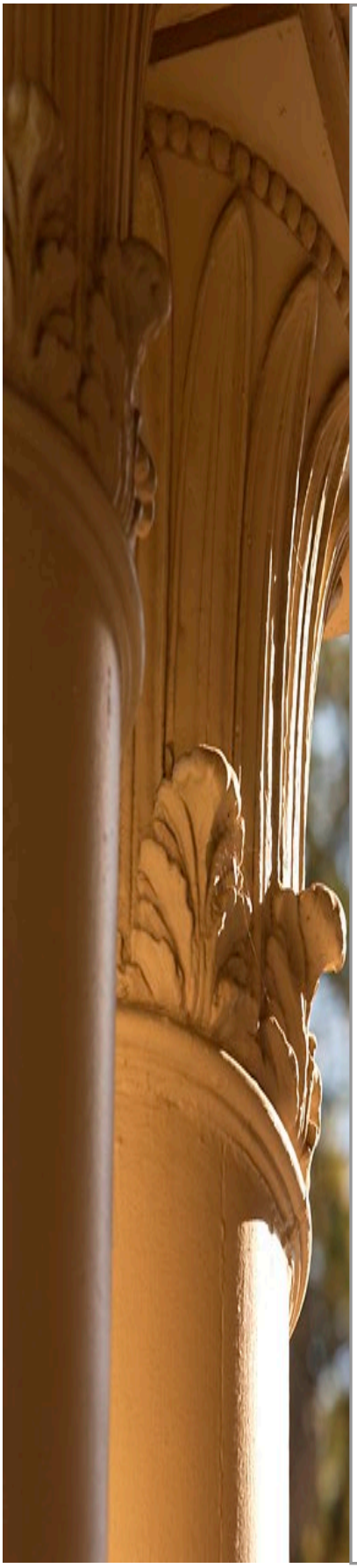

Marine Advanced Technology Education (MATE)

ROV Competition Alumni Survey Results

December 2024

Submitted by:

SESRC

Social & Economic Sciences Research Center (SESRC)
Puget Sound Division
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Telephone: (360) 373-0468

SPONSORSHIP

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ABOUT SESRC

The Social and Economic Sciences Research Center (SESRC) at Washington State University is a recognized leader in the development and conduct of survey research.

SESRC Puget Sound Division provides technical services and consultation to assist clients in acquiring data, understanding what data means, and applying that information to solving problems. The SESRC Puget Sound Division specializes in research design, data collection and analysis, using both qualitative and quantitative methods. The Division also provides interpretive reports, policy studies, presentations and consulting services directly to individual clients, organizations and consortia.

ACKNOWLEDGEMENTS

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ROV Competition Alumni Survey Results

For Marine Advanced Technology Education (MATE)

BY: J. MICHAEL SCHIWART & ADAM MCKEE

SOCIAL & ECONOMIC SCIENCES RESEARCH CENTER, PUGET SOUND DIVISION

WASHINGTON STATE UNIVERSITY

DECEMBER 2024

In the fall of 2019, Marine Advanced Technology Education (MATE) received supplemental funding through a National Science Foundation Advanced Technological Education (ATE) grant for activities that included additional iterations of the MATE ROV Competition Alumni Survey. The goal of this evaluation effort is to answer the following questions about former competitors (aka "alumni"): "Where are they now?" and, "To what extent did their involvement with MATE influence their trajectory?"

In 2024, 403 alumni completed the survey, and 359 partially completed it, and the response rate was 16.9%. The response rate for the alumni survey conducted in 2020 was 16.1%[1], and the 2015 response rate was 10.2%.

MATE ROV COMPETITION ALUMNI SURVEY RESULTS

The 2024 MATE ROV Competition Alumni Survey results are presented below, with some comparisons to the 2020 survey results, where applicable. Unless otherwise noted, survey results refer to the 2024 survey.

Respondent Participation in MATE ROV Competition

- **Years of participation:** Respondents (N=546) competed as student team members for up to 11 years, with an average of 2.4 years per student.
- **Competition Classes:** Respondents (N=533) competed as student team members in all five competition classes: SCOUT (14%), NAVIGATOR (14%), RANGER (42%), PIONEER (6%) and EXPLORER (38%).

[1] The response rate for 2020 was erroneously reported as 9.5% in the 2020 report due to a calculation error.

- **Other Participation in Competition:** Eight percent (8%) of the student competitors over age 18 (N=746) later served as a judge at a competition, another 6% volunteered at a competition (other than as a judge), and 9% served as an instructor leading a team.

Using ROVs outside the ROV Competition

- Thirty percent (30%, N=514) of the alumni have used ROVs outside of the MATE ROV Competition program. Alumni have used ROVs in their roles as students, educators, ROV professionals, and researchers.

Alumni Education and Employment

- The alumni's reported highest level of education ranged from high school (no diploma) to doctorate.
- **Current Students:** Among the 254 current college and university students in the 2024 survey, 89% (N=227) are studying towards a STEM degree.
    - **Institution Type:** Current students (N=254) largely reported attending 4-year universities (65%), graduate programs (12%), high school (8%), community or technical colleges (8%), or 'other' (6%) types of school such as middle school, a 3-year university, or additional credential classes.
    - **Highest Degree Plan to Attain:** The students (N=252) plan to attain a range of terminal degrees: *Associate's degree* (2%), *Bachelor's degree* (27%), *Master's degree* (43%), and *Doctorate* (23%).
- **Degree Holders:** Among the 287 alumni who earned a college degree, 88% earned a degree in a STEM discipline.
- **Employment**: Almost three-quarters (71%) of the alumni (N=486) are currently employed.
    - **STEM-Related Employment:** Among the employed alumni (N=337), 81% are currently working a STEM-related job.
    - **ROV-Related Employment:** Among the employed alumni, 18% are currently working a job related to ROVs or other underwater technologies, and an additional 12% reported that they had at some point worked in a job related to ROVs or other underwater technologies.

ROV Competition's Influence on Educational and Career Paths

- Ninety-three percent (93%; N=482) of the alumni credited the ROV competition with having at least A little influence on their educational or career path. Roughly two-fifths (42%) indicated that the competition influenced them to *A great extent*, and 35% marked that the competition influenced them *Somewhat*. Sixteen percent (16%) noted that the competition influenced them *A little*, 11% indicated that the competition did not affect them at all, and 1% didn't know.

- The ROV competition played a role in alumni attaining admittance into educational programs/college/university (31%; N=482), employment (29%), internships (28%), scholarships (18%), awards (15%), and other outcomes (19%).

ROV Competition's Influence on Knowledge and Skills

- The majority of alumni indicated that ROV program helped strengthen their knowledge or skills to A great extent in engineering (70%, N=425) and technology (62%, N=426). Thirty-three percent (33%, N=427) noted that the ROV program helped strengthen their knowledge in science to A great extent, and 13% (N=426) indicated that the ROV program helped strengthen their knowledge in math to A great extent.
- The majority of the alumni (97%, N=403) noted that participating in the ROV program helped them learn how to apply science, technology, engineering and/or math to real-world problems.
- MATE ROV competition alumni also reported making substantial gains in their 21st Century skills due to the competition. The ROV competition was most beneficial in strengthening skills to A great extent in teamwork (76%), problem solving (68%), leadership (62%), critical thinking (62%), project management (60%), and organizational skills (52%).

Overall Rating of the MATE ROV Competition Program

- A majority of the alumni (N=765) rated their experience with the MATE ROV competition highly, with more than half (56%) indicating that their experience was Excellent, more than one-third (35%) providing a rating of Good, and 7% rating their experience as Fair. Only eleven students (1%) indicated that their experience was Poor, and nine students (1%) rated their experience as Very poor.
- A set of regression analyses highlighted the relationships between aspects of the alumni competition experience, which found that strengthening critical thinking, problem solving, and employability knowledge and skills predicted strengthened technology knowledge and skills, while strengthening leadership, problem solving, and employability skills predicted increased perception of positive influence on education and career goals, which predicted increased positive overall perception of the MATE ROV competition.

INTRODUCTION

In the fall of 2019, Marine Advanced Technology Education (MATE) received funding through a National Science Foundation Advanced Technological Education (ATE) grant for activities that included an additional iteration of the MATE ROV Competition Alumni Survey. The goal of this evaluation effort was to determine the educational and employment outcomes of the former competition participants (aka "alumni") and the extent to which their involvement in the competition influenced these outcomes. This report presents the results of the MATE ROV Competition Alumni Survey.

Data Sources

ROV COMPETITION STUDENT ALUMNI SURVEY

The goal of the MATE ROV Competition student alumni survey was to answer the following questions about former competitors: "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. The survey was first conducted in 2015 and then repeated in 2020 and 2024. Selected results from the 2015 and 2020 surveys are included in this report for historical reference.

The web survey attempted to contact all former competition student participants who were at least 18 years old at the time of the survey. This was complicated by several factors:

- Birthdates entered in multiple formats,
- Unclear identification of student and teacher/mentor status in several competition years, and
- Students often provided parents' or teachers' email addresses. Alternately, they provided their school addresses, which were not active after they left that school.

To resolve the uncertainty created by the first two above factors, the survey included two screening questions at the beginning of the survey.

1. "This survey is designed for people who are at least 18 years of age. Are you at least 18 years old today?" The response options were yes and no. Respondents who marked "no" were filtered out of the survey.
2. "How have you participated in the MATE ROV Competition program? [Mark all that apply.]" The response options were: student on a team, instructor leading a team, judge at a competition, classroom/club mentor assigned to help other teams, and other. Respondents who did not mark "student on a team" were filtered out of the survey.

The survey was programmed into Qualtrics, and quality control was performed by the evaluation team, as well as the MATE PI. The survey was launched on August 1, 2024, with email invitations to 24,022 email addresses. Email reminders were sent to the non-respondents on August 19, September 3, October 1, and October 14, 2024. The survey was closed on November 1, 2024.

The 2015 survey was conducted with unique survey links for each individual respondent. This caused frustration among the respondents, as they tried to forward the survey link to their former teammates, only to find that the link would only work once. The 2020 and 2024 surveys were conducted with unique survey links for each individual respondent as well as snowball sampling. An anonymous survey link was posted on the MATE website and circulated via the MATE social media channels and the MATE newsletter.

Of the 24,022 email addresses distributed:

- 4,243 messages bounced
- 619 participants met the age requirement of being 18 years or older
- 587 surveys were considered at least partially completed with the first substantive item being answered
- 334 surveys were considered fully completed with the final demographic item being answered

Of the 227 surveys initiated via anonymous link:

- 2 filtered out as duplicate responses
- 184 participants met the age requirement of being 18 years of age or older
- 175 surveys were considered at least partially completed as participants answered at the least the first substantive item
- 69 surveys were considered completed as participants answered all substantive and demographic items

Overall, of the survey's 1,006 responses:

- 805 participants met the age requirement of being 18 years or older
- 764 participants answered at least the first substantive item
- 2 were filtered out as duplicate responses
- 762 responses were included in the data analyses
- 403 responses are considered completed as participants answered all substantive and demographic items

The response rate was calculated using the Response Rate 6 (RR6) calculation from the American Association of Public Opinion Research's 2011 *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*. 7th Edition.

