Marine Science - BS
Group 4: Cycle 1 - Fall 2017 - Fall 2018

Currently status is: Report Accepted

ASSESSMENT REPORT FOR Group 4: Cycle 1 - Fall 2017 - Fall 2018

Mission Statement

The mission of the USC School of the Earth, Ocean and Environment's Marine Science (MSCI) degree program is to facilitate a holistic understanding of the interdisciplinary nature of Marine Science through integration of teaching, research, and outreach. MSCI emphasizes critical thinking, research-based learning, and hands on technical and field training at both the graduate and undergraduate levels. Students develop skills which allow them to pursue careers in industry, government, and academic settings. As a multidisciplinary unit, the MSCI program fosters the building of bridges between disciplines to emphasize its unique goals as a research and academic entity.

Goal 1.

The School of the Earth, Ocean and Environment Marine Science degree program expects that by graduation students will understand the scientific process by discerning observation from inference and by writing testable hypotheses.

Curriculum

Completion of upper division MSCI lab courses, including MSCI 399, 505, and 599R

Demonstrate a level of competency on a final lab report in Marine Science Courses with laboratories (e.g. MSCI 311, MSCI 313, MSCI 314 and MSCI 460)R

Participation as a Research Assistant in a faculty member’s laboratory or internship opportunities at other institutions (e.g. REU programs)NR

Participation and attendance at scientific meetings and seminarsNR

NR=Non-Required Course, R=Required Course

Learning Outcome 1.

Students will demonstrate that they understand the scientific process by testing hypotheses related to Marine Science in an inquiry based, hands on setting.

Measures and Criteria

To assess the understanding of the scientific process, all students will complete at least one research project requiring the formulation of a specific hypothesis, and analysis and critical interpretation of the results. To assess this goal, 90% of MSCI majors must minimally demonstrate:

A competency level of knowledge by completing a report or project with the elements above, in at least one of the following (this is not meant as an exhaustive list, rather as courses are added to the MSCI curriculum, other evidence required to meet this goal will be added):

- MSCI 311 (Biology of Marine Organisms) - 'Assimilation' Laboratory report
- MSCI 399 (Independent Study) - Final Report (and Credit Awarded)
- MSCI 460 (Field and Laboratory Investigations) - Final Laboratory Report
- MSCI 496-499 (Research in MSCI) - Final Report (and Credit Awarded)

- MSCI 599 (Data Collection and Analysis Methods in MSCI) - Data Analysis Project
- Final report for the Magellan or Howard Hughes Research Programs
- SC Honors College thesis project
- Research-based internship outside of USC (competency demonstrated by transfer of major credit and/or submission of a copy of final report to the Undergraduate Studies Director - the MSCI program allows students to substitute research internships conducted outside of USC in lieu of MSCI 460 - this is currently at the discretion of the Undergraduate Studies Director and requires documentation and a report on the research experience.)

Methods

Faculty will report to the Undergraduate Director or the undergraduate coordinator, the percentage of students who demonstrate their understanding of this goal at the mastery, excellence, proficiency and competency level of knowledge in one or more of the classes above. Data are presented annually to the MSCI Undergraduate Committee to monitor progress.

The Undergraduate Director also receives copies of the final report submitted by students who participate in a research-based internship outside of USC and notifies the undergraduate student coordinator of the knowledge level for tracking purposes. These data may also be used for this assessment

*All data will be kept in the SEOE Student Services Office.

Results

Goal 1 Learning Outcome 1 provides for all students to complete a research project that demonstrates that they understand the scientific process by testing hypotheses related to Marine Science in an inquiry based, hands on setting. Students complete this goal through various courses during their program and to assess our student's ability to demonstrate this Learning Outcome, we evaluated the competency level of knowledge by determining the percentage of students completing required reports that they were able to perform at various competency levels. In as much as all students will take MSCI 311 prior to graduation, a project in this course can be used as a means to evaluate the student's competency level for this learning outcome. Therefore, rather than evaluating the students at graduation, the student's abilities are evaluated at the time that they complete projects in MSCI 311 and at which time their level of competency related to understanding the scientific process by formulating and testing hypotheses can be evaluated. For this assessment cycle, all evaluations were conducted in MSCI 311 based on the Assimilation Laboratory Report. There were 86 students who participated in this laboratory evaluation.

