

STEM Consulting Services

Evaluation of NOAA Teacher at Sea Alumni Association

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ABSTRACT

The purpose of this evaluation is to describe long-term and unexpected outcomes related to participation within NOAA's Teacher at Sea Program and Teacher at Sea Alumni Association through the use of the Most Significant Change Evaluation Technique. Most Significant Change stories emerged using best practice qualitative research methods. Specifically, STEM Consulting Services employed a revelatory, embedded, single-case design that included surveys, interviews, reflection papers, and artifacts from Teacher at Sea alumni, non-participants in the Teacher at Sea Program, and Teacher at Sea Program leaders. Results indicate that among participants there exists: 1) a long-lasting, positive career impact; 2) connections to the broader scientific community; 3) engagement in best-practice pedagogies and career-related work; 4) commitment to supporting the Teacher at Sea Program; and 5) strong ties to the Teacher at Sea Alumni Association. Implications regarding maintaining and growing successful program elements and incorporating new structures within the Teacher at Sea Alumni Association are addressed.

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INTRODUCTION

In 1990, the National Oceanic and Atmospheric Administration (NOAA) established the Teacher at Sea (TAS) Program. Since that time, approximately 750 individuals have participated in the program. According to NOAA, the mission of the program is “to provide teachers hands-on, real-world research experience working at sea with world-renowned NOAA scientists, thereby giving them unique insight into oceanic and atmospheric research crucial to the nation” (http://teacheratsea.noaa.gov/#/about/who_may_apply, 2017). These cruises include opportunities that fall into one of three main categories: 1) Fisheries research that focuses on sustainable fisheries and healthy habitats; 2) Oceanographic research that focuses on physical oceanography and climate; and 3) Hydrographic surveys to update nautical charts that support safe navigation. The cruises, which are conducted at no cost to the educator participants, take place all around the nation and occasionally internationally. Educators usually spend between two and four weeks at sea, with most cruises occurring during May, June, July, and August. As part of the program, educators must complete an online training course, submit blog entries, develop two lesson plans (i.e. one on science content learned at sea and one on marine science related careers), disseminate information regarding their cruise by publication or presentation, and complete a post-cruise survey. Ultimately, a wide range of kindergarten to post-secondary educators working in formal and informal contexts all across the country have lived and worked alongside NOAA scientists while at sea. Once back, these Teacher at Sea Alumni (TASA) have regularly applied their new knowledge and experiences to enhance their curricula, lessons, and pedagogy (Simmons, 2010).

The TAS leadership recognized that sustained support for these educators upon their return would likely be important for continued results. Consequently, the Teacher at Sea Alumni Association (TASAA) was initiated in 2007 and is currently managed by the National Marine Sanctuary Foundation (NMSF) in partnership with NOAA. Since then, regional groups have also emerged beginning in 2011 including the New England Teacher at Sea Alumni, Pacific Northwest Teacher at Sea Alumni,

and the Mid-Atlantic Teacher at Sea Alumni associations. All TAS participants who successfully complete the cruise and program requirements are automatically included in the TASAA. Membership benefits include “opportunities to participate in other NOAA research projects, information about grants and partnerships, invitations to participate in NOAA education events, classroom materials, invitations to attend regional workshops and conferences, and the potential to participate in another Teacher at Sea research cruise”

(<http://teacheratsea.noaa.gov/#/alumni/Spotlight>, 2017). In an effort to discover and document the long-term impacts of the TASAA, NMSF and NOAA determined that an evaluation regarding the association should be conducted.

METHODS

The evaluator employed the Most Significant Change (MSC) Evaluation Technique (Dart & Davies, 2003) as the guiding program evaluation framework supported by best practice research techniques regarding interview protocol development and execution, triangulation during data analysis, and other strategies and techniques that increased confidence in the findings and assertions (Yin, 2009; Bogdan & Biklen, 1998; Van Maanen, 1988; Haladyna & Rodriguez, 2013; McCracken, 1988; Creswell, 2013). Specifically, STEM Consulting Services employed a revelatory, embedded, single-case design (Yin, 2009) that included surveys, interviews, reflection papers, and artifacts from TAS alumni, non-participants in the TAS Program, and TAS Program and TASAA leaders. While working within the MSC framework, STEM Consulting Services included data sources and analyses that allowed four primary evaluation objectives to be addressed:

- 1) Documentation of Significant Change stories among participants (Obj. 1);
- 2) Empirically measured evidence from non-participants of programmatic impact related to Significant Change stories (Obj. 2);
- 3) Identifying barriers to Significant Change among participants (Obj. 3); as well as
- 4) Evaluation of general program implementation and congruence between program leader and participant expectations (Obj. 4).

Data Sources

Data sources included:

- a) Survey of TASA participants' experiences and perspectives (Obj. 1, 3, and 4);
- b) Survey of non-TAS participants' perceived impact of the TAS Program and TASAA (Obj. 2);
- c) Content analysis of TASA participant and non-TAS participant artifacts (e.g. lesson plans, email communications, digital images, etc.) (Obj. 1 and 2);
- d) Semi-structured, focus group interviews with TASA participants (Obj. 1 and 3)
- e) Survey of TAS Program and TASAA leaders expectations and experiences (Obj. 4);
- f) Observations and artifacts regarding general program implementation (Obj. 4);
and
- g) Final TASA participant written reflections (Obj. 1)

Data Collection

The TASA survey (a) (Appendix A) was developed by adapting the 2005-2009 Program Evaluation survey (Simmons, 2010) and incorporating new items that address the four primary Evaluation Objectives. The survey was administered online. It was initially emailed to 663 TAS educators based on the current list of Teacher at Sea Alumni (TASA) dating back to 1990. Of that initial number, 307 email addresses were considered successfully confirmed because an error message was not received. However, some email addresses were connected to the same individual (e.g. school/work/home). Of those email addresses that successfully received the survey email, 130 TASA responded, which provided a response rate of approximately 42%. Number of responses in graphs may not match, due to the option for multiple responses and/or non-responses. Based on the survey responses, focus groups were developed for interviews per the MSC design. The TASA semi-structured focus group interview protocol items (d) (Appendix B) incorporated questions that directly addressed the four primary evaluation objectives. As part of the initial design, an incentive was offered at this stage of data collection to increase participation. Participants were entered into a drawing for a \$100 Amazon gift card. Per the MSC design, the evaluation team (i.e. evaluators and

association leaders) made selections through an iterative process of recommendations with rationales regarding Most Significant Change and identified fifteen (15) TASA participants to take part in the final phase of data collection (g) (i.e. TASA Final Reflection (Appendix C)). These solicited, participant reflections (Janesick, 1999) were applied in an effort to allow the participants a chance to reflect free from repeated interviewer prompting, provide a more personal account on their own terms, and provide time for reflection and editing before submission. These reflections were then discussed among the TASAA leadership and evaluators to determine the Most Significant Change stories. This was a collaborative, iterative process that involved ranking the stories and providing reviewer-developed rationales for the rankings. The rankings were then discussed until consensus was reached. As intended by the MSC method, this process allowed TASAA leadership to identify and discuss elements of the association that they value most using evidence from participants to refine their vision and craft future goals.

As part of the vetting of the focus group interview data, STEM Consulting Services reached out to individuals identified through the snowball sampling (i.e. non-TAS participants) and asked them to complete an online survey (b) (Appendix D). As part of the initial design, an incentive was also offered at this stage of data collection to increase participation. Participants were entered into a drawing for a \$100 Amazon gift card. These data were used significantly during the MSC Step 7 (Verification of Change) in conjunction with content analysis of artifacts discussed by both TAS and non-TAS participants (c). Additionally, STEM Consulting Services gathered data regarding the TASAA leaders' experiences and expectations through survey (e) (Appendix E). Lastly, STEM Consulting Services collected artifacts and made observations regarding the general program implementation and structure (f).

Data Analysis

Frequency counts and/or descriptive statistics were applied to all demographic data. Additionally, a map of the geographic locations of TASA study participants was developed. Coding on open-ended survey items began with the

identification of the unit of analysis of individual utterances. STEM Consulting Services utilized DeSantis and Housen's (2001) conception of a thought segment, an individual, meaningful unit of speech. Participant responses could contain more than one thought and, therefore, more than one code. Throughout the data coding process, coding categories were developed through constant comparative analysis (Charmaz, 2000; Glaser & Strauss, 1967) aimed at identifying and refining categories of response. As a final step to ensure the reliability of the final code set, an independent coder rated a subset of the survey items. All recorded differences between coders were resolved through discussion and revision until 100% inter-coder reliability was achieved.

In the initial coding period for the open-ended responses, STEM Consulting Services used inductive reasoning and the constant comparative method to allow broader themes to emerge from the data (Charmaz, 2006; Strauss and Corbin, 1990; Glaser and Strauss, 1967). Following the initial analyses of the questionnaire data and based on the grounded theory model (Glaser and Strauss, 1967), ten semi-structured interview questions were developed to further investigate the trends identified in the analyses of the survey data. On the final survey item participants were asked of their willingness to participate in follow-up focus group interviews. Volunteers for interviews were grouped into eight separate groups by time zone. Final focus groups were made up of three to six participants (total of 41) and each interview session lasted from 45 minutes to an hour. Focus group sessions were audio-recorded and later transcribed.

STEM Consulting Services employed the use of constant comparative analysis (Strauss and Corbin, 1990 & Glaser & Strauss, 1967) on focus group transcriptions. Engaging in iterative coding cycles, STEM Consulting Services organized segments of coded data into categories, which were compared across sessions and further refined to identify and capture emergent patterns within and across sessions. In order to ensure reliability, two independent raters coded a subset of partial transcripts that were randomly selected. The subset amounted to an average of 20% of the total number of transcripts. Raters were asked to code the identified portions of the transcripts with the predetermined codes uncovered during the

initial coding period. Computed with Cohen's Kappa, inter-coder reliability was $r = .88$, averaged across the sessions and raters.