RR6 = (Completed + Partially Completed) / (Completed + Partially Completed) + (Refusals + Noncontact + Other)

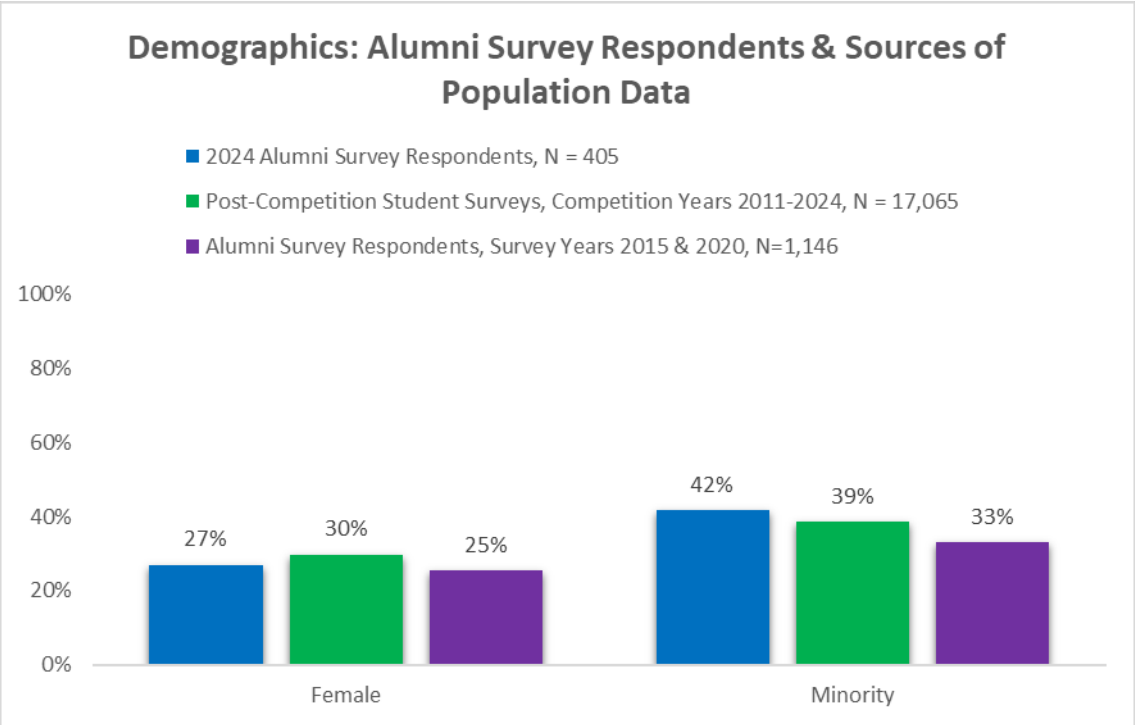
RR6 = (403 + 359) / (403 + 359) + (147 + 3603 + 0) = 762 / (762 + 3750 + 0) = 762/4512 = .169 = 16.9%

As shown by this calculation, the response rate was 16.9% for the 2024 survey. The response rate for the 2020 survey was 16.1%, and the 2015 survey rate was 10.2%.

To determine whether the respondents were representative of the population, evaluators intended to compare respondent demographics with population demographics. Unfortunately, good sources of population demographics are not available for the entire population of the competition (competition years 2006-2024). The demographics of the survey respondents are detailed below, along with the available sources of population demographics. (Figure 1)

The 2024 survey respondents reported being 27% female; and 42% were of minority backgrounds. The 2024 Alumni Survey respondents were representative of prior Post-Competition Survey respondents as well as prior Alumni Survey respondents regarding gender as well as racial and ethnic minorities.

Figure 1. Demographics of Alumni Survey Respondents and Sources of Population Data



FINDINGS

MATE ROV Competition Alumni Survey

The 2024 MATE ROV Competition Alumni Survey results are presented below, with comparison to the 2020 survey results, where applicable. Unless otherwise noted, survey results refer to the 2024 survey. Results only include valid responses (N=762), as determined by the following criteria: the participant reported being 18 years of age or older and they responded to at least the first substantive question "Overall, how would you rate your experience with the MATE ROV competition program?".

RESPONDENT DEMOGRAPHICS

The majority of alumni who responded to the 2024 survey reported being a man or boy (65%; N=405; Figure 2), white (64%; N=405; Figure 3), between the ages of 18 and 24 (60%; N=405; Figure 4), graduated high school within the last four years (48%; N=470; Figure 5) and from the United States of America (65%; N=373; Figure 6).

Figure 2. Participant Demographics: Reported Gender

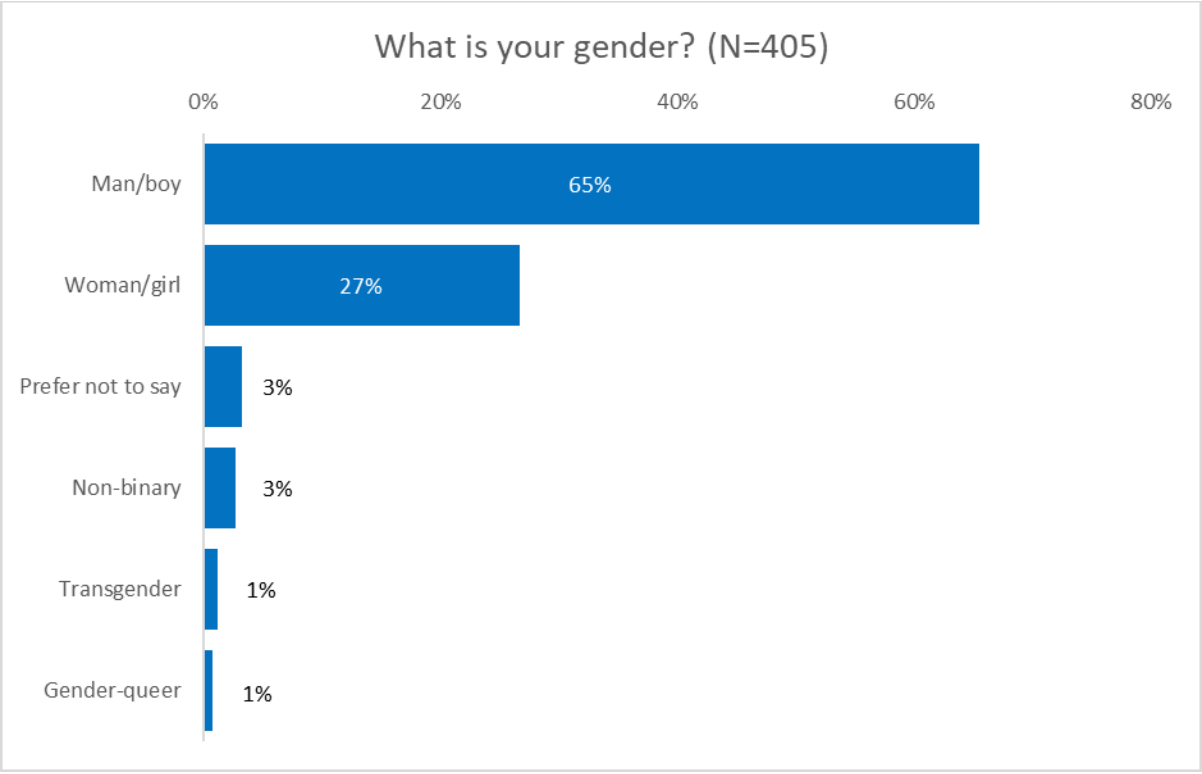
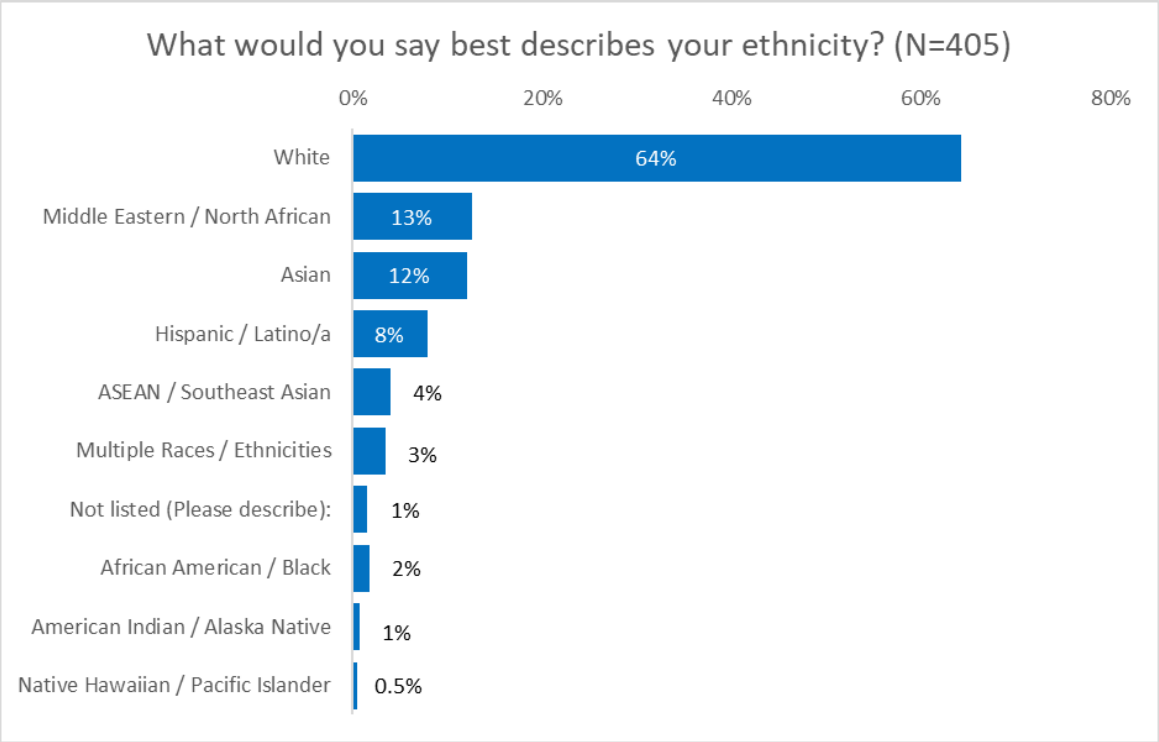


Figure 3. Participant Demographics: Reported Race/Ethnicity



Note. Participants were asked to select all that applied, meaning totals do not sum to 100%.

