TRANSFERABLE ELEMENTS OF THE EDUCATION PROGRAM SEA SEMESTER

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ABSTRACT

SEA Semester is a highly successful semester-length academic program, providing undergraduate students with an in-depth knowledge of the oceans. There are a number of structural, program design, and other educational considerations that have contributed to SEA Semester's success. Key among these is a rigorous interdisciplinary curriculum, an educational program that combines theoretical learning and practical experience, and an environment of focused learning and intense personal and team challenges. Many of these beneficial characteristics can be incorporated to advantage in both field-centered and more traditional college campus settings, leading to enriched student learning and success in a wide variety of geoscience, earth and environmental science, oceanography and other educational programs.

Keywords: Undergraduate education, Environmental studies, Field study, Geoscience, Marine geology and Oceanography

INTRODUCTION

People are concerned about successfully providing quality education for a broad range of students. Those of us responsible for teaching and managing the learning environments in programs and schools are often challenged to explain why we do or do not do particular things in our professional settings for the educational good of the students. The character, philosophy, and individual details behind each program are often the product of peculiar histories and the experience and knowledge of the academic faculty and staff. Designing for success is certainly complex and often based on knowledge gained through shared years of experience. For many of us the program outcome, in terms of student learning, falls somewhere along a spectrum running from thrilling to satisfactory (or frustrating). In any case, we often try to identify the cause(s) and factors which most significantly influenced the outcome, so that they may be repeated if successful or avoided if less than satisfactory.

The purpose of this article is to describe the essential aspects of the SEA Semester program [offered six times a year by the Sea Education Association (SEA) of Woods Hole, Massachusetts] that we see as accounting for its striking success. This success is documented by internal and external reviews, as well as enthusiastic and consistently positive student responses on evaluation forms and other volunteered oral and written appraisals. The 30-year history of the program has provided sufficient time for the evolutionary refinement of the many essential operational aspects. A series of Deans and SEA faculty members have worked together to modify the program in response to their combined experiences on shore and at sea with the students. While descriptions and literature about SEA Semester has become more refined over the years, the fundamental structure has been rather consistent since the program began. A detailed description of SEA and its current programs is available at www.sea.edu.

SEA SEMESTER PROGRAM

SEA Semester is a semester-length interdisciplinary program open to academically qualified undergraduates of any major from any college and university. It involves six weeks of intensive study ashore at SEA's campus in Woods Hole (Shore Component), followed by six weeks of practical experience on a sailing research vessel at sea (Sea Component). Each SEA Semester program involves twenty five to fifty students (enough to fill one or two ship complements, respectively). More than 4,500 undergraduates from over 300 colleges and universities across the country and overseas have participated; most during either their sophomore or junior year, as an "off-campus" experience.

During the Shore Component, all SEA Semester students enroll in three concurrent, three-credit courses: Oceanography, Nautical Science, and Maritime Studies. Oceanography provides an overview of the physical, geological, chemical, and biological characteristics and dynamic processes operating in the oceans. In this course each student develops a detailed proposal for an oceanographic research project that he/she will subsequently conduct at sea. Nautical Science provides students with a theoretical foundation in concepts in general physics, astronomy, and meteorology necessary to subsequently operate SEA's research vessels. Topics covered include the physics of sailing, navigation (coastal piloting, celestial, and electronic), naval architecture, ship construction and stability, marine engineer-

ing systems, and meteorology. Maritime Studies provides students a multi-disciplinary study of the history, literature, and art of our maritime heritage and the political, economic, and international problems of managing our maritime resources. During the Shore Component, students live in the five communal housing units located on SEA's Woods Hole campus. All classes are held in an adjacent academic building. The campus is located in a quiet residential neighborhood.

Students spend the second six weeks of their SEA Semester program working on board one of SEA's sailing research vessels. During this Sea Component, students complete two sequential, four-credit courses: Practical Oceanography I and Practical Oceanography II. At sea, they gain practical laboratory experience, conduct oceanographic research, and assist in the operation of the research vessels. Managing the ship during the constant round-the-clock daily operations provides an endless series of challenges (growth opportunities) with an average of 8 hours per day on watch rotations, in the science laboratory or on deck with research vessel operations, including ship's engine room and galley duties. In addition, two hours of "formal" classes are held each afternoon. Each student completes an original oceanographic research project testing his or her new skills and knowledge in the world offshore. Accommodations onboard ship are spartan, but cozy. Communication to the shore is limited to administrative essentials. There is no email or sail-mail while at sea.

