The South Florida Student Shark Program

(SFSSP) Student Evaluation

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Independent Study Evaluating the SFSSP

For Writing Credit
With the help of politicians, celebrities, and the media, scientists have recently made breakthroughs in informing the public about the many environmental problems that threaten our planet. Scientists are now in great demand as the public turns to them to help repair the damage to the environment and prevent further problems. But where are we going to find enough scientists to get the job done? The truth is that there are not enough to go around. It has become the responsibility of grade schools and universities to help increase their students’ interest in science and develop enough scientific brains for the future. In order to accomplish this task, they have had to develop new methods of teaching and encourage participation in programs that allow students to get hands-on field experience outside of the classroom.

Throughout the country, high schools and universities have created programs that allow their students to work with scientists in the field on current and relevant projects. These types of program have been shown to be extremely beneficial for both the students and the scientists and have become increasingly popular. A recent survey of 136 liberal arts colleges found that the number of students engaged in some type of research had risen by 70% in the past decade and those pursuing more intensive summer projects had grown by 40%. (Mervis) Studies have shown that students become much more engaged and interested in a subject if they learn about it through experience as opposed to reading about it in a textbook or listening in a lecture. They are often required to memorize pieces of information without ever really understanding their practical significance. Students have been shown to have a deeper level of understanding when given the opportunity to directly apply what they are learning firsthand. They also become more motivated to learn and feel better about their education when they see that
the material they are learning in school is actually relevant to their lives. (Sharon and Wright)

Experiential learning has other advantages. Working closely with instructors in and out of the classroom often improves student-teacher relationships. Getting to know an instructor well enhances students intellectually and encourages them to think more about their futures. Students are often asked to work together in a group, which not only improves relationships and builds friendships but also boosts the learning process by encouraging cooperation. While working as a team, students are able to gain a deeper understanding of the material by sharing and responding to each other’s ideas. Also, one’s own peers may be able to explain a concept in a way that is easier to understand than an instructor. (Chickering and Gamson)

By the middle of high school, many students have a good idea of what they would like to do for their career and are very resistant to change from then on. For this reason it is extremely important for schools to get students involved with science at a young age. Unfortunately, large numbers of students have lost interest in science by middle school and by high school they find it boring and irrelevant. Through participation in scientific field projects, students are given the opportunity to experience science in a way that they have never done before. Some students might find learning about fish boring when they are forced to memorize the names of different species and their diets from a textbook. However, when you take these same students out on a boat, teach them how to catch and identify fish, and then allow them to examine their stomach contents, most will not be bored. Some may even be motivated to go out on more trips and/or pursue further education in science. (Duncan and Handler)
For both high school and college students, working on a research project gives them an opportunity to think like a scientist and become actively engaged in the profession. Several programs have been very successful in influencing their students to continue their scientific education. Out of 198 students who participated in a regenerative medicine summer research program in Pittsburgh, 83% went on to pursue M.D. and/or graduate level education and 12% are currently employed in the life sciences industry sector. When surveyed, nearly all state that the program was pivotal in helping them determine the next step of their lives and make critical contacts for their educational and career futures. (PR Newswire) Another highly successful program based in Oahu, Hawaii has given high school students the opportunity to work alongside biologists conducting research on hammerhead sharks. After the project was completed one of the students voluntarily wrote an essay about her experience to give to her teacher and several others continued to volunteer with another project. It is important to note that those students who continued to participate were not your stereotypical “good students.” This shows how successful such programs can be in motivating students and developing their interest in science. (Duncan and Handler)

Whether or not students decide to pursue a career in science, they can improve their skills in writing, speaking, thinking, time management, problem solving, critical thinking, problem identification, and analyzing and synthesizing data. (Millspaugh and Millenbah) Students may also feel a sense of accomplishment from knowing that they are doing meaningful work by helping scientists with their research. According to a 2002 survey of 155 science and engineering faculty at the University of Delaware, 50% claimed that they chose to incorporate undergraduates in their research because they felt
students could contribute to their research goals. (Millspaugh and Millenbah) In addition, because students are not bound by tradition, they might have some bright new ideas that may help scientists expand on current theories or develop new concepts. Research students may also provide scientists with new perspectives on existing concepts. (Duncan and Handler)

The community may benefit the most from bringing experiential learning into our schools. Students who get to experience the environment first-hand often gain a newfound respect for the planet. Many see the problems that face our planet and believe that they can make a difference. As a result, students become spokespeople for the environment and are able to promote its well being by teaching their friends and family how to properly treat it and encouraging them to get involved in its conservation. (Sharon and Wright)

Research Questions

The purpose of the current study was to evaluate the effect of the South Florida Student Shark Program (SFSSP) on two groups of students. The program’s goal is to support student career development and education while performing valuable scientific research on sharks in South Florida. My study is not related to the actual research on sharks but rather to the students involved in the program. The results of a survey were analyzed in order to determine the program’s impact on students. Some of the major research questions are the following: Was the program perceived as a positive learning experience by high school and college students? Has it had an impact on their interest in science? Are the students comfortable conducting research? Do they have a newfound respect for the environment? Has it changed their future career plans? This report also
discusses the students’ opinions about how the program was set up and run, which lead to recommendations for future programming.