Figure 4. Participant Demographics: Reported Age Range

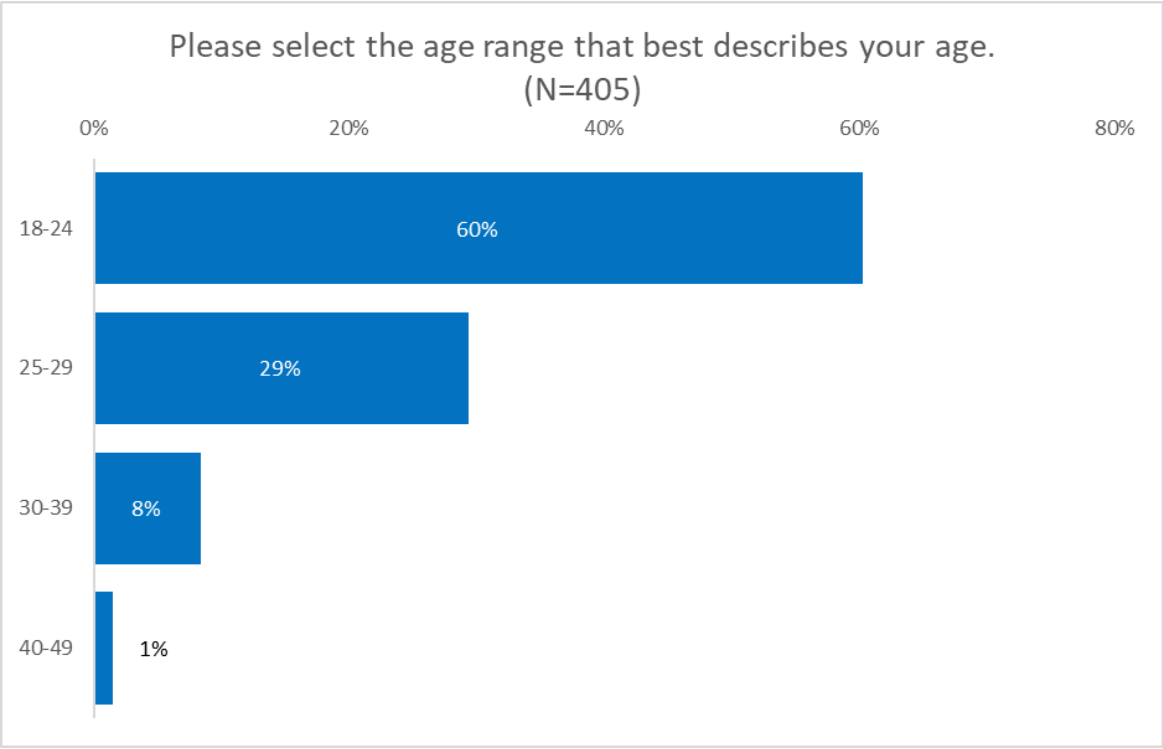


Figure 5. Participant Demographics: Reported Year of High School Graduation

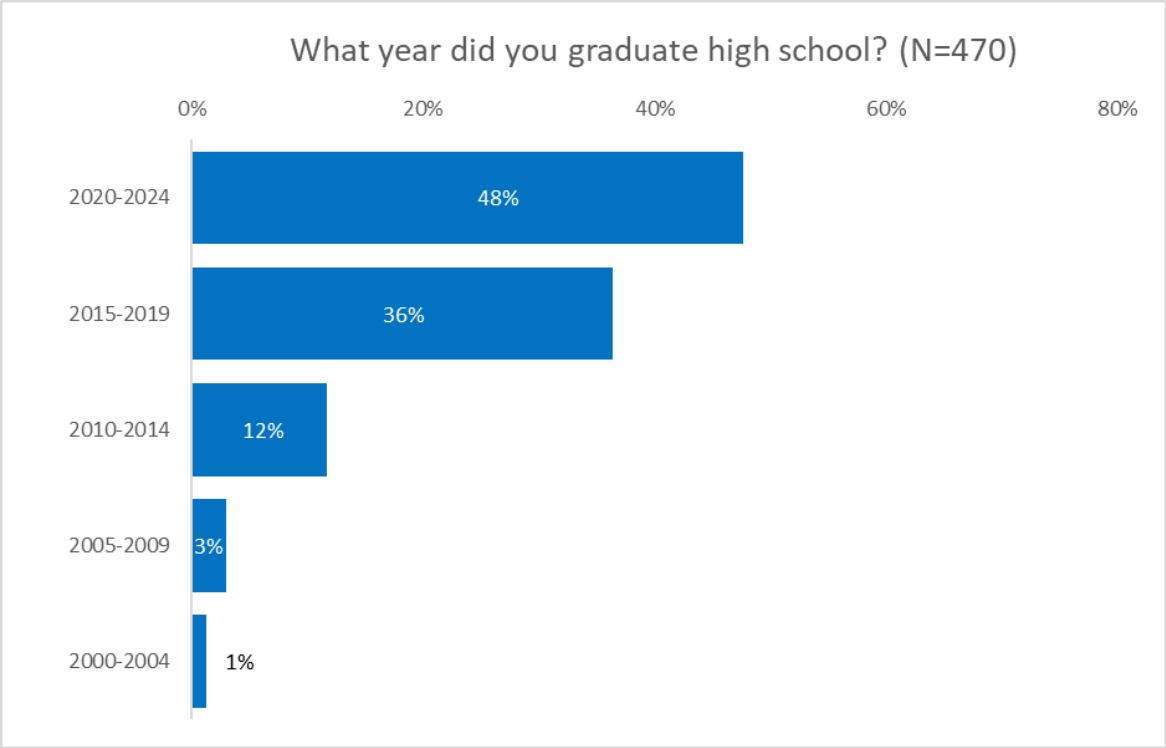
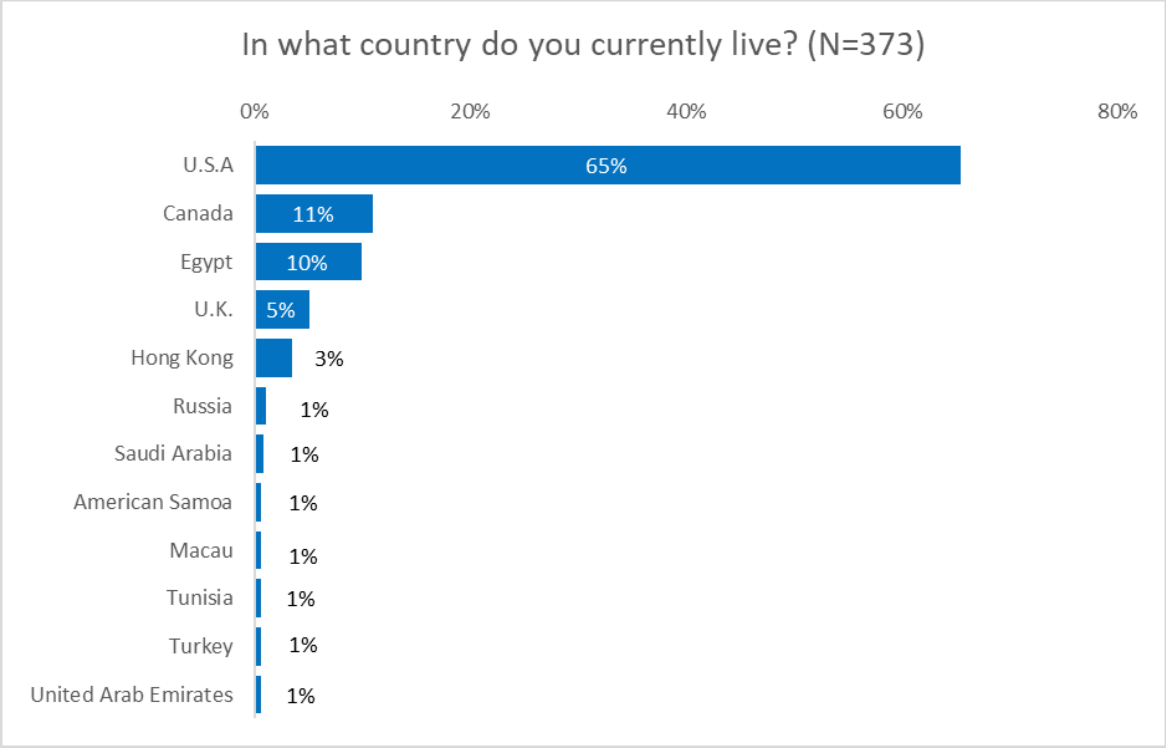


Figure 6. Participant Demographics: Reported Country Currently Lived In



BACKGROUND: ALUMNI PARTICIPATION IN ROV COMPETITION

2024 Survey

- Eight percent (8%) of the student competitors (N=746) later served as a judge at a competition, another 6% volunteered at a competition (other than as a judge), and 9% served as an instructor/mentor/coach leading a team.
- Participants (N=546) competed as student team members for up to 11 years, with an average of 2.4 years per student. Additionally, respondents who went on to serve in other capacities reported the following duration of involvement:
    - Instructors/mentors/coaches who led teams (N=51): up to six years in this role, with a mean of 1.5 years.
    - Competition judges (N=41): up to 15 years in this role, with a mean of 3.7 years.
    - Competition volunteers – (other than judges; N=32): up to 10 years in this role, with a mean of 2.8 years.
- Respondents (N=533) competed as student team members in all five competition classes: SCOUT (14%), NAVIGATOR (14%), RANGER (42%), PIONEER (6%) and EXPLORER (38%). About one-fifth (19%) of the respondents were not sure which competition classes they had participated in.

2020 Survey

- Eight percent (8%) of the student competitors over age 18 (N=697) later served as judge at a competition, another 8% volunteered at a competition (other than as a judge), 6% served as a classroom/club mentor assigned to help other teams, and 12% served as an instructor/mentor/coach leading a team.
- Respondents (N=686) competed as student team members for up to 10 years, with an average of 2.35 years per student.[2] Respondents who went on to serve in other capacities reported the following duration of involvement:
    - Instructors who led teams (N=43): up to seven years in this role, mean of 1.88 years.
    - Competition judges (N=56): up to 10 years in this role, mean of 4.23 years.
    - Competition volunteers – other than judges (N=56): up to 13 years in this role, mean of 2.13 years.
    - Classroom/club mentor (N=42): up to six years in this role, mean of 1.68 years.
- Respondents (N=657) competed as student team members in all four[3] competition classes: SCOUT (17%), NAVIGATOR (11%), RANGER (36%), and EXPLORER (38%). One quarter (25%) of the respondents did not know which competition classes they had participated in.

[2] All responses that included impossible or highly improbable information were removed from results.

[3] PIONEER was not an available competition class in 2020.

USING ROVS OUTSIDE THE ROV COMPETITION

Thirty percent (30%, N=514) of the alumni reported using ROVs outside of the MATE ROV Competition program. Alumni have used ROV's in their roles as students, educators, ROV professionals, and researchers. Examples of how they have used ROV's include the following:

> *Yes, in my current field of study in college as an Ocean Engineering major at the United States Naval Academy.*
>
> *I innovated a Hull cleaning ROV that have been used for cleaning ship hulls specially for cargo ships.*
>
> *We have co-founded an underwater robotics company after getting 1st place in the competition.*
>
> *Created a harbor cleanup robot in high school to cleanup surface plastic and waste from waterways.*
>
> *I am building one as my High School final year project right now.*

ALUMNI EDUCATION AND EMPLOYMENT

- In both the 2024 and 2020 surveys, the alumni's highest level of education ranged from high school (no diploma) to doctorate. (See Figure 7)

2024 Alumni Survey

- The majority of respondents who have graduated high school (N=470) reported graduating between 2020 and 2024 (48%), followed by graduating between 2015 and 2019 (36%; Figure 8).
- **Among the 254 current college and university students who responded to the 2024 survey, 89% (N=227) reported studying towards a STEM degree.**
    - Institution Type: Current students (N=254; Figure 9) largely reported attending 4-year universities (65%), graduate programs (12%), high school (8%), community or technical colleges (8%), or 'other' (6%) types of school such as middle school, a 3-year university, or additional credential classes.
    - Examples of colleges and universities attended: Virginia Tech, University of Michigan, John Hopkins University, Cornell University, Carnegie Mellon University, Georgia Institute of Technology, Stanford University, University of California – Berkeley, University of Washington, Purdue University, and Northwestern University.
    - Examples of college majors: The majors that current college students reported were largely STEM-based, related to engineering and technology, computer science and information technology, natural and physical sciences, health and medical sciences, social sciences and humanities, and science education. Additionally, several other majors were reported, such as culinary arts, graphic design, and business and management.

- Highest Degree Planned to Attain: Respondents (N=252; Figure 10) reported planning on attaining a terminal *Master's degree* (43%), *Bachelor's degree* (27%), *Doctorate* (23%), and *Associate's degree* (2%).

- **Among the 287 alumni who reported having earned at least a Bachelor's degree, over four-fifths of them (88%) earned degrees in STEM fields.**
  - Types and examples of degrees earned:
    - Engineering and Technology: Mechanical Engineering, Electrical Engineering, and Mechatronics Engineering.
    - Computer Sciences and Information Technology: Software Engineering, Information Technology, and Data Science.
    - Natural and Physical Sciences: Physics, Chemistry, Biology, and Marine Science.
    - Social Sciences and Humanities: Psychology, Sociology, Political Science, and Anthropology.
    - Miscellaneous: Marine Transportation, Ocean Mapping, and Environmental Design.
    - Business and Management: Business Administration, Finance and Accounting, Marketing, and Supply Chain Management.
- Nearly three-fourths (71%%; N=486) of alumni reported being currently employed.
  - **Among those currently employed, over four-fifths (81%; N=337) reported working in STEM-related jobs.**
  - **Among those currently employed, 18% (N=335) currently work in a job related to ROVs or other underwater technology, and 12% (N=277) of those who are not currently working in a related job reported having done so at some point in their career.**
    - Types and examples of reported current jobs (see Figure 11):
      - Engineering and Technology: Software Engineers, Mechanical Engineers, Civil Engineers, Robotics Engineers, and Data Analysts.
      - Research and Academia: Professors and Instructors, Research Assistants, and Teaching Assistants.
      - Healthcare and Life Sciences: Clinical Pharmacists, Biomedical Research Assistants, and Behavioral Technicians.
      - Management and Consulting: Product Managers, Management Consultants, and Project Managers.
      - Miscellaneous Roles: Retail and Customer Service, Technicians, Creative Roles, and Education Roles.