	Formulating, Testing Hypotheses (Assimilation Lab)				
	Mastery	Excellent	Proficient	Competent	Not Proficient
86 Students	6	12	27	24	17
percentage	7.0	14.0	31.4	27.9	19.7
Cumulative %	7.0	21.0	52.4	80.3	100

Use of Results

In MSCI 311 in Fall 2018, 80.2% of the students were at a minimum of the Competency level of understanding the scientific process by formulating and testing hypotheses and

52.4% were judged at the Proficiency level or above. This is lower than our goal of 90% at the Competency level and lower than the last two assessments when the program met the goal. Reviewing this data with time will allow us to determine whether our students need additional instruction or practice to improve this learning outcome. Given that we have been benchmarking the Marine Science students for this learning outcome for some time and we have new instructors, we will continue to evaluate our students and strive for increased percentages of our students at the proficiency or greater level of understanding. Given the history of the assessment and the variation in proficiency percentages, (less than 30% were considered as Proficient 6 years ago), the assessment may benefit from the review of additional classes so that we will have a better understanding of whether there is a need to increase our student's conceptualization of hypothesis formulation.

Learning Outcome 2.

Students will demonstrate critical thinking skills using the scientific method.

Measures and Criteria

Criteria: To assess the student's ability for critical thinking, all students will complete at least one research project requiring the formulation of a specific hypothesis, and analysis and critical interpretation of the results. To assess this learning outcome, at least 90% of MSCI majors must minimally demonstrate the successful integration of the scientific process into the interpretation of results. This report will be assessed specifically for critical thinking to determine whether the student demonstrates a competency level of knowledge in the report or project completed in at least one of the following (this is not meant as an exhaustive list, rather as courses are added to the MSCI curriculum, other evidence required to meet this goal will be added):

- MSCI 311 (Biology of Marine Organisms) – 'Assimilation' Laboratory Report
- MSCI 399 (Independent Study) – Final Report (and Credit Awarded)
- MSCI 460 (Field and Laboratory Investigations in Marine Science) - Final Laboratory Report
- MSCI 496-499 (Research in MSCI) - Final Report (and Credit Awarded)
- MSCI 599 (Data Collection and Analysis Methods in Marine Science) - Data Analysis Project
- Final report for the Magellan or Howard Hughes Research Programs
- SC Honor's College thesis project
- Completion of a research based internship outside of USC (evidence of competency includes transfer of major credit and/or submission of a copy of the final report to the Undergraduate Studies Director – the MSCI program allows students to substitute research internships conducted outside of USC in lieu of MSCI 460 – this is currently at the discretion of the Undergraduate Studies Director and requires a report on the research experience)

Methods

Faculty will report to the Undergraduate Director or the undergraduate coordinator, the percentage of students who demonstrate their understanding of this goal at the mastery, excellence, proficiency and competency level of knowledge. Data are presented annually to MSCI Undergraduate Committee to monitor progress.

Undergraduate Director also receives copies of final reports for external internships and reports the level of knowledge to the undergraduate secretary for tracking purposes. This information may also be used for this assessment.

*All data will be kept in the SEOE Student Services Office.

Results

Goal 1 Learning Outcome 2 of the MSCI Assessment plan assesses the student's ability to demonstrate critical thinking skills using the scientific method. The level of knowledge was determined by evaluating the percentage of students completing required reports performed at various competency levels. In as much as many students will take MSCI 311- Biology of Marine Organisms in Marine Science, prior to graduation, a project within this course was used primarily as a means to evaluate the student's competency level for this learning outcome. Therefore, this year's assessment reviews and evaluates the student's abilities when they complete the Assimilation' Laboratory Report in MSCI 311 and at which time their level of competency related to demonstrating critical thinking skills using the scientific method will be assessed.

Assimilation' Laboratory Report, MSCI 311, Fall 2018

Number of Students = 85

	Interpreting Results (critical thinking)				
	Mastery	Excellent	Proficient	Competent	Not Proficient
85 Students	2	16	35	23	9
Percentage	2.4	18.8	41.2	27.1	10.5
Cumulative %	2.4	21.2	62.4	89.5	100

Use of Results

In MSCI 311 in Fall 2018, a total of 89.5% of the students were at a level of Competency or greater for demonstrating critical thinking skills using the scientific method and 61.6% were evaluated at the Proficiency level or higher. This is slightly below our goal of 90% at the Competency level. The level of student improvement fluctuates and has ranged from 50% at the Proficient level or better in 2014 to 76.9% in 2016. Reviewing this data with time will allow us to determine whether our students need additional instruction or practice to improve this critical thinking skill learning outcome. The Undergraduate Committee and unit faculty will continue to evaluate our students and consider more effective methods to increase our student's ability to think critically.