Collecting data regarding the TAS Program and TASAA leader experiences, expectations, and execution of the program allowed for comparisons with participant data that provided insights regarding unidentified successes and areas of opportunity. In addition to the Significant Change stories, descriptive statistics and content analysis regarding emergent themes were employed to analyze participant responses for any changes. Participant artifacts (e.g. lesson plans) were analyzed using content analysis and were incorporated in the interviews when possible. Observations of program activities and artifacts, along with participants' perceptions of program elements, provided evidence for successful program implementation and perceived value by participants. During the process of data analysis, efforts were taken in order to establish the credibility of the data. To address issues of credibility, the alternative data sources mentioned above – participant artifacts, program artifacts, and program observations - were used in conjunction with the survey and interview data sources in data triangulation. Triangulation of data is the most-commonly used and best-known method for establishing credibility (Merriam, 1998). Through the triangulation of the various sources of data, STEM Consulting Services was able to develop a rich, representative account of the programmatic impact of the TAS Program and TASAA.

RESULTS & CONCLUSIONS

Results are presented in a similar way in which they were used to develop the Most Significant Change stories. STEM Consulting Services began with the TASA Participant surveys, focus groups, and final reflections, to identify change and barriers to change, while validating that change through Non-Participant Survey data that described personal and perceived impact to those outside of the TASAA. This section concludes with results that address overall program implementation and congruence between the TAS Program and TASAA leadership and membership.

Participants

From the initial call for participation in the evaluation, STEM Consulting Services received 130 responses. Almost three-quarters were female (72.3%, n=130), two (1.5%) were Hispanic, and 125 (96.2%) were White. Of those, approximately half have taught one or more grades in high school, with the fewest having taught pre-kindergarten (Fig. 1). Additionally, science was overwhelmingly the subject that most TASA had taught (Fig. 2). All but 27 (21%) TASA were between the ages of 31-60, with ten (8%) below the age of 31. All teachers had taught more than four years. TASA represent many areas across the United States as indicated by Figure 3, which shows what states those TASA who completed the survey have lived in since their TAS participation. Additionally, participants have engaged in extended stays in other areas of the globe, including: Antarctica, Argentina, Brazil, Chile, China, Dominican Republic, Finland, India, Japan, Korea, Lebanon, Norway, South Africa, Switzerland, Turkey, and Uruguay. Approximately a quarter (26.2%, n=130) of the TASA surveyed had worked as professional scientists,

Figure 1. Grade Levels Taught by TASA Survey Participants

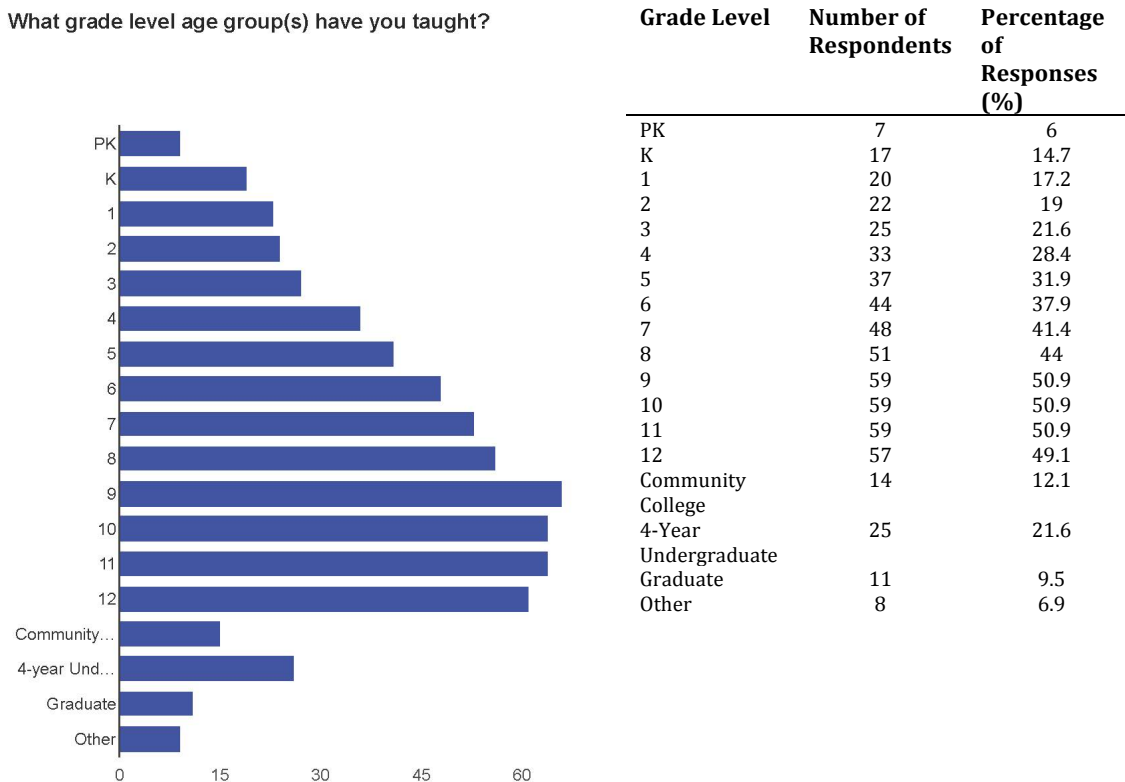


Figure 2. Subjects TASA Survey Participants Have Taught

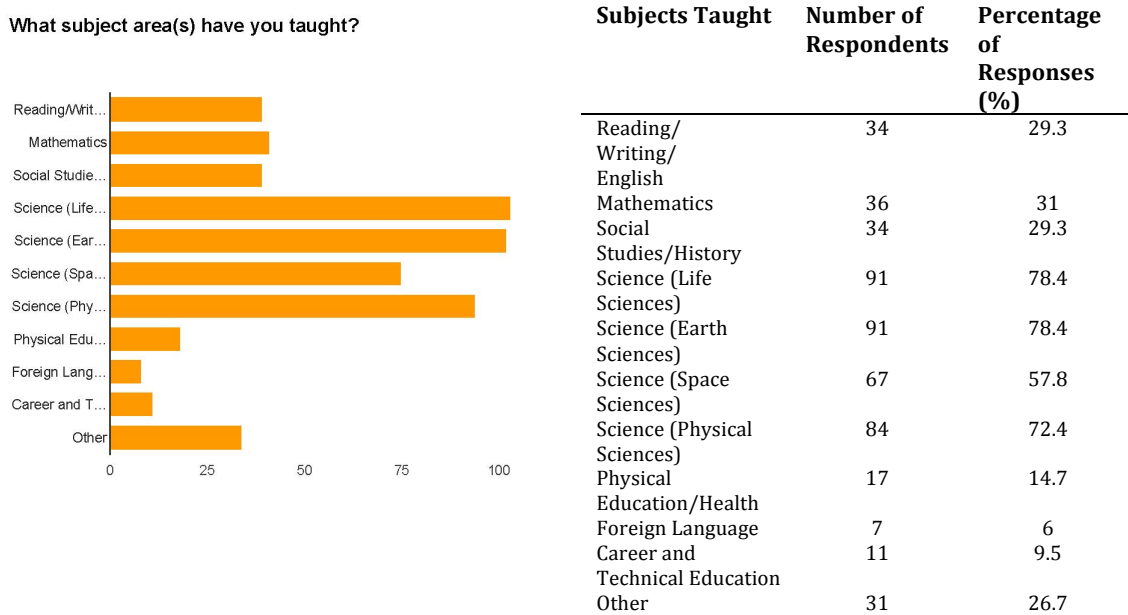
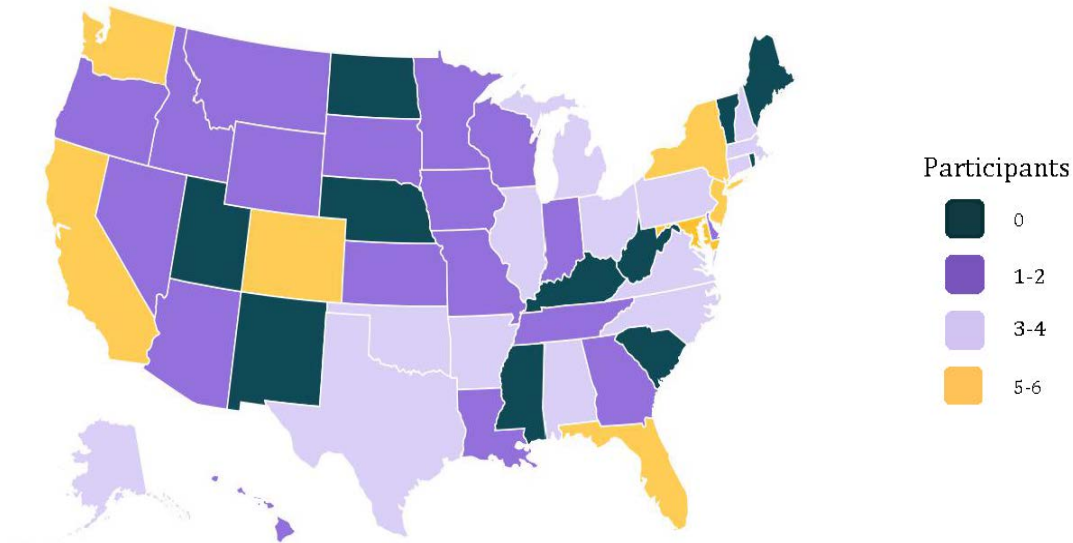