Figure 7. Highest Level of Education

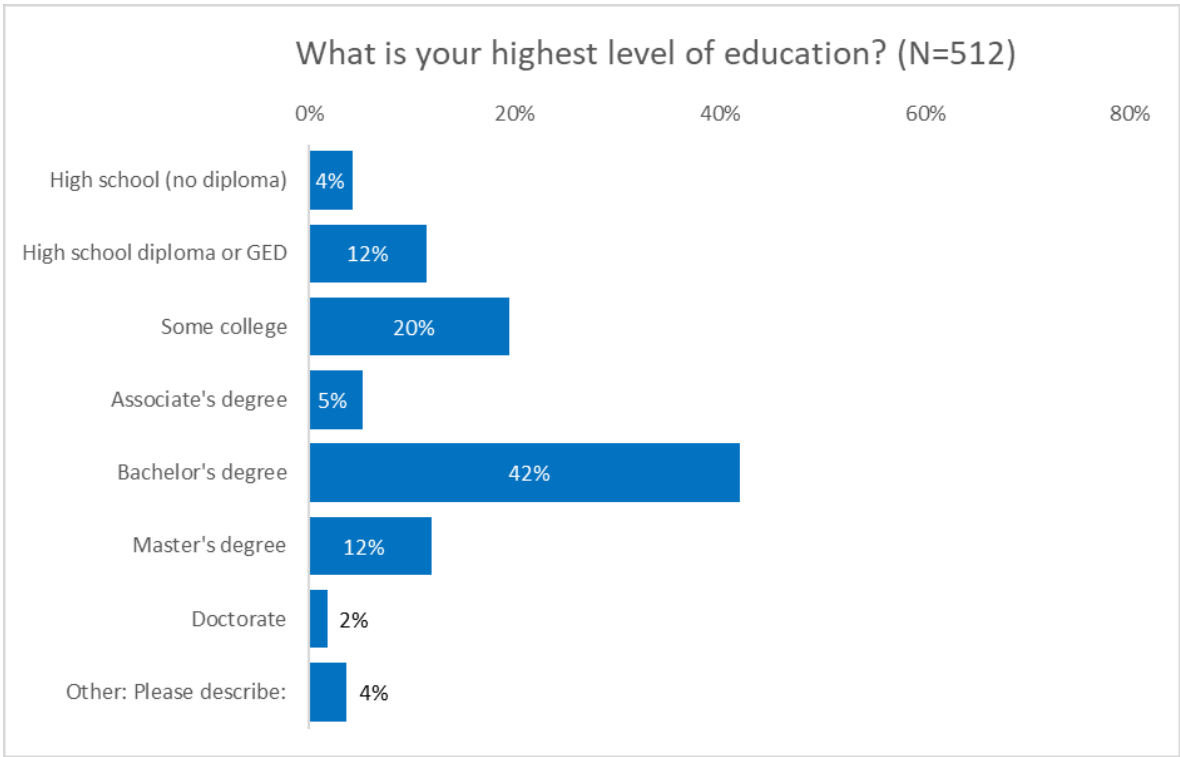


Figure 8. Year of High School Graduation

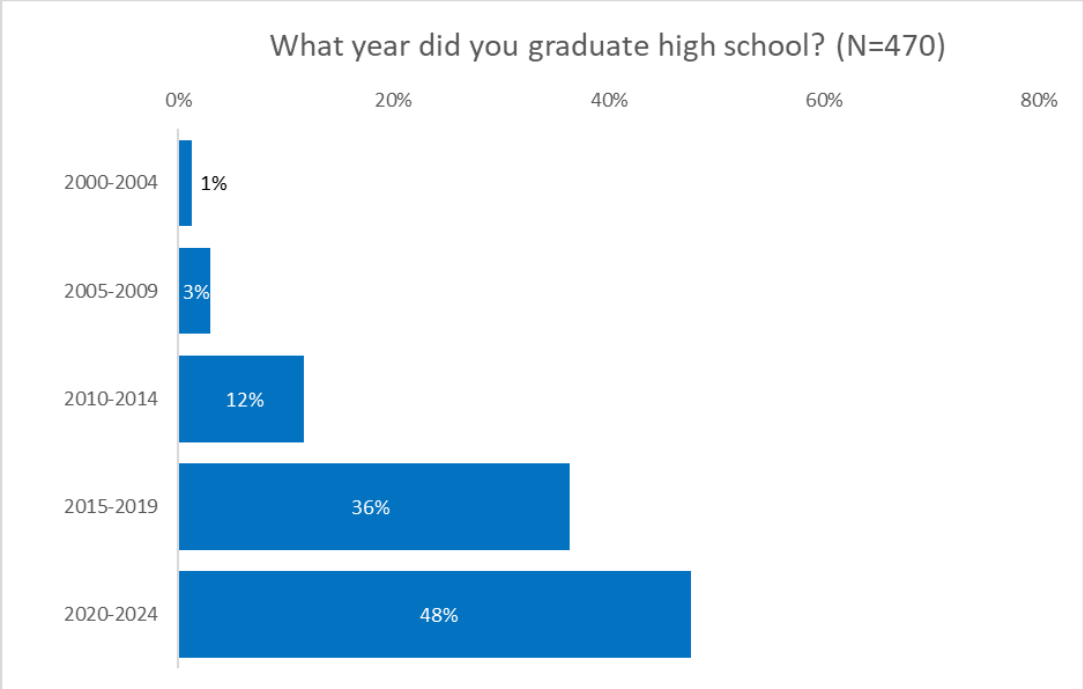


Figure 9. Type of School Currently Attending

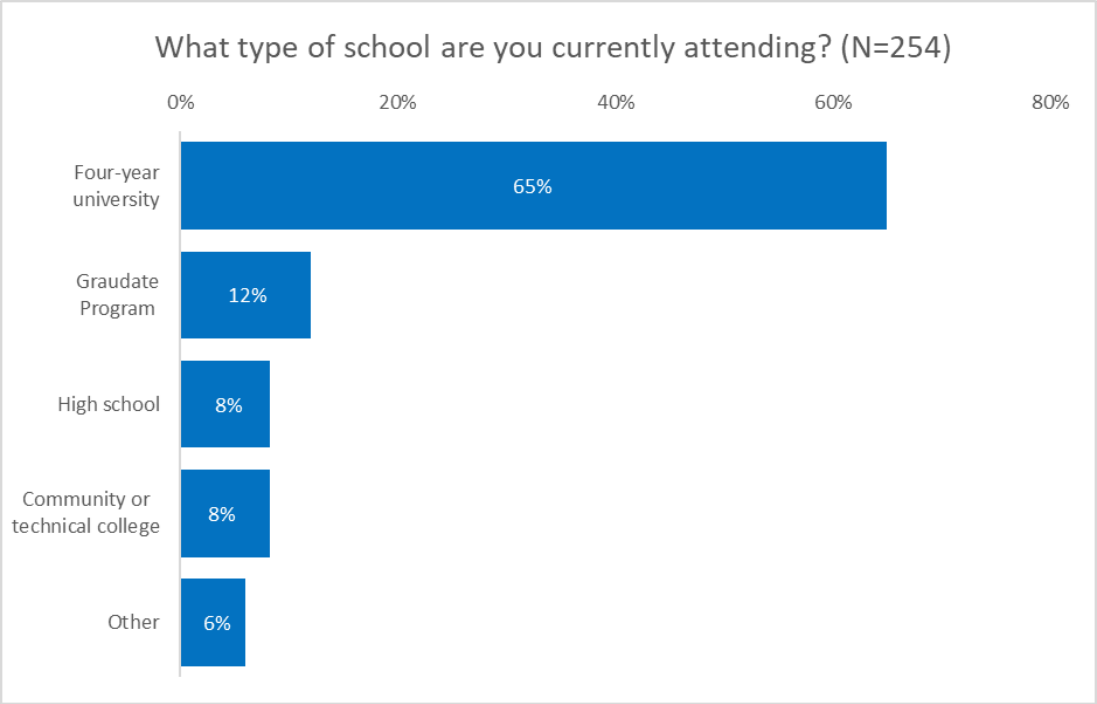


Figure 10. Highest Level of Education planned to Attain

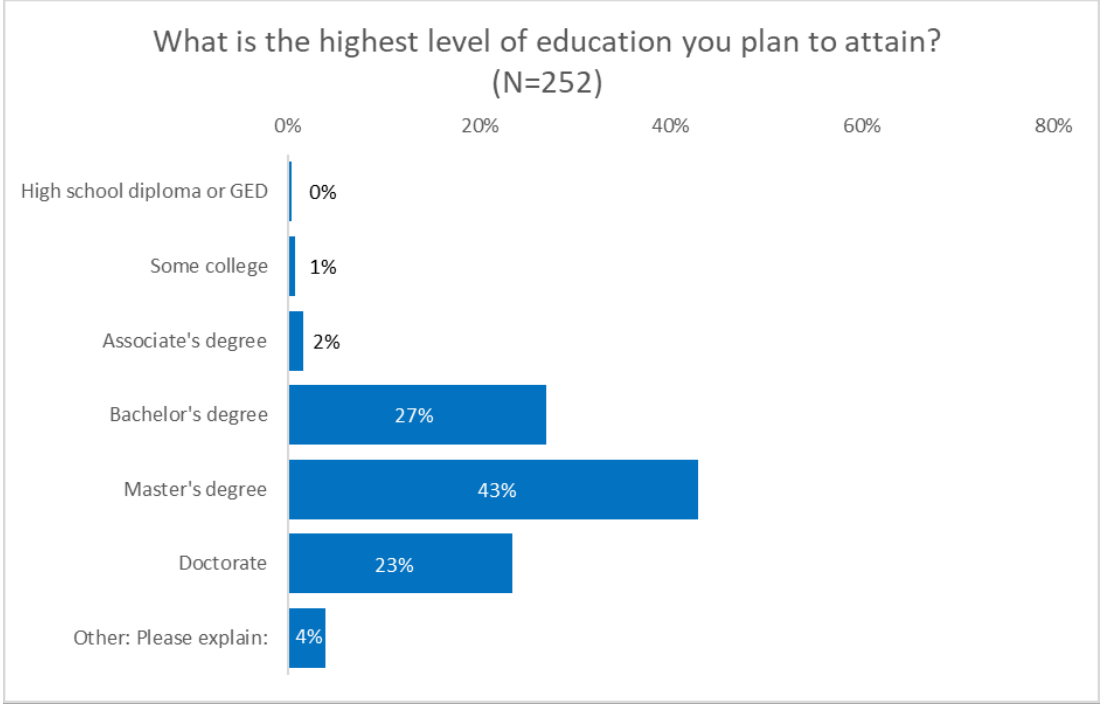


Figure 11. Word Cloud of Alumni's Current Jobs

2020 Alumni Survey

- **Among the 324 current college and university students in the 2020 survey, 83% (N=305) were studying towards a STEM degree.**
    - Examples of colleges and universities attended: Massachusetts Institute of Technology, Harvard University, Carnegie Mellon University, Purdue University, Oregon Institute of Technology, University of Portland, El Camino College, Northeastern University, Washington State University, and University of California - Santa Cruz.
    - Examples of college majors: Computer Science, Computer Engineering, Astrophysics, Environmental Science, Aerospace Engineering, Nursing, Mechatronics, Psychology, Robotics Engineering, Ocean Mapping, Kinesiology, Architecture, Earth Science, Space and Instrumentation Engineering, Aerospace and Occupational Safety, Global Health Management and Policy, International Relations, and Automation.
    - Institution Type: Close to two-thirds (64%) of the current students (N=322) were attending a four-year university; 9% were attending a community or technical college; 3% were in high school; and 24% were attending another type of school, such as graduate school, a five-year University, medical school, or Professional Certificates.
    - Highest Degree Plan to Attain: The students (N=316) plan to attain a range of degrees: *Associate's degree* (1%), *Bachelor's degree* (29%), *Master's degree* (43%), and other degrees, such as medical and dental degrees (1%).
- **Among the 403 alumni who earned a college degree in the 2020 survey, 88% (N=390) earned a degree in a STEM discipline.**
    - Examples of degrees include the following: BS and MS in Mechanical Engineering, MS in Electrical Engineering, BS and MS in Biomedical Engineering, BS in Computer

Engineering, BS Aerospace Engineering, AS in Applied Marine Biology and Oceanography, BS in Marine Biology, and PhD in Astronomy.