Goal 2.

The Marine Science Program expects that by graduation students will have the technical and investigative skills to conduct independent research in marine science.

Curriculum

Completion of MSCI 311, 313, & 314 (Core courses) and MSCI 399 & 499 (Independent research)R.

Completion of MSCI 460 (Capstone Field Course)R

Participation as a Research Asst. in a faculty member's laboratoryNR

Participation in research or internship opportunities at other institutions (e.g. REU programs)NR

NR=Non-Required Course, R=Required Course

Learning Outcome 1.

Students will demonstrate the ability to conduct independent research

Measures and Criteria

80% students before they graduate will complete a research project that requires students to work independently, demonstrate critical thinking skills, and analyze results (participation in MSCI 399, 460, or 499 or other research experience) by graduation.

Methods

Faculty and instructors will evaluate the student's ability to conduct independent research and report their evaluation to the Undergraduate Director for students enrolled in MSCI 460, independent research courses (MSCI 399 and MSCI 496, 497, 498, 499), those awarded Magellan, or other independent research fellowships, and/or those conducting research as a substitute research experience for MSCI 460. Data are presented annually to the MSCI Undergraduate Committee to monitor progress.

Faculty will report to the Undergraduate Director the number of Marine Science students who present their research. Information may be obtained via regular email requests, Marine Science travel requests, USC Discover Day, and abstracts listed on annual Faculty evaluations (in conjunction with Marine Science Director). Data are presented annually to faculty at Faculty Meeting to monitor progress.

The Undergraduate Director will also monitor and report on students who recieve scholarship and fellowship awards that are based on student research, such as the NOAA Hollings Scholarships, Goldwater scholarships. etc., and maintain these data in the Undergraduate Student Services office.

*All data will be kept in the SEOE Undergraduate Student Services Office.

Results

For Fall 2017- Fall 2018 we assessed this learning outcome by reviewing our student's participation in MSCI 460, in research experiences which substitute for MSCI 460, and in student's success in receiving research-based awards and scholarships.

60 Students graduated from Marine Science between December 2017 to December 2018. 28 students participated in MSCI 460 at Baruch Institute during Summer 2018 and instructors reported that each student conducted independent research. All other students who graduated during this time frame completed a research experience as an approved substitute for MSCI 460. Such experiences and substitutions were approved by the Undergraduate Director and the CAS Dean's Office for Undergraduate Students.

The last three years also saw significant increases in our student's ability to conduct independent research, which was recognized through the increased number of student awards: (Announced Spring 2018)

Harry S. Truman Scholar – 1
Goldwater Scholarship – 1
National Science Foundation Graduate Research Fellowship – 2
Morris K. Udall Scholarship – 1
Department of Defense scholarship under the Science, Mathematics, And Research for

Transformation (SMART) Scholarship for Service – 1
2018 NOAA Earnest F. Hollings Undergraduate Scholars – 4
Discover Day – USC : 20 MSCI students presented posters; 7 award winners.

Eight MSCI students graduated with Leadership Distinction, primarily for their research.

Each of these awards requires demonstration of research capability and the Marine Science program had 38 recognized for outstanding research which represents approximately 20% of our Sophomore to Seniors Marine Science majors.

We also had students awarded travel grants to present papers at national (2) and international meetings (1).

100% of our students conducted independent research before they graduated. We exceeded our goal of 80% completing research prior to graduation.

Use of Results

We will continue to foster and direct all of our students to become engaged in some aspect of research.

Goal 3.

The Marine Science Program expects that by graduation all students will effectively communicate Marine Science topics in both oral and written format.

Curriculum

Participation in MSCI 311, 313, 314 and 460 R

Participation in upper division Marine Science courses R

Presentation (both oral and written) at Discover Day or a scientific meeting NR.

NR=Non-Required Course, R=Required Course

Learning Outcome 1.

Students will demonstrate effective oral communication of Marine Science topics by giving an oral presentation

Measures and Criteria

80% of students will present a well-crafted scientific talk in an MSCI 390, other upper division courses, or at a public forum, where appropriate. A well crafted talk will demonstrate: 1- a clear understanding of the topic including presentation of the hypothesis, methodology, results and conclusions; 2- the effective use of visual aids, if necessary. In addition, more than 20% of the graduating class will give an oral presentation at a scientific meeting or conference. Attendance and presentation of a seminar or poster at a recognized local (i.e. Discover Day), national or international meeting will adequately demonstrate oral communication effectiveness for the student under this criterion.