The South Florida Student Shark Project (SFSSP) gives both high school and undergraduate students the opportunity to go out on organized field trips with graduate students who are conducting research on sharks in South Florida. Among other things, the researchers are trying to determine the relative abundances, growth rates, sex ratios, diets, and specific habitats of sharks in Biscayne National Park, Florida Keys Marine Sanctuary, and Florida Bay. Much of the work is hands-on and involves catching, tagging, and collecting data on fish and sharks. To accomplish this, some of the students are encouraged to get into the water and handle the sharks as they bring them from the net to the boat, and then rehabilitate them before their release. There are even opportunities for the students to snorkel around the sampling area to observe the sharks’ environment. Students also get experience working in a lab where they learn how to examine the stomach contents of sharks that have been collected throughout the trips.

Method

The first part of the evaluation of the SFSSP involved going out on several of the field trips to observe the program in action. I attended a morning and night trip with just the undergraduates and a day trip with undergraduates and high school students together. I then designed two surveys (one for the high school students and one for the undergraduates) to help gather the students’ opinions. The surveys were posted online using a website called Survey Monkey.com and could be responded to by the students at their home computers. Three sections of the surveys asked closed-ended questions: Demographic and Background Information, Comments About the SFSSP and How Have
You Been Affected by the SFSSP. An open-ended section asked students to make suggestions for improving the program, mention their favorite trip, and write any additional comments.

About 40 high school students from MAST Academy, Palmer Trinity, and South Broward High School were asked to take the survey along with 12 Undergraduate students from the University of Miami. Two separate surveys were designed because the mindset, knowledge, future goals, and demographics of the high school students are probably very different from that attending college. Seven undergraduates and 18 high school students actually completed the survey. The undergraduates were all upper classmen, and six were pursuing degrees in marine biology with one ecosystems policy and biology major. Only three of the students were raised in a two-parent home but most had parents who were very well-educated with advanced degrees. All of them are good students who had been able to maintain at least a 2.7 GPA and most kept at least a 3.3 GPA in addition to holding a regular job. Most of the students have worked on previous research projects and have been very dedicated to this project, attending seven or more SFSSP trips. All of the students plan on attending graduate school and hope to pursue a career in science/marine science. It is not surprising then that none of the students had a fear of sharks before getting involved with the SFSSP.

More than half of the high school students considered themselves a race other than white. Most were 16 or 17 years old and didn’t have jobs but were very involved with team sports (71%), school clubs (65%), and community service (53%). When asked who influenced their decision to become involved with the program, an overwhelming 94% claimed their teachers and 59% said it was a friend. While the high school students’
parents were not as well-educated as the parents of the undergraduate respondents, 30% of the high school students’ parents completed graduate school and 30% graduated from college. Most of the students did very well in school with the majority claiming to have a GPA of at least 3.7 and no one had a GPA below 3.0. Since both MAST Academy and South Broward are marine biology magnet schools with special programs dedicated to marine study, it was surprising to discover that only 29% of the students listed science as their favorite subject, with English and math each receiving 24% of the votes. Still, 44% strongly agreed that they had a strong interest in science before becoming involved with the SFSSP but most would not choose to pursue a career in the field. Most of the students have had very little field research experience with nine of the students having attended only one or two SFSSP trips thus far and only two having had any research experience in the past. All high school students surveyed planned to attend college. Finally, when asked if they had a fear of sharks before becoming involved with the program, 72% disagreed or disagreed strongly.

Before discussing the results of the study, it is important to note several biases. First, due to the small sample sizes, it is hard to make very definitive conclusions about the program. It is very possible that the students who were most fond of the program were more likely to respond to the survey then those who disliked it. Also, the background information may be biased because the worst students may not have cared enough to answer the survey and the students who had full time jobs may not have had enough time to respond. Finally, most of the high school students and all of the undergraduates who responded already had an interest and some education in marine science. If the program had been filled with history students, the results may have been
very different.