- Almost three-quarters (73%) of the alumni in the 2020 survey (N=642) were currently employed.
    - **Among the employed alumni (N=467), 77% were currently working a STEM-related job.**
    - **Among the employed alumni, 13% were currently working a job related to ROVs or other underwater technologies, and an additional 11% had ever worked in a job related to ROVs or other underwater technologies.**
    - Examples of current jobs, in the respondents' own words were: Subsea Installation Engineer, Aquaculture Technologist, Electrical Engineer for Underwater Sonar Defense Systems, Hydrographic/Geophysical Technologist, and Composite Tooling Engineer supporting Navy submarine programs.

ROV COMPETITION'S INFLUENCE ON EDUCATIONAL AND CAREER PATHS

Ninety-three percent (93%; N=482) of the alumni credited the ROV competition with having at least *A little* influence on their educational or career path. Roughly two-fifths (42%) indicated that the competition influenced them to *A great extent*, and 35% marked that the competition influenced them *Somewhat*. Sixteen percent (16%) noted that the competition influenced them *A little*, 11% indicated that the competition did not affect them at all, and 1% didn't know. (Figure 12) More respondents reported *A great extent* (42%) in the 2024 survey, but otherwise, these results trend similarly to the results of the 2020 alumni survey. (Figure 13)

Figure 12. ROV Competition's Influence on Education or Career Path

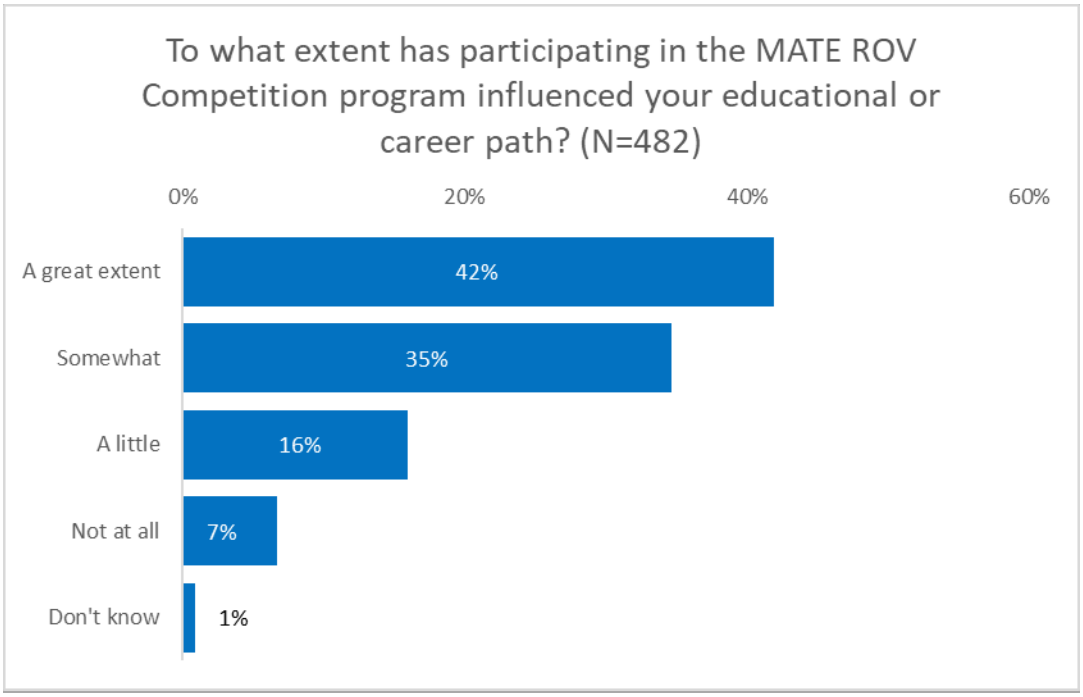
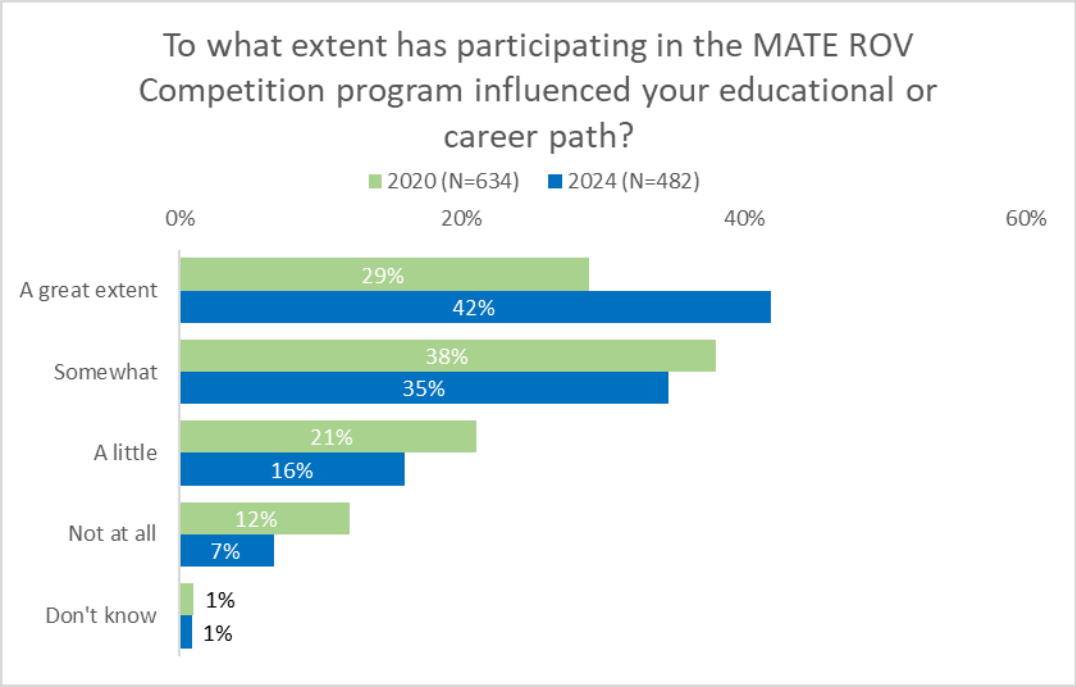


Figure 13. Comparison of 2020 and 2024 ROV Competition's Influence on Education or Career Path



Alumni were asked in a follow-up question to further explain how their experiences in MATE ROV competitions influenced their academic and career paths. The main themes of their responses and key quotes highlighting each theme are presented below:

Skill Development: Alumni highlighted the development of their technical (design, engineering, programming, and documentation) and soft skills (teamwork, leadership, project management, and communication) during their time participating in ROV competitions.

> *I have developed many useful skills such as being proactive and understanding different points of view, which was influenced initially by my experience in the MATE ROV Competition.*
>
> *The interdisciplinary nature of the program enhanced my technical knowledge and project management skills, which are crucial for the role I now hold as a lecturer.*

Career Direction: The competition influenced alumni decisions to study engineering, computer science, and other STEM fields in college, with some reporting that they received scholarships or chose specific universities because of their participation. Furthermore, a number of participants were inspired to pursue careers in engineering, robotics, and related fields, with some mentioning specific interests in underwater robotics, mechanical engineering, and electrical engineering.

> *MATE gave me more exposure to computer programming and electrical engineering, leading me to study Computer Engineering.*
>
> *I originally wanted to specialize in product design but the ROV competition gave me an insight into robotics as a field and I specialized in robotics for the rest of my career.*

Practical Experience: Alumni discussed the ways in which the competition provided practical, hands-on experience that complemented academic learning, which was seen as valuable in securing internships and jobs. They also appreciated opportunities to apply theoretical knowledge to real-world projects, enhancing their problem-solving abilities.

> *It allowed me to get hands-on education and apply what I learned in theory to the real world.*
>
> *It's definitely made me more interested in robotics and practical applications of computer science, rather than just programming. It's also given me more experience with hardware and electronics.*

Networking and Opportunities: Many alumni brought up ways in which the competition helped them build networks with other competitors and industry professionals, which ended up in beneficial career opportunities. Several alumni also mentioned that their participation in the competition helped them secure internships and job offers.

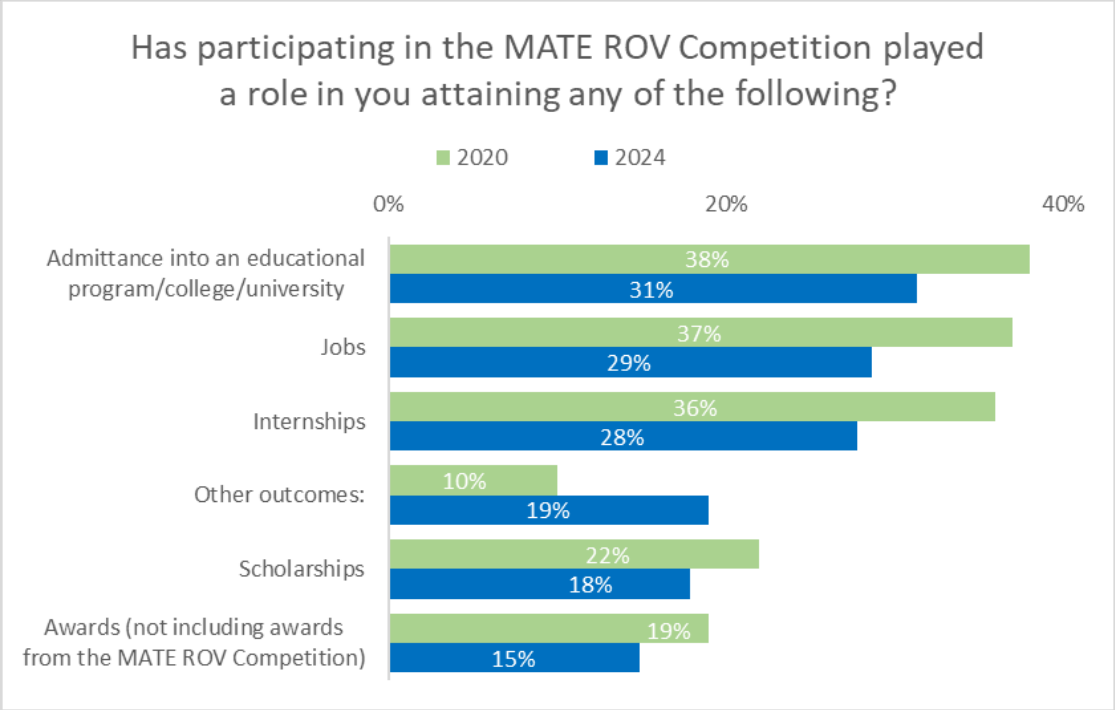
> *MATE was wholly instrumental in getting my career started in offshore technologies. The competition showed me a framework for the knowledge and skills that I would need to master to become successful, and the offshore internship that I secured through MATE gave me my introduction to the network of people and businesses that have constituted the bulk of my career.*
>
> *MATE allowed me to network with professionals already in the industry and make lasting connections.*

Personal Growth: Alumni discussed how they discovered or reinforced their passion for STEM fields through the competition, and how competing boosted their confidence in their abilities and motivated them to pursue challenging careers.

> *It has empowered me to be a leader, be strategic, and pay attention to details while still having fun!*
>
> *I gained valuable skills working as a team and presenting information in public.*

The ROV competition played a role in alumni attaining *Admittance into an educational programs/college/university* (31%), employment (29%), *Internships* (28%), *Other outcomes* (19%). *Scholarships* (18%), and other *Awards* (15%). (See Figure 14) These results follow a similar trend as the results of the 2020 survey.