Figure 3. Map of Where TASA Survey Participants Work and Live

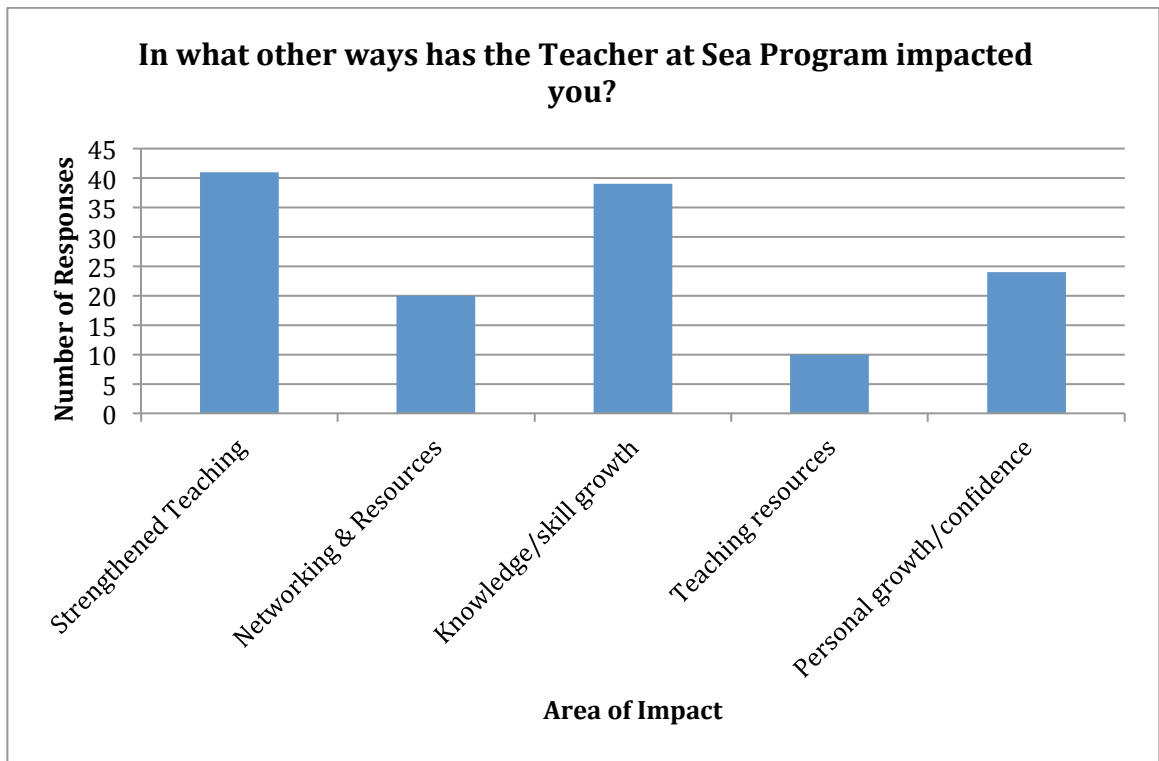


technologists, engineers, or mathematicians. Many of the participants held advanced degrees in either a STEM or education related field. TASA maintained very similar jobs before and after their TAS experience. However, there was a considerable shift among the type of professional development in which they engaged. After their TAS experience, more participants engaged in professional

development at the national level (n=58 pre TAS, n=99 post TAS). All TASA indicated that they used one or more STEM education best practices. TASA held very favorable views of science and engineering in general, although science views were considerably more favorable than those of engineering.

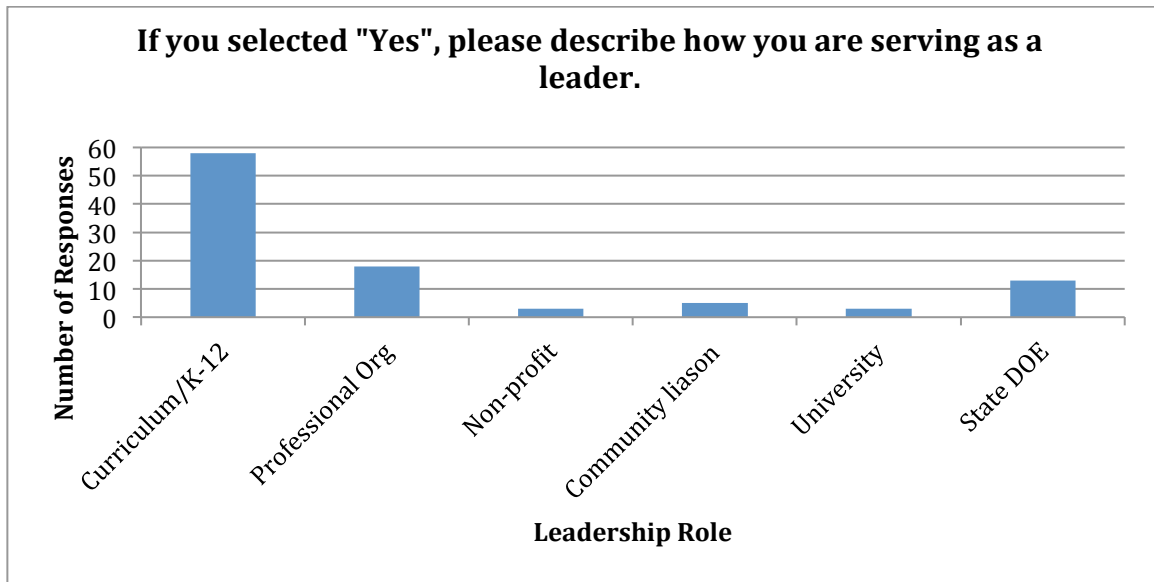
TASA Participant Survey Findings

All TASAA members noted positive benefits of their participation in the TAS Program and TASAA with the majority of those benefits impacting their teaching, knowledge and skills growth, personal growth, and networking (Fig. 4). It is important to note that teachers regularly made little, if any distinction, between their TAS experience and their membership in the TASAA. They considered the two to constitute one sustained effort. This is evidenced in the data as many participants made reference to ‘TAS experiences’ that only happened during TASAA sponsored events. Many participants noted that the TAS Program and TASAA offered meaningful opportunities for continued professional growth and opportunities for



networking through conferences and professional events along with maintaining the professional contacts made during their time at sea. Personal impacts of program and association participation were also noted as increased confidence and a deeper connection to their chosen profession. The majority of TASA surveyed also noted that after their TAS experience, they held one or more leadership positions within their schools, local communities, and at the state and national levels within related professional organizations (Fig. 5).

Figure 5: TASA Leadership Positions after the TAS Program



When asked what set the TAS Program and TASAA apart from other programs in which they participated, the TASA respondents most often noted an immersive nature, as well as the opportunity to work as part of a team alongside other professionals conducting research they viewed as connected to the real world (Fig. 6 and 7). When asked what they would change about the TAS Program and TASAA to benefit future participants, respondents offered suggestions for deeper outreach to potential participants and opportunities for TASA to go on additional cruises. In addition, respondents suggested a need for more detailed programmatic information for potential participants to review including past TASA developed resources. Respondents thought future TAS participants would most benefit from

knowing that the TAS Program was a once in a lifetime opportunity to engage in an authentic, research-focused experience. Respondents stressed that the value of the