The essence of SEA's interdisciplinary educational model lies in the knowledge that the student's newfound skills will be immediately applied to, and tested by, the unforgiving realities of life at sea. Conducting deep-ocean research aboard a sailing research vessel, demands knowledge, teamwork and leadership and fosters decision-making and problem-solving skills. Self-confidence and respect for others are significantly enhanced as they assume increasing levels of accountability and realize a sense of personal responsibility while working together to achieve seemingly unattainable goals.

INDICATORS OF SEA SEMESTER SUCCESS

When student after student reports that their SEA Semester program was the best semester of school or even the best life-experience that they have ever had, it makes one take notice. With over 4,500 graduates, a significant experiential database has been established. Completed assessment forms, collected from virtually all participants, have given clear feedback on the quality of the courses, faculty and many other aspects of the program. Consideration of these evaluations and other suggestions have kept the staff continuously aware of how their educational product is being received and how some individuals think that SEA Semester might be improved.

Student evaluations often focus on how they handled the intense and high level of academic expectations. Mastering the practical components of ship handling, navigation, marine sampling, digital data manipulation and many other oceanographic skills clearly challenge and reward the students. Many comment that they were stretched in numerous ways and discovered that they could handle much more than they anticipated. That new realization of their own abilities and competence generates a great deal of self-confidence and personal satisfaction, and thus strong praise for the program.

Beyond a positive sense of self-development, SEA Semester graduates go on to enjoy a broad range of successful careers, some closely associated with the academic themes of the program. Many recognize the satisfaction and pleasures that come through teaching others new ways of understanding the world. Some continue their formal studies in graduate schools of oceanography or related subjects, while others follow a strong call to the sea as sailors, scientific technicians, or deckhands. Their deep understanding of marine environments and associated sciences has natural applications to many coastal and inland environmental studies and educational situations. Others go on in seemingly unrelated fields, yet express a strong appreciation for how much they grew and developed while in the program. "SEA Semester changed my life" (for the better) is one of the most commonly repeated compliments.

The success of the SEA Semester program can be demonstrated in other ways as well. The close relationship that develops between staff and students leads to many subsequent requests for recommendation letters. Employers and faculty in both undergraduate and graduate schools also provide a series of reinforcing assessments of how important the program has been for the growth of the students who have participated. Their progress in maturation seems to take what is often described as a leap in the minds of the beholders. Parents, perhaps expectedly given their special investments in offspring, echo the same theme of accelerated development. In addition, a recent formal external review of the program concluded that it "provides a rigorous academic experience for students who wish to combine an integrated curriculum in the humanities, social sciences, and natural sciences with a high adventure sailing experience. The SEA program is a model for demonstrating how academics can interface with real world experiences."

CHARACTERISTICS OF SEA SEMESTER THAT GUARANTEE SUCCESS

Many educational programs achieve success, and do so for a variety of reasons. We believe that the success of SEA Semester stems from structural and program design considerations, as well as other factors. Many of these features could be incorporated into other pro-

grams either as described or with some creative modifications. Table 1 provides a quick-reference listing of recognized characteristics supporting success of the SEA Semester program.

Structural Factors

1.Motivated and Able Students
2.Dedicated Faculty and Staff
3.Facilities Designed for the Program
4.Financial Backing for the Enterprise

Program Design

1.Clear Articulation of Purpose
2.Full Engagement while Enrolled
3.Experiential Based Program
4.Student Designed Research Projects
5.Strict Alcohol and Drug Policy

Other Valued Features

1.Consensus on Enterprise
2.Fresh Start for each Class
3.High Expectations for All
4.Total Immersion Standard
5.Group Tasking Required
6.Public Presentations of Work
7.Originality of Experience for Each Participant

STRUCTURAL CONSIDERATIONS

The fundamental structural considerations combine to help guarantee the success of SEA Semester programs. The tabulated list of structural factors are here explained more fully:

The self-selection that occurs through the advertising, application and interview process assembles a class of students who are highly motivated and interested in completing the program. Having interested students who are well suited to the program enables the faculty to focus on educational goals. It is always easier to teach students who are motivated and inclined to absorb the established curriculum. The students are also academically well prepared and among the more able for their age group. Most come to SEA from selective to highly selective colleges or universities. They have respectable transcripts and are able to secure personal recommendation letters that indicate the quality of mind and character needed for success in the program.