Methods

The undergraduate student services coordinator under supervision of the Undergraduate Director, based on information provided by faculty who teach those courses, collects data on oral presentations in MSCI 390 or other courses or venues. Students who present their research at local, national or international meetings will be tracked via regular email requests to faculty and students, Marine Science travel requests, USC Discover Day

(abstracts published annually), and abstracts listed on annual Faculty evaluations (in conjunction with Marine Science Director).

Data are presented annually to the MSCI Undergraduate Committee to monitor progress.

Results

To assess this Learning Outcome ("Students will demonstrate effective oral communication of Marine Science topics by giving an oral presentation"), the program measured effective oral communication by presentation of research before an independent audience. There were at least 5 public forums at which MSCI students presented research findings. These included the International ASLO (Assoc for the Sciences of Limnology and Oceanography) meeting, American Geophysical Union (AGU), Sustainability Showcase, Discover Day, and SEOE Freshman Drop-In.

Numbers of Students giving Oral presentations:

Sustainability Showcase:	2
New Student Drop In (8/22/17)	9
Discover Day (presenters Sp 2018)	20
ASLO meeting	1
AGU	1
Total outside of class oral presentations	33
Spring 2018 MSCI graduates = 34	97%

Use of Results

Our goal is 50% of the graduating class will give a presentation, and we exceeded our goal. In addition, many of the students who graduated in Dec 2017, May 2018 or Aug 2018 are also giving presentations in classes. The faculty will continue to work with our students to encourage out of class presentations as well as in class presentations to assess our student's effective oral communication skills.

Learning Outcome 2.

Students will communicate and summarize their research findings effectively in writing (such as on a poster or in an abstract) on Marine Science topics

Measures and Criteria

Faculty will review and document the level of mastery of effective communication and summary of research results in the following courses(this is not meant as an exhaustive list, rather as courses are added to the MSCI curriculum, other evidence required to meet this goal will be added):

- MSCI 311 (Biology of Marine Organisms) – 'Assimilation' Laboratory Report
- MSCI 399 (Independent Study) – Final Report (and Credit Awarded)
- MSCI 460 (Field and Laboratory Investigations in Marine Science) - Final Laboratory Report
- MSCI 496-499 (Research in MSCI) - Final Report (and Credit Awarded)

- MSCI 599 (Data Collection and Analysis Methods in Marine Science) - Data Analysis Project
- Final abstract of the report for the Magellan or Howard Hughes Research Programs
- SC Honor's College thesis project with specific emphasis on the abstract. - Completion of a research based internship outside of USC and submission of a copy of the final report with abstract to the Undergraduate Studies Director – the MSCI program allows students to substitute research internships conducted outside of USC in lieu of MSCI 460 – this is currently at the discretion of the Undergraduate Studies Director and requires a report on the research experience). After faculty review, greater than 25% of the senior class will submit a poster or submit an abstract to a scientific meeting or conference.

Methods

The faculty to whom poster presentations or abstracts are submitted as above, will communicate the level of competency of the students to the undergraduate student services coordinator under supervision of the Undergraduate Director each semester for the specific projects listed above, via email correspondence from the faculty teaching those courses; faculty evaluation of students participating in Discovery Day, abstracts, and website; Data are presented annually to the MSCI Undergraduate Committee to monitor progress.

Results

We evaluated the competency level of knowledge by determining the percentage of students who effectively communicate through written communications performed at various competency levels. MSCI 311, Biology of Marine Organisms, is a required course in Marine Science, and a written laboratory report within this course was used primarily as a means to evaluate the student's competency level for this learning outcome. Therefore, this year's assessment reviews and evaluates the student's abilities at the time that they complete these learning outcomes in MSCI 311 and at which time their level of competency related to communicating and summarizing their research findings effectively in writing will be assessed.

	Effective Written Communication				
	Mastery	Excellent	Proficient	Competent	Not Proficient
82 Students	2	32	35	8	5
Percentage	2.4	39.0	42.7	9.8	6.1
Cumulative %	2.4	41.4	84.1	93.9	100

Use of Results

Of the students in MSCI 311, 93.9% were assessed as Competent, and 84.1% were evaluated at the Proficiency level or above. In as much as students in this course are usually sophomores or juniors, we are pleased with the writing ability demonstrated by the students in this class compared to prior assessment reports. The Undergraduate Committee and program faculty will continue to evaluate our students and strive for continued higher percentages of our students at the proficiency or greater level of effective written communication.