Mission / Purpose
The purpose of the M.S. program in Marine Science is to enable students to develop research, analytical, computational, and writing skills and a mastery of knowledge in specific fields in preparation for technical and support positions in marine-related occupations in academic, government, and private organizations.

Student Learning Outcomes/Objectives, with Any Associations and Related Measures, Targets, Findings, and Action Plans

SLO 1: Interdisciplinary/multidisciplinary understanding of Marine Science
Students will gain a broad knowledge and conceptual understanding of the interdisciplinary nature of marine science as a basis for proceeding to specialization in an emphasis area.

Related Measures:

M 1: Departmental Oral Qualifying Examination
Students will take and pass the oral qualifying examination after successfully completing department required core coursework.

Source of Evidence: Academic direct measure of learning - other

Target:
70% of students will pass their oral qualifying exams on their first attempt. "Pass" will be determined by a unanimous positive vote of the Interim Advisory Committee.

Findings (2013-2014) - Target: Met
Stennis - 100% (5/5; summer fall spring semester combined), two first-year and one second-year, full-time student and two part-time (one first-year) students took the qualifying exam in May 2014. Two first-year students are scheduled to take the exam at the beginning of spring semester 2015, since one enrolled during spring 2014 and the other student has more work to do before passing all of the core courses. There are also two new part-time students whose exam schedules are to be determined.

The target has been met with success, since it had not been met for several years. Of the six students in the August 2012 cohort of full-time, first year students, one passed on the first attempt, two received a conditional pass, and the other three left the program for various reasons. Of the students with conditional passes, one passed on the second attempt in September 2013, and passed on the second attempt in May 2014.

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

M 2: Successful completion of Ethics in Research training
Students will learn to conduct research ethically based on earning an RCR certificate.

Source of Evidence: Academic direct measure of learning - other
Target:
100% of first-year master's students will demonstrate their knowledge of the ethical conduct of science by earning the RCR certificate, which certifies satisfactory understanding of basic ethics in various, defined aspects of science.

Findings (2013-2014) - Target: Met
Stennis - 100% (9/9) first-year master's students in the Fall 2013 and Spring 2014 cohort have earned an RCR certificate. One part-time student is due his RCR requirements who was admitted during fall 2013. For future reference, our faculty are developing a face-to-face component of RCR training. 37% (7/19) in the Spring 2014 semester of master's students attended their RCR face-to-face training on 09 April 2014 at Stennis. This training session for spring semester 2014 was entitled Research Misconduct, intended to educate students about avoiding the pitfalls of plagiarism.

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

Continued emphasis on student completion of RCR training
Established in Cycle: 2013-2014
We plan to include a face-to-face component in the next evaluation period and have already made partial progress to this object...

SLO 2: Specialized research skills
Master's students will learn how to conduct research in marine science in their chosen emphasis area.

Related Measures:

M 3: Successful completion of a Research Prospectus
Students will learn the following by producing a research prospectus: to propose a testable hypothesis; compose a logical and compelling background to support the hypothesis; conduct scholarly, library research and integrate it into the background and discussion; propose an effective sampling design to test the hypothesis; organize data collection and analytical protocols into a coherent procedure for testing the hypothesis.

Source of Evidence: Senior thesis or culminating major project

Target:
70% of master's students will produce a research prospectus that satisfactorily masters all of the learning objectives above based on the judgment of the thesis committee.

Findings (2013-2014) - Target: Partially Met
Stennis - 67% (6/9; summer fall spring semester combined) of masters students have met the learning objectives of a prospectus. Of 9 active, full-time master's students who are due to complete a prospectus, 6 have satisfactorily met the learning objectives, and 2 of these did so in 2013-2014. This is the same percentage as last year. One second year student just completed the qualifying exam on the second attempt and is now ready to have the thesis committee formed. There are two part-time students who have not completed their prospectus, although one student is very near having the prospectus up for review by the student's committee after the summer data collection has been analyzed.

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

Identify reasons for delayed prospectus submissions
Established in Cycle: 2013-2014
Most students ultimately complete a satisfactory prospectus. However, some submit the prospectus after the target date. Reasons...

**M 4: Field Research element**

Students will learn to execute a field campaign to collect samples/data and demonstrate these learning outcomes: learn and apply basic safety protocols for field-based activities; learn to apply a sampling design to a natural setting; learn to operate all scientific gear and instrumentation needed to execute their thesis; learn how to maintain records of all activities. These learning outcomes will be assessed at a meeting of the thesis committee at the end of the second year.