The faculty and staff are similarly selected from among a pool of applicants that favors those with strong academic, scholarly and administrative credentials. Many SEA faculty members have considerable teaching, research, and sailing or sea going experience prior to working at SEA. The physical facilities were designed and built for the program after more than a decade of operation out of rented facilities. This experience enabled the development of mature educational concepts for the various aspects of both the shorebased and at-sea components of the program. The necessary financial support to back the program's educational needs has also had the needed time to mature. Secure financial status enables the faculty and others to focus their professional energy on the desired educational programming for the student participants. It also permits a level of staff stability that is required for retaining an institutional memory about the knowledge and experience gained with each class.

PROGRAM DESIGN CONSIDERATIONS

In addition to these well-established fundamental or structural matters, there are a number of important details in program design and academic expectations that, in combination, lead to the high level of program success. These include:

From the admissions literature through arrival day to disembarking the ship, strong emphasis is placed on the academic demands of the program and the challenging pace at which instruction is provided. Students are encouraged to work hard. The students come with a broad range of backgrounds, which means they arrive at SEA with a considerable diversity of knowledge about the sea and ocean sciences. The students who seem to be falling behind or are having other problems with learning the materials are strongly encouraged to seek faculty assistance. This one-on-one attention helps the students get adequately engaged in the pace of the learning enterprise. The enrollment limit of 25 students per ship enables the faculty and sea-going crew to work with reasonable class sizes and provide individual tracking of each student throughout the program.

The students are kept busy and focused on their SEA coursework. Instruction on shore is scheduled from early morning through the afternoon and sometimes into the evening, with breaks for meals. Shore course syllabi are coordinated so that tests and other assignments are expected of the students in a bearable, if intense, fashion. The watch schedule at sea is unrelenting, with high academic expectations set for the students both in science lab and on deck. The experiential nature of much of the shore courses and the research cruise activities make the more theoretical concepts easier for the students to absorb. Their abilities to articulate key concepts is frequently practiced and demonstrated in both the oral and written presentations. These experiences serve to build understanding and related self-confidence in the students, as well as provide them with recognizable and valuable communication skills.

Having the students design, plan and propose focused research, while on shore, for their own at-sea research, brings them into direct contact with professional

oceanographic literature and some of the realities of doing ocean science. Carrying out the projects through the sample collection, analysis and interpretation stages goes a long way in developing their understanding of oceanographic processes. The final oral and written research reports enable the students to understand the full cycle of effort behind our ever-growing scientific understanding and progress.

The students are made to understand that the possession and use of recreational drugs as well as alcohol is not compatible with legal and safe operation of the vessel. Persons violating this requirement are immediately removed from the program. This fosters a community of serious learners and educators.

OTHER CONSIDERATIONS

In addition to the structural and program design considerations described above, the following cluster of characteristics all relate to the single-minded focus, small enrollment and highly directed mission of SEA Semester. In combination, they help the students to achieve success.

The faculty and staff have achieved a high level of consensus on the program through their pattern of continuing joint design and refinement. After 180 SEA Semester programs, offered over the past 31 years, SEA has gained extensive experience in what factors ensure program success. The faculty projects an expectation of success for each student in the classes on shore and at sea. Most students work hard to rise to these expectations, and generally meet or exceed them.

Each class is a new creation for the participants with a minimal of "handed down" student culture or influence. There is no overlap between classes on shore or at sea. In contrast to most educational institutions, there are no "upper classmen/women" to teach the entering students. Once on campus the program is characterized by total immersion in the enterprise, with a compact schedule of classes, laboratories, field trips and other assignments. The fact that all classes, housing, meals and studying are conducted exclusively with fellow classmates and faculty produces a clear sense of direction and integrated purpose.

There is a purposeful design of numerous academic assignments to include small group tasking. In addition, the students must function as members of a team to collect scientific data, to sail the vessel, and to feed themselves ashore. This emphasizes the need for and experience with teamwork and cooperation in resolving both academic and non-academic challenges. The constant interactions with others, from which there is little escape ashore and no escape at sea, results in a strong allegiance to the team. In each course and at sea the students have numerous assignments that they must summarize and present both to their classmates and the faculty. Creating and practicing these presentations builds a lot of self-confidence as well as public speaking skills. Their academic performance is known and open to judgment by everyone in the class, unlike in most academic situations where a person's grade is a private matter. This encourages greater effort by each in order to surmount the common fear of public speaking. At the same time, the close relationships that develop during the 12 weeks together ensure that the other students, faculty and staff will be a supportive audience and community.

SEA Semester provides a totally new experience for virtually all of the students. Most students seem to thrive on new situations that are challenging, require personal growth and are conducted in a safe and supportive fashion. This energized level of learning is particularly effective when clear risks remain ever within their range of awareness.