Figure 6: TASA Perception of Unique TAS Program Benefits

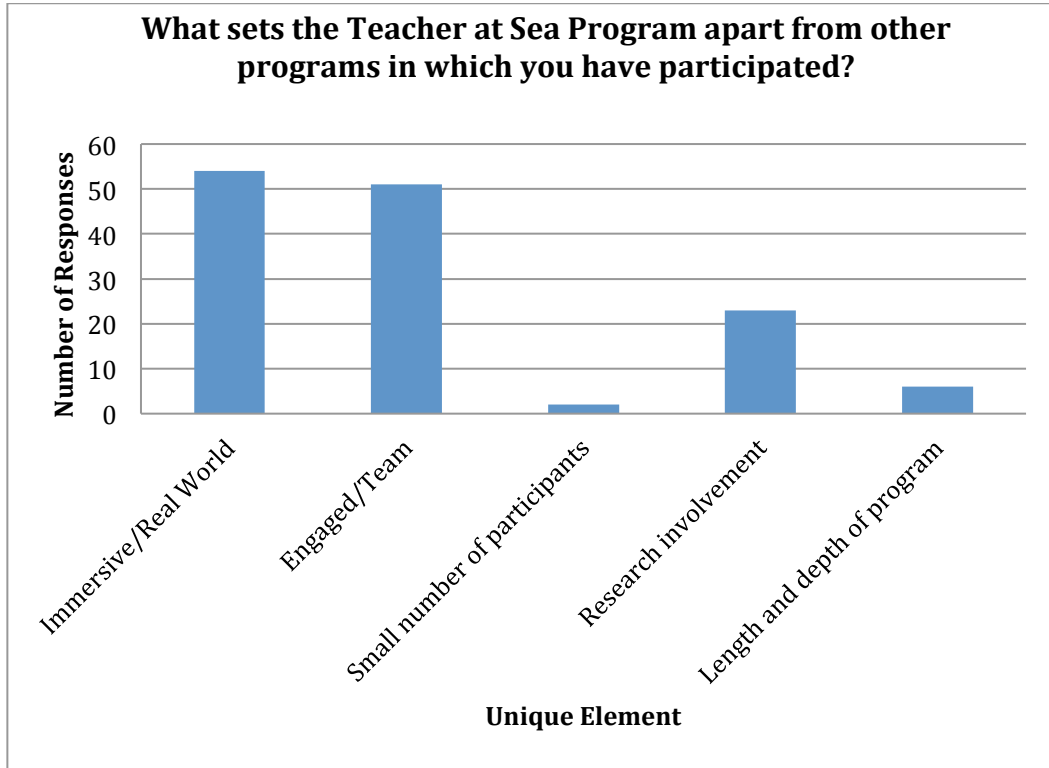
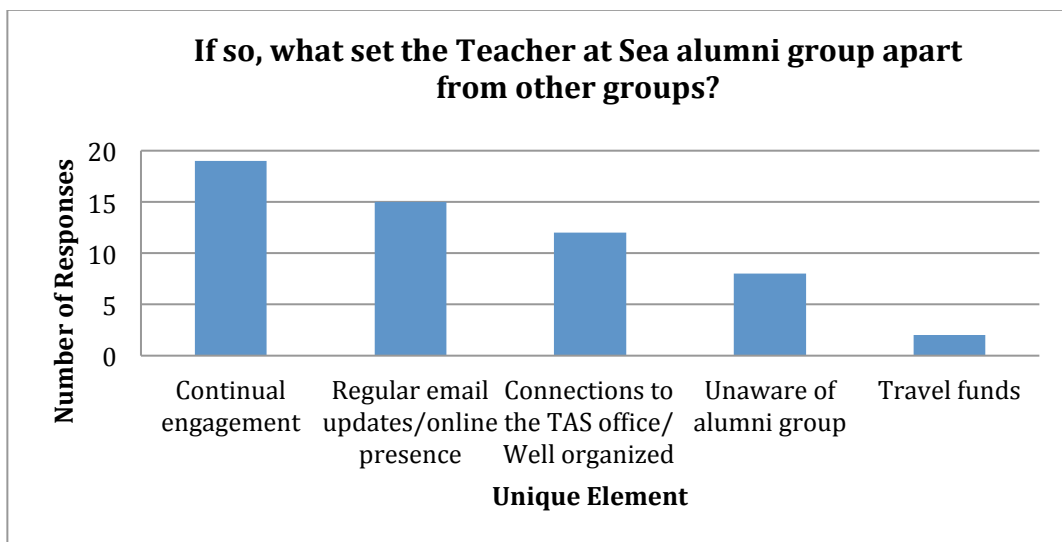
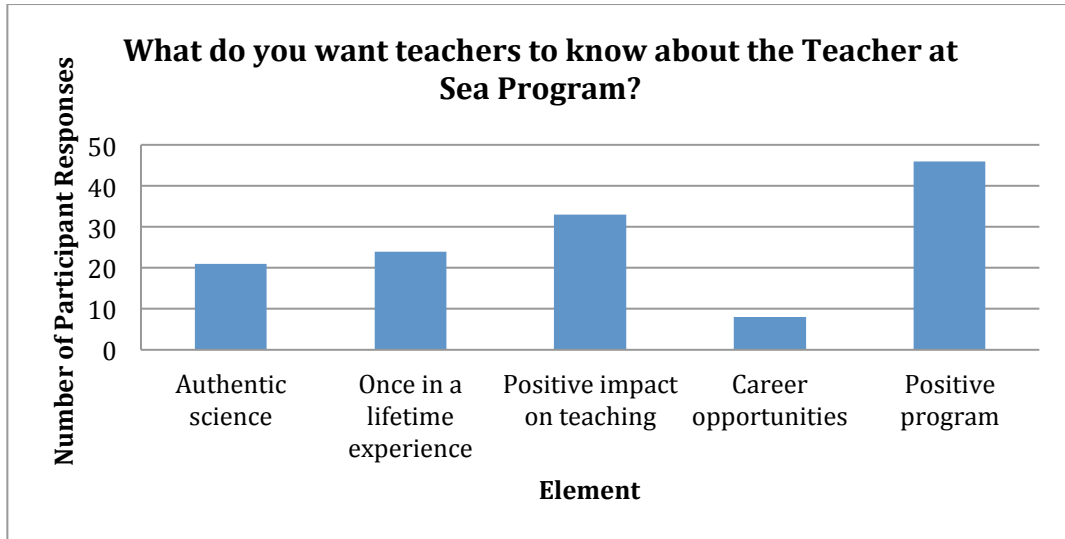


Figure 7: TASA Perception of Unique TASAA Benefits



TAS Program and TASAA participation would be felt in their classroom teaching and content knowledge as well as in their professional identities and connections to the greater STEM professional communities (Fig. 8).

Figure 8: Recommended Messaging to Future TAS Participants



While researchers asked about “barriers to change”, participants routinely reworded and couched their responses in terms of continued program improvement as opposed to TAS Program and TASAA barriers to any positive, significant change they experienced.

TASA Focus Group Interviews

During analysis on the interview sessions, five major categories of program impact were identified: (a) Long-term positive career impact (b) Connections to the broader science community (c) Strengthening pedagogical practices/career-related work (d) Support for the TAS Program and (e) Active TASAA. In the discussion that follows, each category will be explored using representative examples from participant responses. The representative examples of each major category included below were chosen for inclusion to illustrate the nuances of each category in the participants’ own words.

Long-Term Positive Career Impact

The category of long-term positive career impact included sub-categories of (a) TAS Program and the TASAA being the impetus for pursuing additional educational opportunities, (b) TAS being the impetus for increased attention to STEM teaching and learning, and (c) TAS Program and the TASAA inspiring participants to further their professional knowledge/professional development. To illustrate, one TASA shared how her participation in the program promoted stronger connections to the science field. “Well, for me, I am an elementary school teacher. ...I'm not trained as a scientist and stepping outside my comfort zone and working with scientists and NOAA Corps officers and the crew members on the ship was really empowering for me. It showed me that I could go out on that playing field and keep up, and learn new things, and understand what was going on, and turn it into meaningful lessons and experiences for my students that you know, I wasn't before.” Another TASA shared how she described her transition from an “elementary teacher” to an “elementary science teacher” following her time with TAS. Additionally, participants indicated engaging in cross-curricular STEM teaching and learning and reported expanding the number and types of STEM opportunities they provided to their students. For example, one participant stated, “I'm an 8th grade science teacher... and I teach chemistry, physics, biology. I also have an after school STEM club, and then I have an after school 70 student plus oceanography club that started because of the NOAA Teacher At Sea Program.” The TASAA was identified as being integral in continuing the level of professional connections and impact on participants' careers post TAS experience.

Connections to the Broader Science Community

The category of connections to the broader science community included sub-categories of participant opportunities for networking with and opportunities to work alongside scientists. Participants spoke frequently about the ways in which their TAS experience helped to support their connections to NOAA and the field of science in ways they had not previously experienced. One participant noted that his TAS experience provided continued connection with his work as an educator. “... I

connected with scientists on my cruise, and every year when I do a particular unit on sound, we always Skype with her, and she talks about sound because that's what she does, acoustic scientist, so she talks about the science behind the sound and what she does out in the field, and that it fits in so perfect with our unit, and it's such a different kind of experience that the kids get that (the students) wouldn't have gotten otherwise." Many participants commented on how they felt the TASAA allowed them to continue to develop connections to the broader community after TAS involvement. As one participant noted, "I also like being able to network when we've met together or worked online, people also shared lessons and ideas, so it was nice to have the professional community." This sense of continued professional community is an important element for participants as they transition from TAS to TASAA involvement.

Strengthening Pedagogical Practices/Career-Related Work

The category of strengthening pedagogical practices/career-related work included sub-categories of (a) increased opportunities for students to experience authentic, hands-on science activities, (b) opportunities to share authentic data with students, and (c) opportunities to connect students with scientists. To illustrate, one participant shared that she started two new courses for her high school students – a meteorology course and an oceanography course. As she explained, "... NOAA Teacher At Sea is responsible for those courses getting off the ground. I mean if I wouldn't have been a Teacher At Sea, I probably wouldn't have pursued that hard to get those classes. Those classes right now serve as a capstone course for seniors, so they've all had chemistry and physics so I can bring in chemistry and physics concepts to what I'm teaching them. I can teach at a much higher level." Similarly, many participants spoke about the positive feedback they receive from students when they share their TAS experiences, as expressed by the following participant. "I've been able to use you know, my experience, my story when I teach oceanography not only that semester but every semester since then, and so it's -- And it's amazing, because I taught for so many years, but all of a sudden my -- I think the way the students view me, I'm like elevated now, that oh, she's legit, you know,

she really is a scientist, because here's photos of her doing the work in her own stories." Participants noted that while TAS involvement initially strengthened their work, TASAA provided opportunities to continue that process. As one participant noted, "I have had some pretty amazing professional development opportunities through the alumni program. I know I did an online technology and science course. I think it was about a year and a half ago now, and have attended workshops, so I really appreciated the opportunity that I've been able to take advantage of through the alumni program. I think the alumni program is also a way for me to keep in touch with people who have more recently gone out to sea and share those experiences with my students in the classroom." The continued connection to the field experiences of other TASA offers opportunities to continue their own professional growth and development.