Figure 14. Comparison of 2020 and 2024 Role the ROV Competition Played in Attainment of Employment, Educational Program Admittance, Internships, Awards, and Scholarships



Exemplar quotes from alumni participants in the 2024 survey include the following:

Admittance into Educational Programs/College/University

> *Participation in the MATE program helped me build my resume as well as gave me places to talk about my leadership and engineering achievements through my 4 years participating in MATE in high school.*
>
> *Participating in MATE ROV helped me develop and express my excitement in ocean engineering, supporting a college application to Yale University that highlights both a depth of passion in engineering and a breadth of interest in other areas such as marine science.*

Employment

> *I met Ocean Infinity at my last competition (they were sponsors) and applied to the position because I received an email from MATE with the information to apply. They hired me because there's not many people with ROV experience and being part of the competition gave me a plus.*
>
> *My interviewer for my job was very interested to hear my experiences in the ROV program and how it positively improved my understanding of engineering. They were keen to hear how my participation in the competition gained me significant knowledge in a wider range of practical and theoretical subjects than were taught at school.*

Internships

My MATE internship was aboard the EV Nautilus, investigating shipwrecks and volcanoes throughout the Mediterranean. I was a copilot for the Hercules ROV.

Pathways intern for Washington Navy Yard job shadowing data analysis, SMART intern for Naval Surface Warfare Center Dahlgren Division Dam Neck Activity doing software development.

Scholarships

I received the Lyle's College of Engineering Honors Scholarship, and was admitted to the LCOE Honors Program. The dollar value of this scholarship is $26,500.

US Naval Academy, 4 year scholarship $475,000.00.

Erasmus+ mobility of total 9 months (on two times), with basic allowance of 900 GBP per month. Studies were fully funded.

Awards

Received the Deputy Principal's Award for high attainment levels during 3 of my 5 university years, which I do not believe I would have had the skills to do had I not participated in the ROV project.

I was awarded first place in a writing competition at the college level. It was referencing my time in the ROV program, the influences my mentors had on me, and why it mattered to me. We were required to read the novel, Spare Parts, which I connected with because of my own experiences in the program.

Appalachian Highlands Twenty Under 20 Award

ROV COMPETITION'S INFLUENCE ON KNOWLEDGE AND SKILLS

The majority of alumni indicated that ROV program helped strengthen their knowledge or skills to *A great extent* in engineering (70%, N=425) and technology (62%, N=426). Thirty-three percent (33%, N=427) noted that the ROV program helped strengthen their knowledge in science to *A great extent*, and 13% (N=426) indicated that the ROV program helped strengthen their knowledge in math to *A great extent*. Responses of *A great extent* were higher across all 4 fields in 2024 compared to 2020 (Figure 15 & Figure 16)

Additionally, the majority of the alumni (97%, N=403) reported that participating in the ROV program helped them learn how to apply science, technology, engineering and/or math to real-world problems. This finding is slightly higher than the 2020 survey, where 91% of the alumni (N=582) noted that the ROV program helped them learn to apply STEM to real-world problems.

Figure 15. 2024 Survey: Extent ROV Program Helped Strengthen STEM Knowledge or Skills

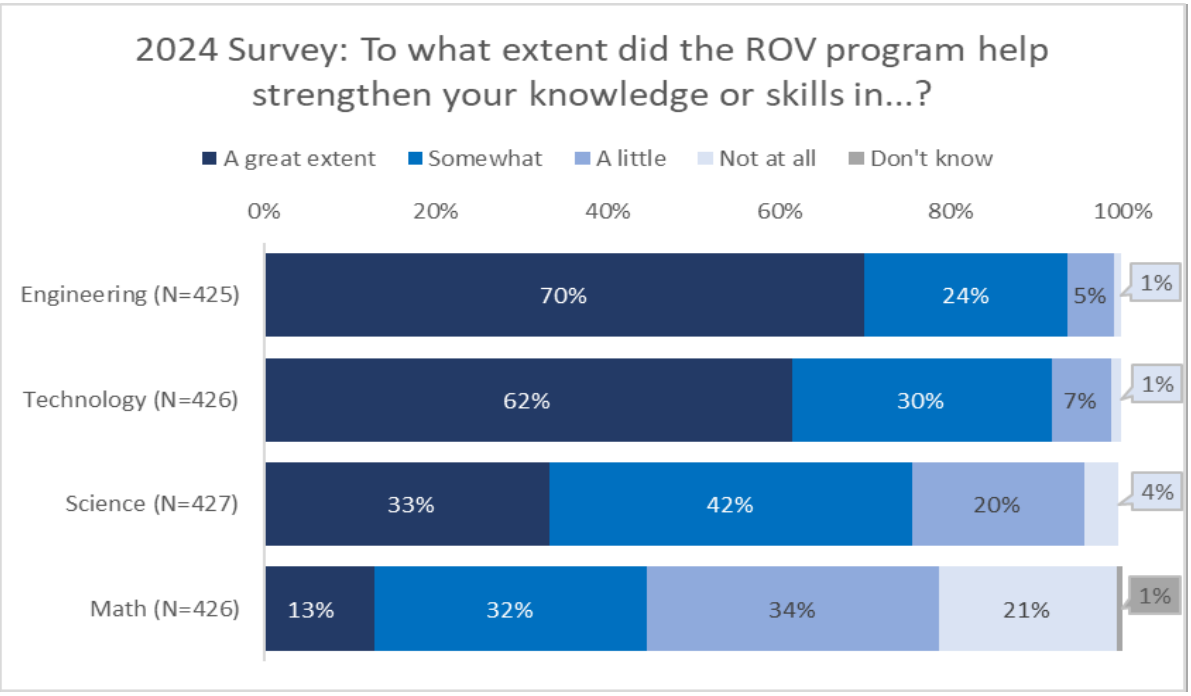
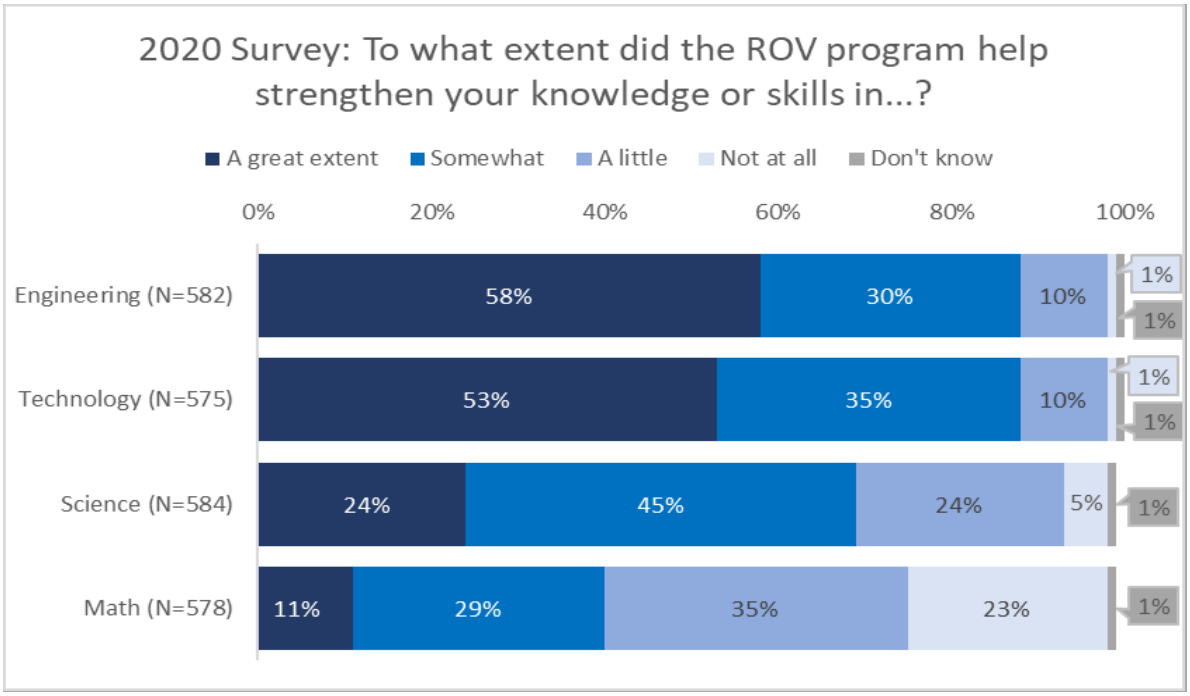
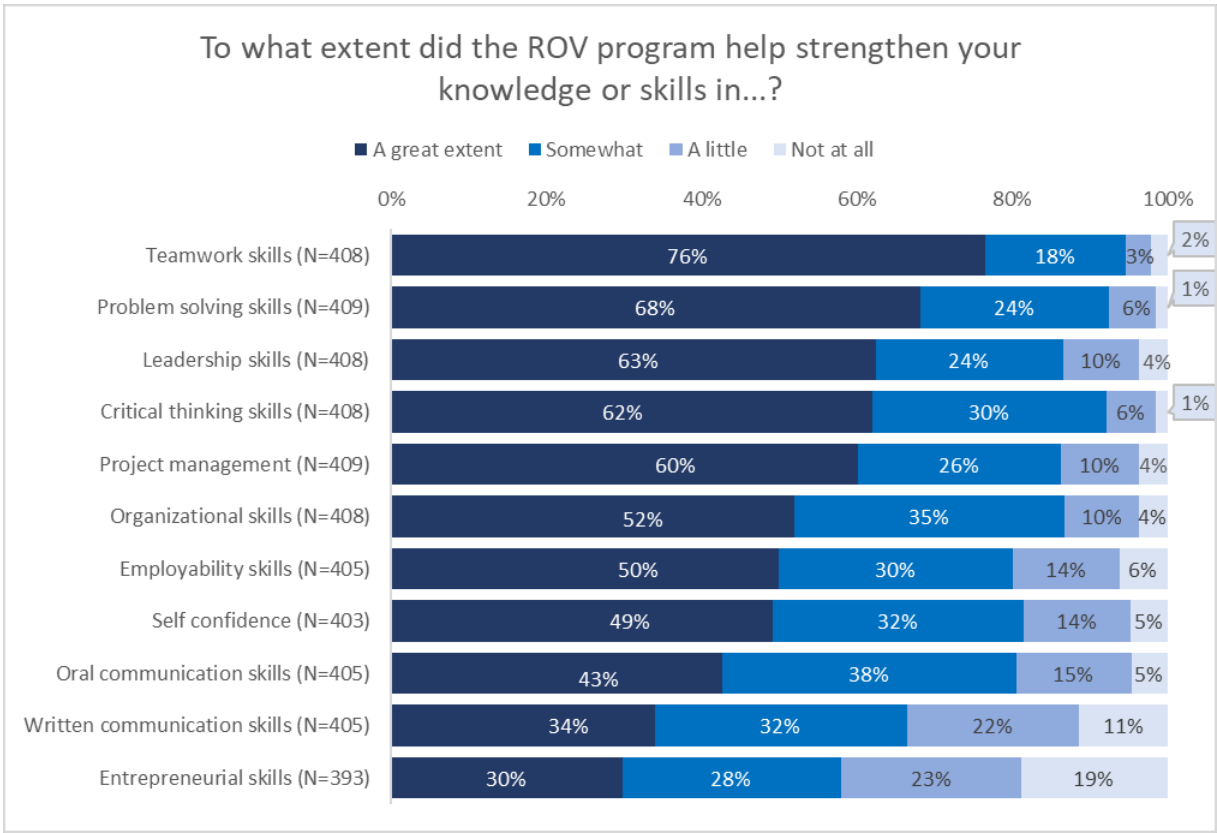


Figure 16. 2020 Survey: Extent ROV Program Helped Strengthen STEM Knowledge or Skills



MATE ROV competition alumni also reported making substantial gains in their 21st Century skills due to the competition. The ROV competition was most beneficial in strengthening skills to *A great extent* in teamwork (76%), problem solving (68%), leadership (62%), critical thinking (62%), project management (60%), and organizational skills (52%). (See Figure 17)

Figure 17. Extent ROV Program Helped Stregnthen 21st Century Skills



Respondents provide a range of thoughts about the skills they gained through the MATE ROV program. Selected comments include the following:

<u>Teamwork and Communication:</u>

> *The MATE ROV program has helped me develop better teamworking skills showing me how to work well in a team and has helped me better my communication skills and my project management skills.*
>
> *Being in a team that deals with ROV certainly brought a huge impact on both hard skills and soft skills. Constantly put in a situation where we need to utilize our technical skills that also requires us to communicate effectively has proven to be useful for us in understanding how to work in a more professional setting.*
>
> *I would not have the strong problem-solving and teamwork skills I am proud of and use every day if not for my participation in the MATE ROV program. I learned more about real*

engineering principles and practices through being on the ROV team than I did in all the laboratory experiments in university.

