.9	95.6
	College Junior	30	1.6	1.7	97.3
	College Senior	48	2.6	2.7	100.0
	Total	1781	96.4	100.0	
Missing	Partial complete	12	0.6		
	No answer	55	3.0		
	Total	67	3.6		
Total		1848	100.0		

What competition class did you participate in?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	EXPLORER	175	9.5	9.8	9.8
	RANGER	872	47.2	48.6	58.4
	NAVIGATOR	210	11.4	11.7	70.1
	SCOUT	537	29.1	29.9	100.0
	Total	1794	97.1	100.0	
Missing	Partial complete	12	0.6		
	No answer	42	2.3		
	Total	54	2.9		
Total		1848	100.0		

How many years have you participated in the MATE ROV competition?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	This is my first year	995	53.8	55.5	55.5
	2 years	480	26.0	26.8	82.3
	3 years	206	11.1	11.5	93.8
	4 years	66	3.6	3.7	97.4
	5 or more years	46	2.5	2.6	100.0
	Total	1793	97.0	100.0	
Missing	-2	12	0.6		
	-1	42	2.3		
	System	1	0.1		
	Total	55	3.0		
Total		1848	100.0		

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	1255	67.9	70.9	70.9
	Female	514	27.8	29.1	100.0
	Total	1769	95.7	100.0	
Missing	Partial complete	12	0.6		
	No answer	67	3.6		
	Total	79	4.3		
Total		1848	100.0		

What would you say best describes your ethnicity? White

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1176	63.6	64.1	64.1
	No	659	35.7	35.9	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? African American/Black

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	107	5.8	5.8	5.8
	No	1728	93.5	94.2	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? Hispanic/Latino/a

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	260	14.1	14.2	14.2
	No	1575	85.2	85.8	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? Asian

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	244	13.2	13.3	13.3
	No	1591	86.1	86.7	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? Filipino/a

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	46	2.5	2.5	2.5
	No	1789	96.8	97.5	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? Pacific Islander

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	31	1.7	1.7	1.7
	No	1804	97.6	98.3	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? American Indian or Alaska Native

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	33	1.8	1.8	1.8
	No	1802	97.5	98.2	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? Multiple Ethnicities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	76	4.1	4.1	4.1
	No	1759	95.2	95.9	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? Other -- Please describe

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	77	4.2	4.2	4.2
	No	1758	95.1	95.8	100.0
	Total	1835	99.3	100.0	
Missing	Partial complete	13	0.7		
Total		1848	100.0		

What would you say best describes your ethnicity? Other -- Please describe (specify)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Comments	81	4.4	100.0	100.0
Missing	Partial complete	21	1.1		
	No comment	1746	94.5		
	Total	1767	95.6		
Total		1848	100.0		

Do you have any disabilities that require accommodations?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	38	2.1	2.1	2.1
	No	1631	88.3	91.6	93.8
	Prefer not to respond	111	6.0	6.2	100.0
	Total	1780	96.3	100.0	
Missing	Partial complete	13	0.7		
	No answer	55	3.0		
	Total	68	3.7		
Total		1848	100.0		