Support for the TAS Program and TASAA

The category of support for the TAS Program and TASAA included sub-categories of (a) participant desire to see program grow, (b) personal need to pay back the program, and (c) working to support new applicants to TAS. All participants interviewed expressed a strong desire to grow the programs by actively promoting TAS and TASAA. As the following participant expressed, the TASA all spoke about wanting to assist in the recruitment of new teachers. "And I guess my response would be that it's had such a positive effect on me with the continued involvement that it's allowed me to have, that it's led me to be a real advocate for the program. I had a number of friends apply. I have worked with teachers from all over the country now, and it gives me that window to spread experience and become enveloped in professional development in my district, and be very active with NSTA conferences and presentations. So being part of the alumni association really gave me that boost to get involved and take my reach outside the classroom with other teachers, and I really appreciate the support I get for that." Many participants stressed how important it was for them as past TAS participants and TASAA members to find ways to both support and provide awareness of the program and association. As one participant stated, "We as Teachers At Sea and

Teacher At Sea alumni, we need to help NOAA out.” Another participant went further to explain her desire to help support the program and association. “I guess my response would be that it's had such a positive effect on me with the continued involvement that it's allowed me to have, that it's led me to be a real advocate for the program.” Participants were quick to share that their own TAS and TASAA experiences had such a large personal and professional impact that they felt it necessary to share their experiences with other educators in hopes of inspiring others to apply.

Active Teacher at Sea Alumni Association (TASAA)

The category of active TASAA included sub-categories of (a) ongoing electronic communications, (b) increased conference opportunities, (c) desire for continued role but uncertain of roles available, (d) desire for support to set up regional alumni networking opportunities, and (e) provide TASA with strategies and materials to recruit and support the program for administrators and state/country policy makers and politicians. This category of participant responses included mainly suggestions for TASAA improvement. While participants spoke positively of the alumni association, they offered suggestions for improvement in a manner consistent with perceived shared ownership of the association. TASA talked about the cruises and science as efforts that they collaborated on, but did not lead. However, when discussing the TASAA, alumni spoke with a greater sense of leadership and perceived capacity to determine TASAA's course and future. For example, suggestions included increased electronic communications and more frequent opportunities for networking and conferences at the regional and national levels. While many participants noted that they had supported the program and association by working the National Oceanic and Atmospheric Administration (NOAA) booth at the National Science Teachers Association (NSTA) annual conference, the following participant shared that she had not felt as connected to TASAA but would welcome the opportunity to become more involved “Personally, I don't go to NSTA, so beyond that conference, I fortunately feel like I've been kind of sharing my experiences with others, which is great, but just haven't had the

opportunity to really connect with other TAS teachers. I would certainly like to do it more, certainly. There's only one other teacher that we communicate back and forth, but -- And I don't know if maybe I'm missing an e-mail list or I'm missing some kind of group somewhere, but I'm still proud to have done the program and participated. I just don't feel like I've been able to network as much as others that have gone through the same experience". Participants went on to further recommend that while the national conferences were valuable for networking, local or regional conferences and alumni groups would be a welcome addition as echoed by the following participant. "I'm also trying to push for a southeast regional alumni organization in our region so that we could possibly meet and try to collaborate a little bit more in the future if funding allows for it."

Several participants noted a concern about the continued future of the TAS Program and expressed a desire to communicate with policy makers and other stakeholders as expressed by the following participant. "...Maybe there's some way we could be communicating more with our local politicians, if (TAS) would set up a mechanism or a format that could target or identify politicians to say here's a blog of what I did on a wonderful program, and I hope you'll support it, you know? Something as simple as that from every Teacher At Sea might get their -- maintain their attention, you know?" Strong themes among TASA comments were their concerns for the program's viability and the need to increase financial support. This is not a surprising finding, given the perceived/observed participant effort applied towards TAS and TASAA. Several participants described engaging in varying levels of grassroots political advocacy for the program, including some very sophisticated approaches where TASA collaborated with various stakeholder groups within their communities and even across TASA regional communities.

TASA Final Reflections and Artifacts

Based on data collected from the other evaluation sources and after discussions with TAS Program and TASAA leadership, a list of TASA was developed from the TASA Focus Group Interview pool. Fifteen participants responded and provided a reflective response and artifacts. Summarized change stories were

developed for each participant and then the TAS Program and TASAA leadership and evaluators came to consensus regarding the most significant change stories and rationales for those considered most significant. All names are pseudonyms and efforts were made to remove identifiers.

Summarized Change Stories

Teacher A

Bringing marine science to the landlocked interior of the country through art and a passion for authentic science education

Teacher A's work is characterized by the statement, "you can't "tell" science to children, you also can't really just "tell" science to teachers". Her reflection was a well-written, logical, and internally consistent description of science teaching best practice from rationale for teaching marine science content to curricula development and implementation. The TAS Program and TASAA have allowed her to express her creativity and passion in ways that benefit her personally and professionally while staying true to her apparent passion for serving students and other science teachers. While it does not appear that the TAS Program and TASAA is responsible for the initial development of her worldview on teaching and service, it clearly provided a major, if not, primary mechanism by which she brought to fruition her ideas and applied her philosophy. The personal change was significant and transformative. The change for others was experienced through her art, teaching, curricula development, coaching, and regional/national conference participation.

Teacher B

Rebuilding from a foundation of NOAA's TAS Program

This title of "Rebuilding from a foundation..." may initially come across as an overly dramatic statement until *Teacher B's* story unfolds. In short, it appears that his participation in the TAS Program and TASAA, which he says is "valuable", sustained, and unlike comparable agencies' educational outreach efforts, is in large part responsible for his professional career path. This path has resulted in infusing

marine science in multiple disciplines, advancing the use of cutting edge instructional technologies such as virtual reality, and perhaps most importantly, inspiring a community through his efforts with TAS to rebuild a school after a devastating fire destroyed it. As he put it, “NOAA TAS provided a tremendous benefit in science education and moral support in my community during our recovery for which I am greatly thankful”.

Teacher C

Creating STEM teachers

Perhaps the most telling statement from this TASA is that she became, “the go-to girl for science questions from teachers and administrators throughout my district” despite initially only having one science class in post-secondary as an elementary education/humanities major. Most elementary teachers take very few STEM courses in their post-secondary education and poor attitudes towards STEM are regularly documented in the STEM research literature. The TAS Program and TASAA however have found a way to engage elementary teachers by providing exciting adventures to exotic locations as a hook to participating in authentic science. Once aboard, *Teacher C* learned that she not only could do real science, but also that she loved science. That newfound passion led to the development of local, regional, and national curricula with world-renowned scientists.

Teacher D

Impacting STEM education in informal settings

Like many of the TASA, the TAS Program and TASAA profoundly impacted *Teacher D* in several ways. The two that stand out are (a) the development of his leadership abilities and interests as he looks to pursue the founding of a New York/New Jersey TASAA chapter and (b) his application of TAS experiences to work with cruise lines sharing his experiences and teaching marine science in informal science education contexts.

Teacher E

NOAA talent recruitment tool

An interesting element of the TAS Program and TASAA is that not only do these increase professional opportunities for participants in their current fields, but they also serve as a means to develop talent for the agency itself. As TASA learn about themselves and authentic marine science, their appreciation for the various elements of conducting and disseminating research increase. Some find advancement within their current employment, while others seek careers that more deeply engage them in field-based science and perhaps administration of scientific endeavors. *Teacher E's* path has taken the latter route, leading her away from post-secondary education to running governmental science/science education programs. This path has been a very successful one where she has accumulated national awards, served as keynote speaker at universities across the worlds, and has appeared in the Congressional Record.

Teacher F

Producing recognized leaders

Teacher F clearly articulates a sense of ownership with respect to the program and association and a strong desire for ever-increasing advancement. He deeply values the TAS Program and TASAA and describes numerous examples of when he was called upon to provide leadership/direction and serve as a point person for marine science because of his association with the TAS Program and TASAA. These times included invitations to speak with government officials (e.g. Senator Shaheen), Rotary Clubs, the Smithsonian, post-secondary marine science courses, and others.

Teacher G

Addressing poverty through marine science

Anyone who has worked in education knows that one of the most difficult challenges to address is that of teaching children who grow up in a culture of multi-generational poverty. *Teacher G* has found a way through her experiences with the

TAS Program and TASAA to provide students a new view of success and hope using marine science as a catalyst in the heartland of America. Her passion, content knowledge, and expertise in education has allowed her to use sharks to transform the lives of economically disadvantaged students in Oklahoma, most of whom have never seen the ocean. She measures her successes by individuals – individuals whose lives she has changed forever, by enhancing their quality of life in the here and now and offering a glimpse of what could be and the support to make it a way of life. The Washington Post has recognized her work and her students have won awards such as the Indian Heritage Art Competition.

Teacher H

It's all connected: Breaking down the silos of instruction

The most striking comments from *Teacher H* include how he integrates mathematics, science, social studies, and other domains in an organic, fluid effort to address authentic problems. He credits his TAS Program and TASAA experiences with this directly from the perspective of learning how to address real problems through teamwork. His approach to teaching and learning highlights to students of poverty that they can be empowered to solve real issues through teamwork. The New York Times has covered his and his students' work regarding, "a student project that incorporates authentic science research that led to the re-discovery of long obliterated African burial ground in our school community's neighborhood" using GPS/GIS.

Teacher I

Leading girls to STEM

Teacher I focused her reflection primarily on her efforts to bring more girls into STEM. These efforts center on camps, invited presentations, classroom visits, and a one-to-one pen pal program. These efforts, particularly the pen pal program, are up to national in scope.