MATE helped me get where I am today! I am so grateful for this experience because it taught me how to be professional. It allowed me to work with others in a professional setting where what we did mattered.

I will note that my emotional growth perhaps what grew the most during the 6 years I competed in the program. Whether that was in conflict management, leadership, or otherwise.

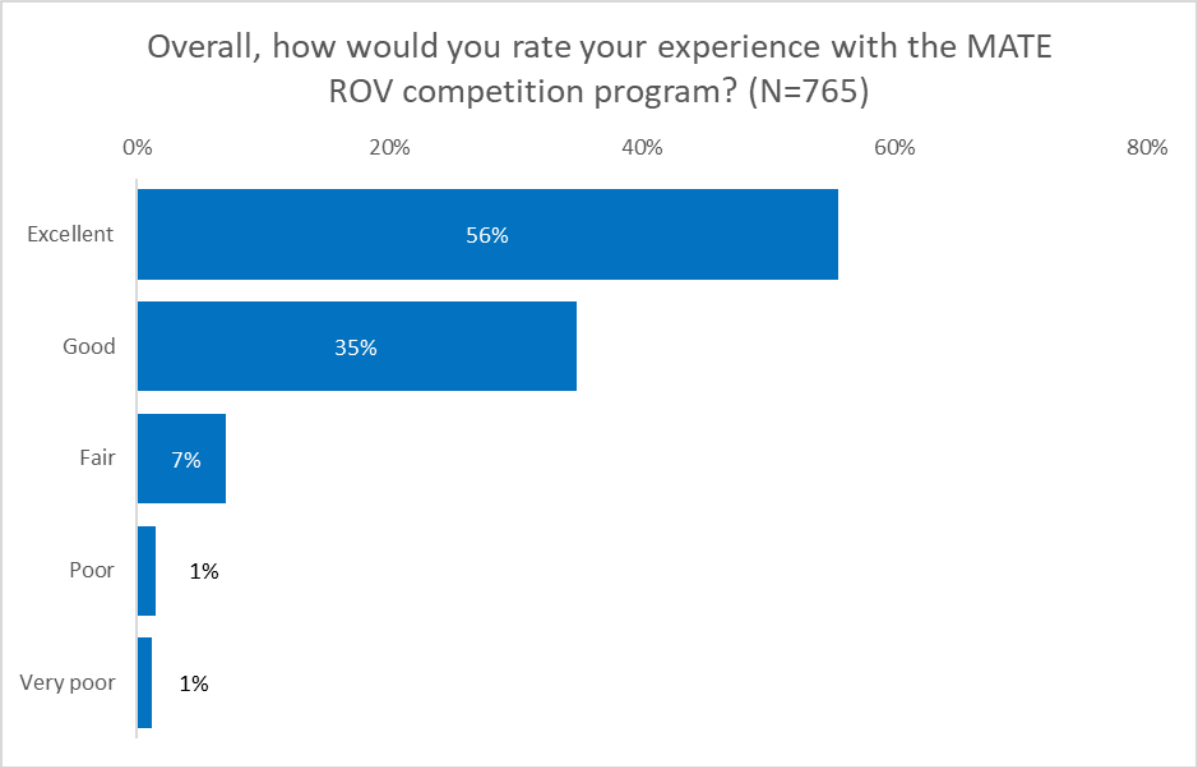
My husband's story with MATE is impacted much more than mine, but it really did increase his skills in many of the areas listed. He earned his first internship through MATE and we have developed lifelong friends in volunteering/judging the competition.

Figure 18. Word Cloud: How ROV Program Affected Skills

OVERALL RATING OF THE MATE ROV COMPETITION PROGRAM

A majority of the alumni (N=765) rated their experience with the MATE ROV competition highly, with more than half (56%) indicating that their experience was *Excellent*, more than one-third (35%) providing a rating of *Good*, and 7% rating their experience as *Fair*. Only eleven students (1%) indicated that their experience was *Poor*, and nine students (1%) rated their experience as *Very poor*. (Figure 19)

Figure 19. Overall Rating of ROV Competition Program



SPECIAL ANALYSES

In addition the descriptive statistics provided throughout this report, two linear regression analyses were conducted to further explore the MATE ROV competition's alumni experiences. Linear regression was specifically chosen to aid in understanding the aspects of the competition that significantly contribute to how alumni perceive it as a whole.

Overall Competition Rating

The aim of the first regression analysis was to investigate alumni overall ratings of the competition. Several salient predictors were chosen to evaluate the extent to which they could predict the respondents' rating of the competition ([Rating] "Overall, how would you rate your experience with the MATE ROV competition program?"). The predictors are presented below with the name in brackets, followed by how the question was asked in the survey:

- [Years] How many years have you participated in the MATE ROV Competition? - Total year(s)
- [Influence] To what extent has participating in the MATE ROV Competition program influenced your educational or career path?
- [Age] Please select the age range that best describes your age.

- [Science] To what extent did the ROV program help strengthen your knowledge or skills in science, technology, engineering, and math? – Science
- [Technology] To what extent did the ROV program help strengthen your knowledge or skills in science, technology, engineering, and math? – Technology
- [Engineering] To what extent did the ROV program help strengthen your knowledge or skills in science, technology, engineering, and math? – Engineering
- [Math] To what extent did the ROV program help strengthen your knowledge or skills in science, technology, engineering, and math? – Math

A significant regression was found ($F(7, 388) = 11.342$, $p < .001$). The R^2 (0.17) indicated that all of the selected predictors explained approximately 17% of the variance in competition ratings. Only two predictors significantly contributed to the regression model – Influence and Technology.

Rating = 2.869 + 0.162 [Influence] + 0.188 [Technology].

For each one unit increase in Influence rating, the competition rating increased by 0.162, and for each unit increase in Technology rating, the competition rating increased by 0.188.

The overall takeaway from these results is that alumni who felt that their experiences with the MATE ROV competition positively influenced their educational or career goals and strengthened their knowledge or skills in technology had a more positive perception overall of the competition.

This analysis was followed up with an additional two linear regression analyses using the significant predictors (Influence and Technology) as outcome variables. The questions used for the new predictors all share the same stem - "To what extent did the ROV program help strengthen your skills in the following areas?" and the predictors consist of the following skills: Critical thinking, teamwork, leadership, organization, problem solving, project management, self-confidence, employability, oral communication, written communication, and entrepreneurial skills.

Influence on Educational or Career Path

The aim of the second regression analysis was to investigate salient predictors of alumni ratings of the competition's influence (Influence) on their educational or career path. A significant regression was found ($F(11, 368) = 19.108$, $p < .001$). The R^2 (0.603) indicated that all of the selected predictors explained approximately 60% of the variance in Influence. Three predictors significantly contributed to the regression model – leadership, problem solving, and employability.

Influence = 0.576 + 0.177 [Leadership] + 0.329 [Problem solving] + 0.289 [Employability].

The overall takeaway from these results is that feeling that the competition helped to strengthen their leadership, problem solving, and employability skills significantly contributed to alumni perception that the competition influenced their educational or career path.

Strengthened Knowledge or Skills in Technology

The aim of the third regression analysis was to investigate salient predictors of alumni ratings of the competition strengthening their technology skills or knowledge (Technology). A significant regression was found ($F(11, 368) = 24.108$, $p < .001$). The R^2 (0.647) indicated that all of the selected predictors explained approximately 65% of the variance in Technology. Three predictors significantly contributed to the regression model – critical thinking, problem solving, and employability.

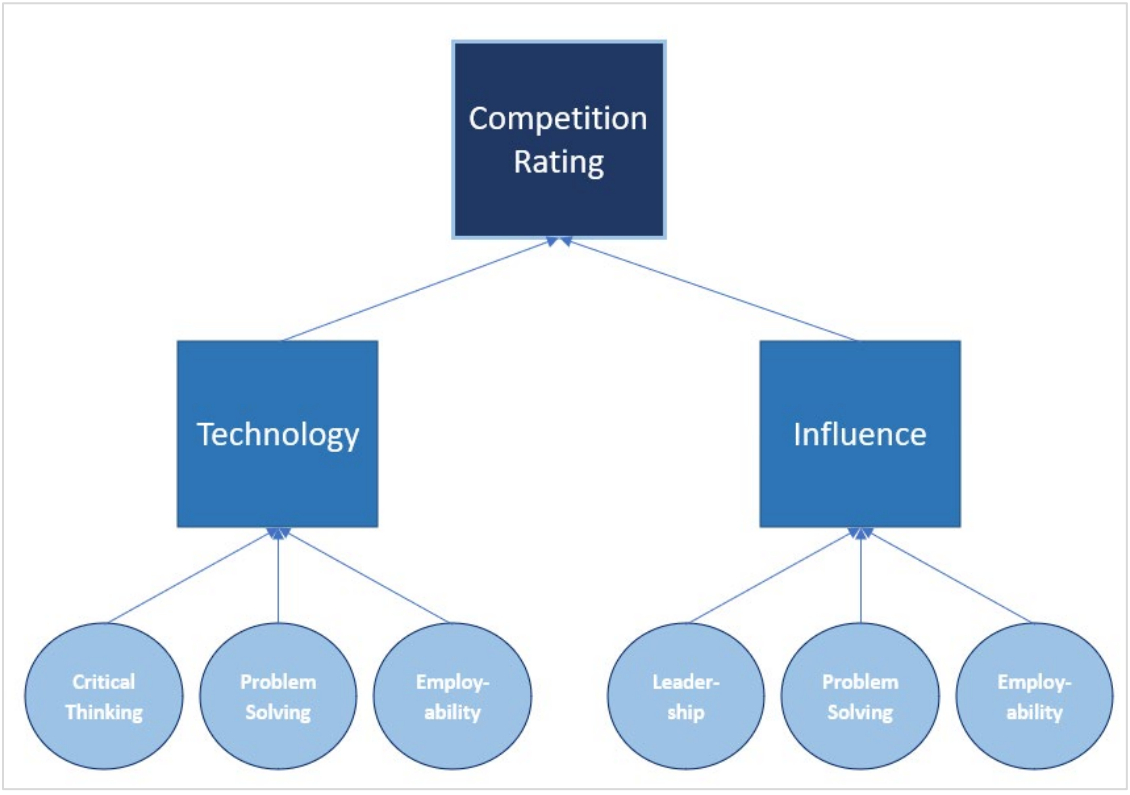
Technology = 1.009 + 0.260 [Critical thinking] + 0.221 [Problem solving] + 0.151 [Employability]

The overall takeaway from these results is that feeling that the competition helped to strengthen their critical thinking, problem solving, and employability skills significantly contributed to alumni perception that the competition strengthened their knowledge or skills in technology.

Relationship of Regression Analyses

Overall, the results of the regression analyses highlight several important aspects of the competition that may influence how alumni perceive the competition overall. Figure 20 presents the relationships between those aspects within the context of the previously discussed analyses. In short, strengthening critical thinking, problem solving, and employability knowledge and skills predicts strengthened technology knowledge and skills, while strengthening leadership, problem solving, and employability skills predicts increased perception of positive influence on education and career goals, which predict increased positive overall perception of the MATE ROV competition.

Figure 20. Relationship of Regression Outcomes and Significant Predictors



APPENDIX

2024 MATE ROV Competition Alumni Survey

Start of Block: Block 1

Dear MATE Competition Alumni, Thank you for taking part in the MATE ROV Competition Alumni Survey! Your input is crucial to helping improve the competition and determine its effectiveness. This survey will take approximately 5-7 minutes to complete. It is entirely voluntary, and you may skip any question or leave the survey at any time. Your responses will be kept confidential by our independent evaluator, Washington State University's Social and Economic Sciences Research Center (WSU-SESRC). For questions about this survey, please contact james.schiwart@wsu.edu. Thanks! Jill Zande, MATE Executive Director, Marine Technology Society

Page Break

This survey is designed for people who are at least 18 years of age. Are you at least 18 years old today?