Results

When commenting about the program, the undergraduate students responded more positively than the high school students on every question. All data are shown in charts in the Appendix. One of the largest discrepancies had to do with the actual work that was being done on the boats. 71% of the undergraduates strongly agreed that they were happy with the jobs they received, 71% strongly agreed that jobs were assigned fairly, and 86% strongly agreed that they had the opportunity to work on a variety of different aspects of the project. Those who did not strongly agree still agreed to these statements. In contrast, only 33% of the high school students strongly agreed that they were happy with their job assignments, 22% strongly agreed that they were assigned fairly, and 28% strongly agreed that they were given the opportunity to work on a variety of different aspects of the project while 22% were neutral when asked this question. 17% also claimed to be neutral when asked if they were happy with their job assignment. One high school student mentioned not being able to work on one aspect of the project and wrote: “Try to give others a chance to participate in the fishing, not just the same people all the time. If anything, alternate the fishing responsibility to others so that there is an equal chance for everyone to participate.” When asked if their ability to perform assigned tasks improved from one trip to the next, all but one of the undergraduates strongly agreed that it did and the other agreed. One undergraduate wrote about their improvement during a trip: “…it was wonderful, once techniques were learned, to just DO them…and the very routine of doing a job and getting data was a rewarding experience that was easy to look at and say, ‘Hey, this program is WORKING.”
high school students showed fewer signs of improvement with only 29% strongly agreeing, 47% agreeing, and 24% claiming to be neutral.

Several questions pertained to the way the program was run. Both groups of students felt that the expectations and demands of the program were appropriate with 77% of the high school students agreeing and 57% of the undergraduates strongly agreeing. Most students didn’t consider boat overcrowding to be an issue with 71% of the undergraduates disagreeing that there are too many people working on the boat at one time and the rest being neutral. Only 12% of the high school students agreed that there were too many people with the rest either disagreeing or feeling neutral. Both groups of students responded very positively to the staff with everyone either agreeing or strongly agreeing that the instructors were patient, understanding, and supportive when working with them in the field. One high school student supported this by writing: “…the program was set up really well to have older kids, teachers, and other mentors to teach ones who might have needed a little help here and there.” As was the case with every other question, the undergraduates responded more positively than the high school students.

When asked to choose their favorite aspects of the project, 100% of the students said that it was observing marine life. 100% of the undergraduates also choose being on a boat, collecting data, and handling the animals. Working with scientists and graduate students came in second place at 86%, snorkeling and getting in the water were next with 71% each, and 57% enjoyed working with other undergraduate students. After observing marine life, 82% of the high school students choose being on the boat as one of their favorite aspects of the project, 65% choose conducting research and being able to
interact with scientists and college students, and 59% choose being able to interact with their peers outside of the classroom. The majority of the students claimed that they did not have a least favorite aspect of the program but there were a few comments made. One of the undergraduates mentioned the time commitment and another mentioned the long driving time to get to the site as being their least favorite aspects. 42% of the high school students also said the time commitment was their least favorite aspect. The other things mentioned were the bugs, some of the other participants, conducting research, and one student said it was hard work. In the open ended section one high school student must have had a problem with some of the other students on the trips and wrote that the program needed “more authority for the non workers.” Another high school student made a similar remark about his/her peers suggesting that the program should “exclude MAST Academy in the trips. They don’t participate as much as South Broward does. They are just along for the ride.” Both groups of students felt very comfortable when working on the project and only two people claimed that something made them feel uncomfortable. One of the undergraduates mentioned handling marine life and one of the high school students mentioned the assigned tasks with all the rest claiming that nothing made them feel uncomfortable.

All of the undergraduates strongly agreed that they would like to work with the program in the future and 100% of the high school students either strongly agreed or agreed to this question. However, some of the students still believed that changes could be made to the program. Out of the undergraduate students, 14% disagreed, 43% were neutral, and 43% agreed when asked if they would not make any changes to the program. 29% of the high school students disagreed, 18% were neutral, and 53% agreed to the
same question. One high school student wrote: “I believe we could improve the program by having more resources.” Another asked for “more knowledgeable instructors in the field of sharks.”

The next section of the survey asked questions about how the students were affected by the SFSSP. Unlike the last section where the results were much more positive for the undergraduates than the high school students, the results in this section were more varied. All of the undergraduates and 73% of the high school students agreed that the program has inspired them to think scientifically. In addition, 71% of the undergraduates and 27% of the high school students strongly agreed that the program increased their interest in science with the rest of the students agreeing to this question.