Teacher J

Supporting teachers holistically

By any standard, *Teacher J* is an exceptional science educator. She has won national awards and is focused on her students' successes. She works to provide them opportunities that they would not have if she did not push for them. It is clear from her statements that she cares about others and works to hold a work/life balance that is healthy and appropriate for her. This is an element that is often overlooked in professional development work with teachers. Teachers are people. They have real lives and have to balance those lives with caring for and supporting children who are not their own, but whose futures they deeply care about. *Teacher J* has continued to serve children and communities in profound ways while also taking care of sick and elderly family members. She credits TASAA with providing support to her during stressful times and responding to the ebb and flow of life's demands allowing her give what she can when she can. This is a powerful testament to the program and association's abilities to be responsive to the participants' needs, while continuing to support a continuous progression of excellence. *Teacher J's* story is one of continuing to provide excellent instruction for her students, while dealing with issues all too familiar to many and the role that TASAA played in that.

Teacher K

Lasting, statewide changes

Many TASA have had statewide impacts, but *Teacher K* has done so at an unprecedented level. Due in part to her position at the Maryland State Department of Education, *Teacher K* was able to not only include marine science into the state's science curriculum more explicitly, she was able to make shifts in popular perception of environmental science. *Teacher K* applied her TAS experiences to helping policy-makers, curriculum developers, educational administrators, teachers, and many other stakeholder groups better understand the relevance of environmental science. These successes have garnered her national attention from a wide range of federal agencies and organizations.

Teacher L

Building connections to engineering

Teacher L just does it all as a classroom teacher - write grants, manages grants, writes curriculum, works with informal science education institutions, brings in high profile speakers, provides high quality instruction, engages in her own professional development, helps other teachers by providing professional development training, and the list just keeps on going. She is a classic example of a teacher with what appears to be unlimited energy and enthusiasm - the kind that her students can draw from to propel them into STEM-related careers, including engineering. *Teacher L* indicated that her TAS experience provided a foundational element for her current efforts to better incorporate engineering curricula in her teaching, consistent with the Next Generation Science Standards, by having students build working boats. *Teacher L's* impact is felt beyond science instruction and more fully addresses STEM education.

Teacher M

Addressing STEM teacher attrition

Many teachers are drawn to the field because they enjoy the act of learning. Teaching with all the added responsibilities beyond teaching content can become burdensome and draining. Many teachers experience low points in their careers when they wonder whether or not continuing is worth it. *Teacher M* was at this point and luckily for her students and the larger science education community, TAS was there. *Teacher M* credits the TAS Program and TASAA with providing her with new and exciting challenges that made staying the classroom not just tolerable, but what she had always wanted it to be. She is extremely articulate in relating her passion for the program and association. It is difficult to summarize her reflection in any way that does it justice because she touches so strongly and precisely on the change she experienced and the role the TAS Program and TASAA had in that change. In short, she was a teacher ready to quit – now, she is “not just helping stakeholder groups, I’m *making* stakeholder groups. I’m influencing future voters. In

our tiny corner of the U.S., Teacher At Sea is having a powerful impact. I can't imagine my life without it, and I am so grateful for the opportunity that it created for our students."

Teacher N

Symbiotic relationships

Teacher N is an exceptional educator as evidenced by awards and practice. She has participated in numerous research experiences all prompted by her TAS experience. She even began her own sustained research experience that involved her camping in remote locations to gather data on fish in collaboration with other fisheries scientists. Her dedication to teaching and learning is generated for the sake of her students, their families, and her colleagues. Again, she credits her TAS experiences with 'empowering' her to "stretch and grow as a person and a teacher". However, it is clear that the TAS Program and TASAA have also stretched and grown as a result of *Teacher N's* participation. She gave back to the program and association in meaningful ways by helping to initiate the TASAA in 2007 and start other pilot opportunities such as Teacher in the Air, Teacher in the Lab, and Teacher in the Field. Both *Teacher N* and the TAS Program and TASAA have benefitted from their relationship with one another, which has resulted in a multiplying effect.

Teacher O

Making waves internationally

Connecting with scientists in meaningful ways is a powerful experience for science teachers. This is the premise behind TAS. *Teacher O's* story exemplifies that as she described how engaging in authentic scientific practice refreshed her understandings and added to them in significant ways. She leveraged her experiences by placing her students in direct contact with scientists through online teleconferencing technology. These experiences then served as a springboard into additional opportunities including Teacher in the Air. This allowed her a chance to learn about conducting research regarding whales (same focus as her TAS experience) from literally another perspective. These experiences create teachers

that have insight regarding authentic research that most educators do not have. *Teacher O* attributes her selection as a Fulbright Distinguished Teacher in part to these experiences and their application in the classroom. Consequently, the TAS Program and TASAA have not only made impacts here at home, but internationally as well.

Ranking of Most Significant Change Stories

Of the fifteen stories that were analyzed, each had a unique element that made their change, and often the change they affected, significant. This does not mean that other TASA study participants did not also embody these elements. These stories were selected using the qualitative data analysis techniques described in the Methods section of this report using the data provided in the surveys, focus group interviews, and final reflection papers. It is acknowledged that the richness of the descriptions provided by participants can be impacted by many factors including a participant's sense of modesty, time constraints on completing instruments, health and well-being during data collection, etc. Consequently, other participants' stories that were not shared in as great of depth may be equally significant, however, given the data these fifteen stories emerged as most significant. The TASAA leadership and evaluators individually ranked the fifteen stories and then discussed them until they came to consensus. The TASA Final Reflection rankings in decreasing order of significance are: *Teacher M, Teacher J, Teacher N, Teacher L, Teacher G, Teacher F, Teacher C, Teacher B, Teacher E, Teacher H, Teacher K, Teacher O, Teacher A, Teacher I, Teacher D*. Rationales were discussed regarding the rankings. In general, the rationales fell into one of four categories: (a) student impact, instruction, and interaction; (b) collaboration with teachers, alumni, and colleagues; (c) passion added to teaching; and (d) knowledge gained. Discussions regarding the association's values considered various perspectives including affect on individual students compared to systemic, programmatic, or institutional shifts. Ultimately, what emerged from the conversations was a clear message that while both are valued, the primary focus of the association is on helping teachers improve the quality of life for individual students. Consequently, current and future networking

and other support structures of the association should be established and function with these organizational values in mind.

Non-Participant Survey Findings

All data suggest that related MSC stories are supported by non-participant (i.e. other teachers, administrators, scientists, etc.) statements and accounts. Limitations exist however and include that the TASA identified and suggested the contact. Consequently, the non-participant may be more inclined to provide responses that come from a shared perspective with the TASA. However, inclusion of artifacts in the TASA Final Reflections helps to mitigate this potential bias and results from those data support the findings in this section and others, effectively triangulating results.

Overall Program Implementation and TAS Program and TASAA Leadership Survey Findings

Data suggest overall implementation of the program is effective and efficient. STEM Consulting Services collected data that included (a) emails between leaders and participants, leaders and leaders, and leaders and the program evaluators, (b) descriptions and digital images of events, (c) TAS leadership surveys, and (d) comments from participants. The amount of communication that was observed suggests that the TAS Program and TASAA leadership value input from one another, teachers, and other stakeholder groups. They appear open and collaborative in their conversations. The TAS Program and TASAA leadership also regularly engages TASA in professional development opportunities at the regional and national levels. While all TASA do not have the same regional opportunities for dedicated TASAA conferencing (three TASAA regional organizations currently exist), beginning in 2011 the TAS Program and TASAA leadership has worked to grow this area of support for its membership by adding regions at a rate reasonable for the size of the TAS Program and TASAA leadership staff. This serves as evidence that the leadership has been responsive to its membership, who explicitly asks for such opportunities. Analysis of email data shows clear indication that the TAS Program

and TASAA leadership (a) act based on clear connections to NOAA mission and goals, (b) actively share their leadership knowledge with other leaders of related organizations, (c) are visible at the national level, (d) use data to make decisions, and (e) seek to learn from other organizations to enhance the TAS Program and TASAA.

The TAS Program and TASAA leadership appears passionate and driven by personal conviction as they draw from their own experiences in the public education system (e.g. teacher, parent) to support and sustain the TAS Program and TASAA. The leadership acknowledges genuine challenges and makes efforts to apply reasonable solutions. Due in large part by the volume and quality of communication between the leadership and membership, there was little disconnect between membership expectations/desires and those from the leadership, with one exception. The membership expressed the need for more explicit articulation of opportunities by the leadership and implied a need for guidance in navigating those opportunities in a way that would be most beneficial to them and their students. Currently, leadership does not provide “formal expectations” despite currently encouraging “alumni to keep in touch with TAS staff about the work they’re doing related to their TAS experience in the classroom and outreach within their community” (TAS Program and TASAA Leader quote) and some TASA explicitly asked for this.

SUMMARY

Overall, there is considerable evidence to suggest that the TAS Program and TASAA are strong, effective efforts that result in positive, meaningful, large-scale change. While the nature and magnitude of participant change experienced varied, it was overwhelmingly positive. The most significant change experienced by participants was characterized by an empowerment to affect change beyond themselves and their own classrooms. TASA identified program improvements all centered on enhancement efforts by both leadership and alumni. The image of shared ownership and responsibility for success was vivid. Results indicate that

TAS/TASAA leadership has asked much of the TASA and the TASA expect a lot from the TAS/TASAA leadership. Equally important, is that both groups feel that each other's expectations are reasonable and justified. Program implementation appears to be logistically smooth, programmatically robust, responsive, relevant, and highly self-reflective.