HANDLING OF DIFFICULTIES

Any program with so many people involved and such an intense level of activities is bound to have had its share of problems over the decades. Of particular interest and importance to educators are the problems classified into the academic and social realms. At SEA the record has been relatively fortunate and the difficulties well managed. From an administrative perspective the clarity of goals and shared purpose has guided most of the planning and responses to difficulties. Enthusiastic personal commitment of all participants greatly reduces problems and allows each faculty and staff member to support others when student difficulties do arise. The advantage of an excellent student to faculty ratio has enabled problems to be recognized early in their development. No problem can be hidden for long in such a close-knit community. Excitement is generated for the faculty as the new class of students arrives for each class. Teaching on land and at sea provides additional stimulation and variety. The parallel experience and general intensity for students precludes any chance of boredom that does so often underlie undergraduate social behavior problems. Strict exclusion of alcohol and drug use while enrolled sharply reduces many other academic and social difficulties.

Given the fortunate faculty-student ratio and frequency of class and laboratory meetings, most problems with students are quickly identified and handled by the faculty, staff and the actively involved Academic Dean. At sea there is near continuous involvement in academic interactions, during the waking hours, among the ship's professional staff and the students. Assistance is ever present for those confronting academic or social difficulties. Psychological stress while potentially threatening has rarely developed into unacceptable responses. Few students have ever had to be dismissed for these or other reasons.

USEFUL GENERALIZATIONS AND LESSONS EXTRACTABLE FROM SEA SEMESTER

It is neither practical nor desirable to duplicate SEA Semester on every college campus, nor is the program appropriate for every undergraduate student. However, several key aspects of SEA Semester can be successfully incorporated into any undergraduate academic program. These include a rigorous interdisciplinary curriculum, an educational program that combines theoretical learning and practical experience, and an environment of focused learning and intense personal challenge.

A number of current undergraduate programs are reshaping their curriculums to provide students with an interdisciplinary educational experience. Interdisciplinary education has been central to the core of the SEA Semester program since its inception, and we believe this has significantly contributed to its success. The interdisciplinary nature of the oceanography, nautical science, and maritime studies coursework requires students to focus on the oceans from a variety of perspectives. This demonstrates the complex interrelationships between seemingly diverse ocean-related subjects, and therefore encourages students to develop a knowledgeable "big picture" view of the oceans as a whole. Every interdisciplinary curriculum has this potential, and we encourage those interested in creating interdisciplinary programs to continue in their endeavors.

A key aspect contributing to SEA Semester's success is its combination of theoretical learning and practical experience. This practical experience has often been compared to the internship and/or research experiences currently offered at a number of colleges and universities. Indeed, many SEA Semester students tell us that they came to the program to "try out" oceanography, nautical science or maritime studies as a possible future career path. Other students tell us that the practical aspects of SEA Semester demonstrated the relevance of the subject matter to their personal lives. Furthermore, combining practical experience and theoretical learning appeals to a diversity of learning styles, which makes the coursework more comprehensible to a broad range of students. Along these lines, well-designed internship and research programs can provide students with valuable practical experience to complement their more theoretical coursework. Archaeological, biological, geological, earth and environmental programs all have long traditions of integrating field experience and laboratory analysis which can serve to enrich and intensify their students' depth of educational growth and theoretical understanding.

Another aspect of SEA Semester crucial to its success is the total immersion of the students in the program, allowing for a minimum of competing distractions. While this is clearly more easily achieved in the middle of the ocean than on a typical college campus, we believe that this can be approximated in other ways. For example, small groups of students can be combined to focus on studying particular topics for a specific time period. Colgate University has been successfully running such intensive semester-long programs, called "study groups," for several decades. Other colleges also offer such semester programs, usually led by one or more members of their faculty in an off-campus setting. January terms provide an ideal venue for this kind of focused study, as they do not require students to potentially delay progress in the coursework required for their major. Alternatively, small groups of students can be combined on campus to work together with a group of faculty members on a common cluster of courses developed around an interdisciplinary theme. This provides stimulating challenges for both faculty and students, with the many benefits of working closely together on an integrated enterprise.

CONCLUSION

SEA Semester is a highly successful academic program, providing three decades of undergraduate students with knowledge and understanding of the ocean environment. There are a number of structural arrangements and program design elements, and other considerations that have contributed to the program's success. Key among these considerations is a rigorous interdisciplinary curriculum, an educational program that combines theoretical learning and practical experience, and an environment of focused learning and intense personal and team challenges. Some transferable aspects of this educational program have been incorporated into more traditional campus settings and others could be considered for adoption. We encourage our faculty and administrative colleagues in these endeavors.

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