One of the major goals of the SFSSP is to make students more informed about the environment. Half of the undergraduates agreed that the program changed the way they think about the environment and 71% agreed that it made them more aware of and interested in current scientific/environmental issues. The high school results were more scattered with 60% agreeing, 20% strongly agreeing, 13% being neutral and 7% strongly disagreeing that the program changed the way they think about the environment and 53% agreeing, 40% strongly agreeing, and 7% claiming to be neutral for the question on current environmental issues. While discussing the programs advantages, one undergraduate student wrote: “it’s also a great way to get high school students educated and interested about the environment and pursuing careers in the field. Most of the students strongly agreed that they received satisfaction from knowing they are helping the environment (71% of the undergraduates and 60% of the high school students), while the rest agreed. Many of the students agreed that they intended to speak out on behalf of
relevant issues (57% of undergraduates and 60% of high school students) while the rest were neutral.

The SFSSP presents students with the opportunity to learn outside of the classroom and gives them great experience working in the field. 86% of the undergraduates either agreed or strongly agreed and 14% were neutral that working closely with graduate students and scientists in the field had been a rewarding experience. For the high school students, 67% agreed and 33% strongly agreed that they enjoyed working with teachers outside of the classroom. In addition, 57% of the undergraduates and 60% of the high school students agreed that the program has made them feel more comfortable working on a boat and in the field. 14% of the undergraduates and 27% of the high school students strongly agreed, with the rest choosing neutral. When asked if they learned a lot through their involvement with the program, 57% of the undergraduates strongly agreed, 29% agreed, and 14% were neutral, while only 33% of the high school students strongly agreed with the rest choosing agree. Even though most thought that the program was a good learning experience, 71% of the undergraduates and 87% of the high school students chose neutral when asked if their school grades had improved as a result of their involvement with the program.

In order for the program to be considered successful, students must pass on the knowledge they obtain to others. 57% of the undergraduates and 53% of the high school students strongly agreed and most of the rest agreed that they have discussed their experience in the program with people outside of the program. 86% of the undergraduates and 77% of the high school students either agreed or strongly agreed that they attempted to educate others about issues they learned about through the program.
with most of the rest choosing neutral. Additionally, 57% of the undergraduates and 47% of the high school students agreed that they encouraged others to become involved with the program. Most of the remaining students strongly agreed and a few choose neutral.

Several of the remaining questions focused on how the SFSSP affected the students’ plans for the future. When the undergraduates were asked this question, 43% claimed to be neutral, 29% strongly agreed, 14% agreed, and 14% disagreed. 67% of the high school students chose neutral as their answer while 20% disagreed, 7% agreed, and 7% strongly agreed. When asked if participating in the program had changed their interest in higher education there was a pretty big difference in the students’ responses. 57% of the undergraduates agreed that it has, 29% strongly agreed, and 14% chose neutral. In contrast, 47% of the high school students chose neutral, 40% agreed, and 13% strongly agreed. In terms of the students’ interest in a career in science/marine science, 43% of the undergraduates were neutral when asked if the program had an effect, 29% agreed that it had, 14% strongly agreed, and 14% strongly disagreed. On the contrary, 53% of the high school students agreed, 40% disagreed, and 7% choose neutral. In addition, 57% of the undergraduates strongly agreed and 43% agreed that they would like to continue working on research projects in the future. One undergraduate student wrote: “This is awesome work. I hope to do this kind of work for the rest of my life.” The high school students were slightly less enthusiastic about the idea with 60% agreeing, 20% strongly agreeing, 13% claiming to be neutral, and 7% disagreeing. The last question asked the students if they thought that participating in the SFSSP was a good decision. Every undergraduate and 73% of the high school students strongly agreed that it was, with the remaining 27% agreeing.
Conclusions and Recommendations

Because the current study was only able to analyze the short-term effects that this project has had on the students, it might be useful to discuss the results of a few other studies that examined some of the long-term effects that student research projects had on the participants. One study conducted by the University of Delaware in 1998 investigated whether undergraduate research could be shown to add a significant value to the education of its participants. 2,444 alumni were surveyed, including 865 who had participated in the university's undergraduate research program, and others who had either completed self-initiated research projects or had conducted no research at all. The alumni were asked to indicate the number of semesters that they had participated in various campus activities, their perceived benefit from each activity, their involvement in graduate study and/or employment since graduation, and the level to which 32 skills and abilities that are generally valued outcomes of a college education had been enhanced during their time at the university. Every student who participated in some sort of research rated the experience as being highly beneficial with the highest ratings being given by the students who dedicated the most time to the project. It was found that involvement in research did not interfere with involvement in other campus activities such as sports, clubs, performing arts, and student government but instead respondents reported involvement at higher levels than those who had not participated in research projects. It is believed that students who participate in research projects develop better time management skills, which allows them to allocate their time to a variety of activities. For the skills and abilities section, students who participated in research received higher scores on three skill factors:
1. Science, math, logic, and problem solving
2. Literature, language, and mastery of context
3. Personal initiative and communication