- ○ Yes
- ○ No

Skip To: End of Survey If This survey is designed for people who are at least 18 years of age. Are you at least 18 years ol... = No

Page Break

Overall, how would you rate your experience with the MATE ROV competition program?

- ○ Excellent
- ○ Good
- ○ Fair
- ○ Poor
- ○ Very poor

Page Break

How have you participated in the MATE ROV Competition program? [Mark ALL that apply.]

- ☐ **Student** on a team
- ☐ **Instructor/Mentor/Coach** leading a team
- ☐ **Judge** at a competition
- ☐ **Volunteer** (other than judge) at a competition
- ☐ Other: Please describe: _____

Skip To: End of Survey If How have you participated in the MATE ROV Competition program? [Mark ALL that apply.] != Student on a team

Page Break

How many years have you participated in the MATE ROV Competition? [Please enter the number of years below.]

Display This Choice:

If How have you participated in the MATE ROV Competition program? [Mark ALL that apply.] = Student on a team

- _____ Year(s) as a **student** on a team

Display This Choice:

If How have you participated in the MATE ROV Competition program? [Mark ALL that apply.] = Instructor/Mentor/Coach leading a team

- _____ Year(s) as an **instructor/mentor/coach** leading a team

Display This Choice:

If How have you participated in the MATE ROV Competition program? [Mark ALL that apply.] = Judge at a competition

- _____ Year(s) as a **judge** at a competition

Display This Choice:

If How have you participated in the MATE ROV Competition program? [Mark ALL that apply.] = Volunteer (other than judge) at a competition

- _____ Year(s) as a **volunteer** (other than judge) at a competition
- _____ Total year(s)

Page Break

Display This Question:

If How have you participated in the MATE ROV Competition program? [Mark ALL that apply.] = Student on a team

Thinking about your time as a student on a team, in which class(es) did you compete? [Mark ALL that apply.]

- ☐ SCOUT
- ☐ NAVIGATOR
- ☐ RANGER
- ☐ PIONEER
- ☐ EXPLORER
- ☐ Don’t know

Page Break

Have you used ROVs outside of the MATE ROV Competition program? For instance, for science projects in school or independent research projects?

- ○ Yes: Please describe: _____
- ○ No
- ○ Don't know

Page Break

The next questions ask about your education and employment. What is your highest level of education?

- ○ High school (no diploma)
- ○ High school diploma or GED
- ○ Some college
- ○ Associate's degree
- ○ Bachelor's degree
- ○ Master's degree
- ○ Doctorate
- ○ Other: Please describe: _____

Skip To: Q12 If The next questions ask about your education and employment. What is your highest level of education? = High school (no diploma)

What year did you graduate high school?

▼ 2024 ... 2000

Page Break

Display This Question:

If The next questions ask about your education and employment. What is your highest level of education? = Associate's degree

Or The next questions ask about your education and employment. What is your highest level of education? = Bachelor's degree

Or The next questions ask about your education and employment. What is your highest level of education? = Master's degree

Or The next questions ask about your education and employment. What is your highest level of education? = Doctorate

What college degree(s) have you earned? Please include your major(s).

_____

_____

_____

_____

_____

Page Break

Display This Question:

If The next questions ask about your education and employment. What is your highest level of education? = Associate's degree

Or The next questions ask about your education and employment. What is your highest level of education? = Bachelor's degree

Or The next questions ask about your education and employment. What is your highest level of education? = Master's degree

Or The next questions ask about your education and employment. What is your highest level of education? = Doctorate

Have you earned a college degree in science, technology, engineering, or math?

- ○ Yes
- ○ No
- ○ Don't Know

Page Break

Are you currently a student?

- ○ Yes
- ○ No
- ○ Don't know

Skip To: Q18 If Are you currently a student? != Yes

What type of school are you currently attending?

- ○ High school
- ○ Community or technical college
- ○ Four-year university
- ○ Other: Please explain: _____

Skip To: Q17 If What type of school are you currently attending? = High school

What is the name of your college or university?

_____

Page Break

Are you studying towards a degree in science, technology, engineering, or math?

- ○ Yes
- ○ No
- ○ Don't know

What is your major?

_____

Page Break

What is the highest level of education you plan to attain?

- ○ High school diploma or GED
- ○ Some college
- ○ Associate's degree
- ○ Bachelor's degree
- ○ Master's degree
- ○ Doctorate
- ○ Other: Please explain: _____

Page Break

Are you currently employed?

- ○ Yes
- ○ No
- ○ Don't know

Skip To: Q23 If Are you currently employed? != Yes

Are you currently working in a job related to science, technology, engineering or math?

- ○ Yes
- ○ No
- ○ Don't know

Are you currently working in a job related to ROVs, other ocean technologies, or other areas of the blue economy?

- ○ Yes
- ○ No
- ○ Don't know

Skip To: Q22 If Are you currently working in a job related to ROVs, other ocean technologies, or other areas of t... = Yes

Page Break

Have you ever worked in a job related to ROVs, other ocean technologies, or other areas of the blue economy?

- ○ Yes
- ○ No
- ○ Don't know

What is your current job?

_____

_____

_____

_____

_____

Page Break

The next questions ask about how the MATE ROV Competition program has influenced your educational and career path. To what extent has participating in the MATE ROV Competition program influenced your educational or career path?

- ○ A great extent
- ○ Somewhat
- ○ A little
- ○ Not at all
- ○ Don't know

Display This Question:

If The next questions ask about how the MATE ROV Competition program has influenced your educational... = A great extent

Or The next questions ask about how the MATE ROV Competition program has influenced your educational... = Somewhat

Or The next questions ask about how the MATE ROV Competition program has influenced your educational... = A little

How has participating in the MATE ROV Competition program influenced your education and/or career path?

_____

_____

_____

_____

_____

Page Break

Has participating in the MATE ROV Competition played a role in you attaining any of the following?

	Yes	No	Not Applicable / Not Attained
Scholarships	○	○	○
Admittance into an educational program/college/university	○	○	○
Internships	○	○	○
Jobs	○	○	○
Awards (not including awards from the MATE ROV Competition)	○	○	○
Other outcomes:	○	○	○

Display This Question:

If Has participating in the MATE ROV Competition played a role in you attaining any of the following? = Scholarships [Yes]

Which scholarships did you receive, and what was the dollar amount of the scholarship(s)? (Estimates are fine.)

_____

_____

_____

_____

_____

Page Break

Display This Question:

If Has participating in the MATE ROV Competition played a role in you attaining any of the following? = Admittance into an educational program/college/university [Yes]

Please describe how your participation in the ROV program played a role in your admittance into an educational program/college. Please include the program and/or college name.

_____

_____

_____

_____

_____

Page Break

Display This Question:

If Has participating in the MATE ROV Competition played a role in you attaining any of the following? = Internships [Yes]

Please describe your internship(s), including the organization and your role.

_____

_____

_____

_____

_____

Page Break

Display This Question:

If Has participating in the MATE ROV Competition played a role in you attaining any of the following? = Jobs [Yes]

Please describe the jobs and how your participation in the MATE ROV program played a role in becoming hired.

_____

_____

_____

_____

_____

Page Break

Display This Question:

If Has participating in the MATE ROV Competition played a role in you attaining any of the following? = Awards (not including awards from the MATE ROV Competition) [Yes]

Please list the awards you received that were related to your participation in the MATE ROV program.

_____

_____

_____

_____

_____

Page Break

The next questions ask about how the MATE ROV Competition program affected your knowledge and skills. To what extent did the ROV program help strengthen your knowledge or skills in science, technology, engineering, and math?

	A great extent	Somewhat	A little	Not at all	Don't know
Science	○	○	○	○	○
Technology	○	○	○	○	○
Engineering	○	○	○	○	○
Math	○	○	○	○	○

Page Break

Did participating in the ROV program help you learn how to apply science, technology, engineering and/or math to real-world problems?

- ○ Yes
- ○ No
- ○ Don't know

Page Break

To what extent did the ROV program help strengthen your skills in the following areas?

	A great extent	Somewhat	A little	Not at all	Don't know
Critical thinking skills	○	○	○	○	○
Teamwork skills	○	○	○	○	○
Leadership skills	○	○	○	○	○
Organizational skills	○	○	○	○	○
Problem solving skills	○	○	○	○	○
Project management	○	○	○	○	○
Self confidence	○	○	○	○	○
Employability skills (e.g., a positive work ethic, reliability, or professionalism)	○	○	○	○	○
Oral communication skills	○	○	○	○	○
Written communication skills	○	○	○	○	○
Entrepreneurial skills	○	○	○	○	○

Do you have any comments to share about how the ROV program affected your skills in the above areas?

_____

_____

_____

_____

_____

Page Break

Are you currently a member of a professional society or organization?

- ○ Yes: Please name the professional society(s)/organization(s):

_____

- ○ No

Page Break

Which of the resources below would be valuable to you? (Mark all that apply)

- [ ] Career resources (e.g., access to job postings, professional development opportunities, etc.)
- [ ] Webinars on job search skills, resume writing, interview skills
- [ ] Funding to attend conferences
- [ ] Networking opportunities
- [ ] Invitations to competition events
- [ ] Receiving career mentoring
- [ ] Scholarship opportunities
- [ ] None of the above

Page Break

How would you like to get involved with the MATE alumni community? (Mark all that apply)

- ☐ Serving as a mentor
- ☐ Speaking at events (such as team building and professional development workshops)
- ☐ Volunteering at a competition or workshop
- ☐ Contributing to creating competition themes and mission tasks
- ☐ Becoming a sponsor of a team or an event
- ☐ Other (Please describe): _____
- ☐ Unsure at this time
- ☐ Not interested

How would you like to be informed of these types of opportunities? (Mark all that apply)

- [ ] Email newsletter
- [ ] Print mail/fliers
- [ ] Facebook
- [ ] Instagram
- [ ] LinkedIn
- [ ] X (formerly Twitter)
- [ ] TikTok
- [ ] Online forum
- [ ] Blog updates
- [ ] Other (Please specify):

Page Break

The last questions ask about you. What is your gender?

- ○ Man/boy
- ○ Woman/girl
- ○ Transgender
- ○ Non-binary
- ○ Gender-queer
- ○ Not listed:
- ○ Prefer not to say

What would you say best describes your ethnicity? (You can check more than one.)

- ☐ White
- ☐ African American / Black
- ☐ Hispanic / Latino/a
- ☐ Asian
- ☐ ASEAN / Southeast Asian
- ☐ Native Hawaiian / Pacific Islander
- ☐ American Indian / Alaska Native
- ☐ Middle Eastern / North African
- ☐ Multiple Races / Ethnicities
- ☐ Not listed (Please describe): _____

Page Break

Please select the age range that best describes your age.

- ○ 18-24
- ○ 25-29
- ○ 30-39
- ○ 40-49
- ○ 50-59
- ○ 60-69
- ○ 70+

Page Break

Do you have any comments you'd like to share about your experience in the MATE ROV Competition?

_____

_____

_____

_____

_____

Page Break

In what country do you currently live?

▼ American Samoa ... United Arab Emirates

Page Break

Could we contact you in the future about your experiences in the MATE ROV Competition and your life since then?

- ○ Yes
- ○ No
- ○ Don't know

End of Block: Block 1

Start of Block: Block 2

Display This Question:

If Could we contact you in the future about your experiences in the MATE ROV Competition and your li... = Yes

What is your name?

_____

Display This Question:

If Could we contact you in the future about your experiences in the MATE ROV Competition and your li... = Yes

What is your email?

_____

Page Break

Thank you for taking the time to complete this survey! Please feel free to forward the survey invitation to other competition alumni. As your life has evolved, so has ours! On July 1, 2023, MATE Inspiration for Innovation became part of the Marine Technology Society (MTS), along with the MATE ROV Competition and related workshops and resources that support student learning. If you are interested in learning more about MATE+MTS = Amazing Things! and how you can become involved with our efforts to keep the competition thriving well into the future, please visit https://materovcompetition.org/en-us/alumni. We look forward to hearing from you! We invite you to STAY CONNECTED! Visit us at: Facebook Flickr Twitter Vimeo YouTube LinkedIn Instagram #watergame