RECOMMENDATIONS

A summarized account of recommendations from the vast majority of the TASA survey respondents indicate that the TAS Program and TASAA should both increase operations and staffing in order to meet current and future participant demand and needs. Specifically, STEM Consulting Services recommends the TAS Program and TASAA embedded research opportunities be expanded to include additional domains that are increasingly representative of content included in the Next Generation Science Standards (NGSS Lead States, 2013), including those involving engineering and economics/policy-making. These opportunities are particularly relevant for TASA, who clearly articulated a desire for additional research opportunities, after their initial TAS experience. For example, current focus appears to be on TAS participants learning science content related to their time at sea. While this should stay the focus of the program, additional opportunities that involve cruises that focus on the engineering and technology related content and careers associated with the cruises may help teachers better address those standards. Additionally, for TASA, providing experiences that help them understand the full range of conducting science at sea, including the role of policy-making may also be helpful. For example, providing opportunity for TASA to engage in internships with legislators (Teacher on the Hill) may help them better understand how science is funded and how policy is made regarding socio-scientific issues. This will also provide insight into potential STEM-related careers that do not necessarily involve hands-on data collection but are just as crucial to the scientific enterprise and our nation's growth. By expanding to other content standards beyond marine science (e.g. engineering-related standards, economics/policy-making related

standards), TASA would gain additional understandings of (a) potential career pathways and (b) research methods across fields, some of which TASA may be able to better implement in citizen science/school science contexts thereby further expanding some programmatic impacts.

The most critical recommendation for alteration revolves around the purposeful construction of a TASA professional development plan that provides flexible opportunities for any level of engagement at any career stage. It is acknowledged that this is no small task and that the TAS Program and TASAA leadership is already engaged in this work in some respects. However, given that TASAA has been so successful at supporting considerable change and impact among some educators, the logical next step is to consider (a) replication and expansion of effective elements of TAS and TASAA among the broader TASA membership and (b) continued support for the most significant change participants. This implies that a scalable, alumni development model be implemented that has the capacity to support educators who have varying levels of ability and interest and is flexible enough to accommodate changes in those abilities and interests that occur at variable rates. One possibility is for the TAS Program and TASAA leadership to develop a concise document and/or visual that would include all the various opportunities offered by TASAA, paying particular attention to those related to the most significant change cases. This would result in a contextualized, evidence-based plan as opposed to applying plans developed in other contexts with other goals. The opportunities identified in the document/visual could be communicated in a dendritic pattern from less to more sophisticated types of engagement implying a pathway approach to alumni involvement and career development. From this outline, the TAS Program and TASAA leadership could plan purposeful support activities designed to move TASA from less to more sophisticated forms of engagement in the association at the local, regional, and national levels. Sharing a well-constructed, electronic document and/or visual (perhaps even interactive) of the TASAA opportunities with TASA would (a) address concerns regarding awareness of opportunities, (b) meet the need for more formalized expectations, and (c) allow for clear linkages regarding support efforts in which participants

indicated interest within this evaluation. It would also provide a concrete structure for formative assessment by the TAS Program and TASAA leadership between periodic external program evaluations.

The most critical recommendation overall is that the TAS Program and TASAA, which appear to function symbiotically, need to both continue in order to maintain their individual effectiveness. Viewed together, the TAS Program and TASAA have made a tremendous impact locally, regionally, and nationally, as evidenced by the most significant change stories, on science education teaching and learning and on the dissemination of NOAA-related science and resources.

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APPENDIX A

NOAA Teacher at Sea Alumni Association Survey

NOAA Teacher at Sea Alumni Association Survey

Dear Teacher at Sea Alumni,

We are conducting this survey to gather your feedback about your experience as a NOAA Teacher at Sea (TAS) and the impact the TAS Program has had after your research cruise. Your views and perspectives are central to the evaluation and improvement of the TAS Program. Participation in this survey is completely voluntary.

Your completion of the survey constitutes your consent to participate in this research. Your responses will be confidential unless you choose to provide your name and contact information for a follow up interview. It is estimated that the survey will take approximately 45 minutes to complete. You will need to complete the survey in one sitting. Thank you for taking the time to assist us in this important research.

* Required

Part 1: Survey Participant Information

1. What grade level age group(s) have you taught? *

Check all that apply.

- PK
- K
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- Community College
- 4-year Undergraduate
- Graduate
- Other: _____

2. What subject area(s) have you taught? *

Check all that apply.

- Reading/Writing/English
- Mathematics
- Social Studies/History
- Science (Life Sciences)
- Science (Earth Sciences)
- Science (Space Sciences)
- Science (Physical Sciences)
- Physical Education/Health
- Foreign Language
- Career and Technical Education
- Other: _____

3. Science is taught in my class using the following: *

Check all that apply.

- Students answer teacher questions
- Students answer their own questions
- Students read in the content area
- Students record using science notebooks
- Students engage in the analysis of data
- Students work in small ability groups
- Students work in small mixed ability groups
- Students engage in science lessons outside
- Students go on science field trips
- Students learn about science using local contexts
- I do not ever teach science
- Other: _____

4. What is your age range? *

Mark only one oval.

- Under 20
- 21-30
- 31-40
- 41-50
- 51-60
- Over 60

5. How long have you been an educator? *

Mark only one oval.

- 0-3 years
- 4-10 years
- 11-20 years
- More than 20 years
- Not applicable, never been a educator

6. List all of your academic degrees and associated majors. *

7. Please list and very briefly describe the last 3 jobs you held BEFORE the Teacher at Sea Program. *

Note: Before TAS

8. Please list and very briefly describe the jobs you have held AFTER the Teacher at Sea Program. *

Note: After TAS

9. What is your current job title? *

10. Please list and very briefly describe professional development programs you participated in BEFORE the Teacher at Sea Program. *

Note: Before TAS

11. Please list and very briefly describe professional development programs you participated in AFTER the Teacher at Sea Program. *

Note: After TAS

12. Have you ever worked as a professional scientist, technologist, engineer, or mathematician? *

Mark only one oval.

- No
- Yes

13. If you selected "Yes", please briefly describe that work.

14. In what state or states have you lived since your participation in the Teacher at Sea Program? *

15. In what country or countries have you lived since your participation in the Teacher at Sea Program? *

16. What is your gender? *

Mark only one oval.

- Female
 Male

17. Are you Hispanic or Latino? *

Mark only one oval.

- Yes
 No

18. Please select the racial category or categories with which you most closely identify (mark as many as apply). *

Check all that apply.

- American Indian or Alaska Native
 Asian
 Black or African American
 Hispanic
 Native Hawaiian or Other Pacific Islander
 White
 Other: _____

Part 2: Attitudes toward STEM

19. How interested in science are you? *

Mark only one oval.

- Not at all
 Very little
 Some
 Quite a bit
 Extensively
 Completely

20. How interested in engineering are you? *

Mark only one oval.

- Not at all
- Very little
- Some
- Quite a bit
- Extensively
- Completely

21. How important is science to you? *

Mark only one oval.

- Critical
- Very important
- Important
- Somewhat important
- Very unimportant

22. How important is engineering to you? *

Mark only one oval.

- Critical
- Very important
- Important
- Somewhat important
- Very unimportant

23. How important is it for your students to learn science? *

Mark only one oval.

- Critical
- Very important
- Important
- Somewhat important
- Very unimportant
- Not Applicable

24. How important is it for your students to learn engineering? *

Mark only one oval.

- Critical
- Very important
- Important
- Somewhat important
- Very unimportant
- Not Applicable

Part 3: Impact of Teacher at Sea Program

25. To what extent has the Teacher at Sea program increased your ability to discuss STEM career options? *

Mark only one oval.

- To A Great Extent
- Somewhat
- Very Little
- Not At All

26. To what extent has the Teacher at Sea program improved your effectiveness in working within a team? *

Mark only one oval.

- To A Great Extent
- Somewhat
- Very Little
- Not At All

27. To what extent has the Teacher at Sea program impacted the content you teach? *

Mark only one oval.

- To A Great Extent
- Somewhat
- Very Little
- Not At All

28. To what extent has the Teacher at Sea program impacted how you teach? *

Mark only one oval.

- To A Great Extent
- Somewhat
- Very Little
- Not At All

29. **To what extent has the Teacher at Sea program impacted your enthusiasm for teaching? ***

Mark only one oval.

- To A Great Extent
- Somewhat
- Very Little
- Not At All

30. **To what extent has the Teacher at Sea program impacted your professional networking? ***

Mark only one oval.

- To A Great Extent
- Somewhat
- Very Little
- Not At All

31. **In what other ways has the Teacher at Sea program impacted you? ***

32. **What groups have been impacted by your Teacher at Sea experience? ***

Check all that apply.

- Students
- Teachers
- Administrators
- Parents
- Businesses
- Government Agencies
- Non-Profit Groups
- Family
- Friends
- STEM Professionals (e.g. scientists)
- Other: _____

33. From the groups you've selected above, please provide examples of the ways (or times) when your Teacher at Sea experience had an impact on these groups. *

34. Of the examples you provided regarding how your Teacher at Sea experience impacted others, what are the 3 most impactful? *

35. If possible, please provide point of contact information (i.e name and email) for each of the 3 most impacted groups. *

36. Are you serving as a leader, either locally or otherwise, in terms of reforming teaching in science? *

Mark only one oval.

- No
 Yes

37. If you selected "Yes", please describe how you are serving as a leader.

Part 4: Insights Regarding Teacher at Sea Program

38. What sets the Teacher at Sea program apart from other programs in which you have participated? *

39. What would you change about the Teacher at Sea program? *

40. What do you want teachers to know about the Teacher at Sea program? *

41. The NOAA Teacher at Sea program was listed to be terminated several times over the last few years. What would you like for decision makers to know about this program that may impact their decision? *

42. Do any other professional development programs you participated in have an alumni group? *

Mark only one oval.

- No
 Yes

43. If so, what set the Teacher at Sea alumni group apart from other groups?

44. Is there anything else you would like to tell us?

45. If you would be willing to participate in a follow up interview, please provide your name, phone number, and email contact.