For a fourth factor, personal and social skills, there was no significant difference. The probability of attending graduate school for a student with research experience was 67% as opposed to 57% for those with no such experience. Also, students with research experience were almost twice as likely to pursue a doctoral degree than students without it. In terms of employment, about one-third more non-research students were employed in a career that did not pertain to their major than research students. Finally, respondents with research experience reported a significantly greater overall level of satisfaction with their undergraduate experience than respondents without research experience. All of these factors indicate the important educational gains associated with student research. (Bennett and Bauer)

Several comparisons can be made between Bennett and Bauer’s study and the current one with the students from the SFSSP. First, one of the reasons that the findings were more positive for the undergraduate students could be due to the fact that most of them had attended more field trips than the high school students. Bennett and Bauer’s research showed that the more time that is invested into a research experience the more beneficial it can be. While the current research did not have a control group, all the SFSSP students seemed to be very involved in other activities as is typical of a research student. In addition, these activities did not seem to interfere with their schooling considering their high GPA’s. While one can’t be sure if they will follow through with their goals, 100% of both the high school and undergraduate students plan on pursuing
higher forms of education after they graduate. Furthermore, all of the undergraduates plan on pursuing a career related to a major in marine science.

Evidence of the benefits associated with student research can be seen through a field-based, inquiry-driven research course in Geoscience offered at Fort Lewis College, New Mexico. The goal was to offer a course that would allow students to learn important observational and interpretive skills while doing science in the field. The twelve students involved were evaluated on a five point Likert-scale and the questions with the most significant results are the following: improved knowledge of regional geology (4.9), likelihood of selecting another research-based course (4.9), professional usefulness of research course format (4.8), and greater understanding of how scientific research is conducted (4.7). After the project was finished, three of the students decided to conduct senior theses on the geology work they had completed in this course and several of the students got involved with other research projects. Two of the students from the class are currently employed as geologists and claim that their experiences in the class contributed significantly to their careers and perspectives (Gonzales).

The current study’s results are congruent with those found above. Both the undergraduate and high school students showed signs of improved knowledge in the field of science and the environment and claimed to have learned a lot through their participation in the program the same way the Geology students displayed an increase of knowledge in their field. Most of the students in both studies also showed a desire to continue working on research projects in the future. In addition, the students in both studies felt more comfortable conducting scientific research.

A final relevant study worth mentioning involved giving high school students the
opportunity to work with scientists conducting research on hammerhead shark. The students completed self-surveys before and after the program to examine how much knowledge they had retained. They were also evaluated by their teachers to determine if their self-assessments were accurate. Before the program, the students felt they knew .55 of the seven surveyed skills as compared to after the program when the students felt they knew 4.05 of the seven skills. At this point the students felt like they had a good understanding of the material and felt that they could teach it effectively to someone 79% of the time. It was also determined that the students had retained the most knowledge on the skills that they gained through hands-on work. Many of the students in this study got involved in other research studies after this one was complete. It is important to note that a large percentage of the students that were most inspired by the project were underprivileged in terms of ethnicity and socio-economic status. Therefore, experiential learning may be an important way to reach students who have lost an interest in science or may have a difficult time learning in a traditional classroom setting. In addition since this project only took place during a five-day trip, it can show how even a short experiential learning experience can have a big impact on a young students life. (Duncan and Handler)

It is clear from the existing literature in the field and from the results of the current research that opportunities for experiential learning can have a powerful effect on students at the high school and college level. Because so many students develop negative attitudes about science before they even reach high school, opportunities for middle school students are also needed. Future research needs to look at the kinds of hands-on science experiences that would most benefit students at different levels. Student feedback
should be in the form of responses to structured questions as well as answers to open-ended questions. Both types are critical in designing and evaluating experiential programs.

Finally, the impact of the SFSSP program is made clear by these comments:

“\textquote{This is a wonderful program, and one of my favorite after school commitments. I wouldn’t quit this program for anything.}” and “\textquote{Thank you for the amazing opportunity to further my knowledge in marine science and get to know and understand my favorite marine animals.}”
Works Cited


Mervis, Jeffrey. “Student Research: What is it Good for?” JSTOR 293 (2001): 1614