As a token of appreciation for your participation in the follow-up interview, we will enter your name into a drawing for a \$100 Amazon gift card.

Review of Responses

Please take this time to review and/or print your responses if you would like to keep a copy. When you are satisfied with your responses, please click on the SUBMIT button at the bottom of the page to submit your survey.

APPENDIX B

NOAA Teacher at Sea Alumni

Focus Group Interview Protocol

Teacher at Sea Alumni Focus Group Interview

Protocol:

Hello and Welcome - Thank you so much for taking the time to join this call. As you know, we are collecting evaluation data on the Teacher at Sea Alumni program and your perspectives are very important. I am ___ a member of the evaluation team. Participation in this focus group is completely voluntary and you may choose to stop the interview at any time. Your responses will be confidential. It is estimated that the interview will take approximately 30- 45 minutes to complete. If you have any questions or concerns about this study or if any problems arise, please contact Dr. Angela Eckhoff at Old Dominion University at 757-683-6263. As this is a focus group format, we will need to make sure that everyone has a chance to give responses so I will check in periodically to make sure each one of you has a chance to respond. Does anyone have any questions before we get started?

1. Briefly what is your role and relationship with the NOAA Teacher at Sea (TAS) program? (USING THIS TO IDENTIFY RESPONSES – Not directly related to themes)
2. Why do you remain involved with the NOAA Teacher at Sea Alumni (TASA) Association?
3. What makes it difficult to remain involved with the NOAA Teacher at Sea Alumni Association?
4. What is the most significant change you experienced as a result of being part of the TAS program?
5. What was the most valuable element of the TAS program for you? Other stakeholder groups?
6. What is the most significant change you experienced as a result of being part of the TASA program?
7. What is the most valuable element of the TASA program for you? Other stakeholder groups?
8. From your perspective, what is the biggest challenge facing the TAS program? Not related to funding.
9. From your perspective, what is the biggest challenge facing the TASA program? Not related to funding.
10. What else would you like to tell me regarding TAS and the TASA programs?

APPENDIX C
NOAA Teacher at Sea Alumni
Final Reflection

Teacher at Sea Alumni Final Reflection

Dear TASA,

Evaluation - Reflection Story: Deadline February 6, 2017

We appreciate the time you've taken to complete the evaluation survey, participate in focus group phone calls and your overall support! All of your help throughout this process is critical in contributing to the evaluation of the Teacher at Sea Program. We recognize that many of you are doing multiple tasks for us at the moment, and again, we greatly appreciate you and your time! **You were selected as a small subset of TASA to participate in a final evaluation component called a Refection Protocol.** This is similar to a final interview and gives you the opportunity to tell your TAS story in its entirety. Below are some guiding questions as you explain how the TAS/TASA Association impacted you and others. Feel free to write two or more pages as you tell your story. We want to hear all about the amazing accomplishments and lives you've impacted. Please explain what the Teacher at Sea and the Teacher at Sea Alumni programs mean to you, as they relate to your professional life. Focusing on the most significant change you experienced as a result of being part of the TAS/TASA programs may be a helpful starting place.

ALSO: please add pictures (e.g. awards, experiences, etc.), URL links to newspaper articles or media reports about your work, or any other artifacts that tell the story of all you do and how TAS/TASA played a role in those successes, if applicable.

Please email your reflection and artifacts to Dr. Daniel Dickerson at Daniel@stemconsultingcompany.com

Guiding Questions:

1. What is your role and relationship with the NOAA Teacher at Sea (TAS) program?
2. Why do you remain involved with the NOAA Teacher at Sea Alumni (TASA) Association?
3. What is the most significant change you experienced as a result of being part of the **TAS** program?
4. What was the most valuable element of the **TAS** program for you? Other stakeholder groups?
5. What is the most significant change you experienced as a result of being part of the **TASA** program?

6. What is the most valuable element of the TASA program for you? Other stakeholder groups?

APPENDIX D
NOAA Teacher at Sea
Non-Participant Survey

NOAA Teacher at Sea Alumni Association Impact Survey

Dear Study Participant,

STEM Consulting Services is conducting this survey to gather your feedback about the impact the NOAA Teacher at Sea (TAS) Program has had on you and possibly others. You were recommended by a NOAA Teacher at Sea Alumnus as someone who could speak about the program's impact. Your views and perspectives are central to the evaluation and improvement of the TAS Program. Participation in this survey is completely voluntary. Your completion of the survey constitutes your consent to participate in this research. Your responses will be confidential unless you choose to provide your name and contact information for a follow-up interview. It is estimated that the survey will take approximately 10 minutes to complete. You will need to complete the survey in one sitting. Thank you for taking the time to assist us in this important research.

* Required

Part 1: Survey Participant Information

1. What is your gender? *

Mark only one oval.

- Female
- Male

2. Are you Hispanic or Latino? *

Mark only one oval.

- Yes
- No

3. Please select the racial category or categories with which you most closely identify (mark as many as apply). *

Check all that apply.

- American Indian or Alaska Native
- Asian
- Black or African American
- Hispanic
- Native Hawaiian or Other Pacific Islander
- White
- Other:

4. Select your age range *

Mark only one oval.

- Under 18
- 18-29
- 30-45
- 46-65
- Over 66

5. What is your current job title? *

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Part 2: Attitudes toward STEM

6. How interested in science are you? *

Mark only one oval.

- Not at all
- Very little
- Some
- Quite a bit
- Extensively
- Completely

7. How interested in engineering are you? *

Mark only one oval.

- Not at all
- Very little
- Some
- Quite a bit
- Extensively
- Completely

8. How important is science to you? *

Mark only one oval.

- Critical
- Very important
- Important
- Somewhat important
- Very unimportant

9. How important is engineering to you? *

Mark only one oval.

- Critical
- Very important
- Important
- Somewhat important
- Very unimportant

Part 3: Impact of Teacher at Sea Program

10. How do you know the alumnus? *

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11. Please provide the most significant examples of how interactions with the Teacher at Sea Alumnus impacted YOU. *

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12. What other groups have been impacted by your interactions with the TAS Alumnus? *

Check all that apply.

- Students
- Teachers
- Administrators
- Parents
- Businesses
- Government Agencies
- Non-Profit Groups
- Family
- Friends
- STEM Professionals (e.g. scientists)
- Other:

13. Of the groups you identified, what are the 3 most significant examples of how your interactions with the Teacher at Sea Alumnus impacted OTHERS directly or indirectly? *

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Part 4: Insights Regarding Teacher at Sea Program

14. The NOAA Teacher at Sea program was listed to be terminated several times over the last few years. What would you like for decision makers to know about this program that may impact their decision? *

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15. Is there anything else you would like to tell us?

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16. If you would be willing to participate in a follow-up interview, please provide your name, phone number, and email contact.

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Review of Responses

Please take this time to review and/or print your responses if you would like to keep a copy. When you are satisfied with your responses, please click on the SUBMIT button at the bottom of the page to submit your survey.

APPENDIX E

**NOAA Teacher at Sea/Teacher at
Sea Alumni Association Leader Survey**

Teacher at Sea Leader Survey

Hope everyone is doing well! Below are the questions for the TASA Leader Interview. Please feel free to pass these questions on to any others you feel should complete them. Please answer each question thoroughly and email your responses to:

daniel@stemconsultingcompany.com

If you have any questions or would prefer to discuss any of the items, please let me know and we can schedule a time to talk.

Thank you so much!

Thanks, D

-- Dr. Daniel Dickerson
STEM Consulting Services
919.812.8317
daniel@stemconsultingcompany.com
www.stemconsultingcompany.com

Dear Teacher at Sea Program Leader, We are conducting this interview to gather your feedback about your experience as a Teacher at Sea Program Leader. Your views and perspectives are central to the evaluation and improvement of the Teacher at Sea Alumni Program. Participation in this interview is completely voluntary and should take no more than 45 minutes to complete.

Questions:

1. What is your role and relationship with the NOAA Teacher at Sea (TAS) program?
2. What prompted the development of the NOAA Teacher at Sea Alumni (TASA) program?
3. How would you describe participation in the Alumni program by TAS participants?
4. How do (a) you keep in touch with TAS participants? (b) TAS Alumni?
5. What are (a) your expectations of TAS participants? (b) TAS Alumni participants?
6. How do you communicate those expectations?
7. What is (a) the most valuable element of the TAS program for participants? (b) How have you facilitated that? (c) Other stakeholder groups? (d) How have you facilitated that?

8. What is (a) the most valuable element of the TASA program for participants? (b) How have you facilitated that? (c) Other stakeholder groups? (d) How have you facilitated that?
9. From your perspective, (a) what is the biggest challenge facing the TAS program? (b) What have you done to address that challenge? (c) what is the biggest challenge not related to funding? (d) What have you done to address that challenge?
10. From your perspective, (a) what is the biggest challenge facing the TASA program? (b) What have you done to address that challenge? (c) what is the biggest challenge not related to funding? (d) What have you done to address that challenge?
11. Is there anything else you feel is important to share about the TAS/TASA programs?

STEM Consulting Services

STEM Consulting Services provides educational consulting services that include program evaluation, professional development, project management, curriculum development, and grant writing. The company strives to understand and meet the needs of our customers and consequently offers a level of personalized service that is unmatched. Our team has garnered experiences that include serving as principal investigator or evaluator (PI and Co-PI) on National Science Foundation (NSF), National Oceanic and Atmospheric Administration (NOAA), and other federal, state, and privately-funded efforts. Additionally, team members have considerable practical experiences in K-12 and postsecondary environments.

For more information about STEM Consulting Services, please visit our website at www.stemconsultingcompany.com

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