Source of Evidence: Academic direct measure of learning - other

**Target:**

100% of second-year students will master the learning objectives above to the satisfaction of the thesis advisor and the thesis committee.

**Findings (2013-2014) - Target: Met**

Stennis - 100% (1/1; summer, fall, semester combined) of second-year master's students have started field activities. Five other students began the program in the fall of 2012, but three left the program for various reasons and two students did not pass the core courses and qualifier exam on the first try so have not been allowed to start research until these deficiencies are rectified.

**Related Action Plans (by Established cycle, then alpha):**

For full information, see the *Details of Action Plans* section of this report.

**Field/laboratory work**

*Established in Cycle: 2013-2014*

None needed. However, we are considering improvements to the field research requirement to meet the needs of our students. We a...

**SLO 3: Oral communication of original research findings**

Students will give poster presentations and formal scientific talks for the oral communication of original research findings.

**Related Measures:**

**M 5: Formal presentation of research through scientific talk or poster**

Students will learn how to present a talk/poster that accomplishes these learning outcomes: learn the appropriate form and elements of a talk/poster, learn proper citation and acknowledgment protocols, learn effective mechanics of presentation, learn to address questions. The learning outcomes will be assessed by the major advisor (and co-authors when appropriate) before and after the presentation.

Source of Evidence: Presentation, either individual or group

**Target:**

50% of master's students beyond the first year will present a poster or talk at a local or state-wide forum. The success of learned outcomes will be assessed by the thesis advisor (and co-authors) at a dress rehearsal before the presentation and at a meeting with the thesis advisor immediately after the presentation.

**Findings (2013-2014) - Target: Met**

Stennis - 67% (6/9; summer, fall, spring combined) of master's students beyond their first year have presented a talk or a poster at a local or regional scientific meeting and have met the learning objectives for a presentation.
M 6: Formal presentation of original research in a public presentation as part of the Thesis Defense
At their thesis defense, master's students will orally present their research project in a public forum and answer questions about their original research, both as a demonstration of their oral communication skills.

Source of Evidence: Presentation, either individual or group

**Target:**
100% of master's students will demonstrate their facility with oral presentation; demonstrate a command of their research topic including critical thinking, synthesis skills, analytical skills, information literacy, and creativity. They will demonstrate their success in presenting and testing their research hypothesis. The demonstration of these learning objectives must satisfy the members of the thesis committee.

**Findings (2013-2014) - Target: Met**
Stennis - 100% (2/2; summer, fall, spring combined) of students who defended during this period gave a successful oral defense that demonstrated the learning outcomes above. Remaining are four additional, active master's students who have completed a prospectus but have not yet completed a thesis.

M 7: Successful completion of a Comprehensive Exam as part of the Thesis Defense
Master's students will demonstrate their command of basic knowledge related to their thesis as evaluated by a Thesis Committee separate from the Public Forum questioning period.

Source of Evidence: Comprehensive/end-of-program subject matter exam

**Target:**
100% of master's students who submit a thesis will take an oral comprehensive exam to demonstrate satisfactory knowledge of their general thesis topic as judged suitable by their thesis committee.

**Findings (2013-2014) - Target: Met**
Stennis - 100% (2/2; summer, fall, spring combined) of students who have advanced to a completed thesis, have taken the comprehensive exam, and have demonstrated satisfactory knowledge of her general thesis topic in this assessment period. Remaining are four additional, active master's students who have completed a prospectus but have not yet completed a thesis.

SLO 4: Written formats of research findings
Students will learn to communicate their findings of original research in written formats.

**Related Measures:**

M 8: Successful completion of a Research Thesis
Master's students will write a thesis that accomplishes the following learning objectives. The organization of the thesis is consistent with the norms of good science writing. The writing is grammatical and understandable. Acknowledgements and citation of other’s work and ideas are consistent with standards in the field and with proper ethical conduct. Literature research is conducted at a high scholarly level. The hypotheses are clear and the tests of the hypothesis are effective. The sampling protocol, analytical methods, and data analyses are applied appropriately. The data are interpreted to the best standard of current knowledge.

Source of Evidence: Senior thesis or culminating major project

**Target:**
100% of master's students who write a successful prospectus will write a thesis that satisfies the learning objectives above to the satisfaction of the thesis committee members.
Findings (2013-2014) - Target: Met
Stennis - 100% (2/2; summer, fall, spring combined) Two of the 6 active master's students who completed a prospectus have advance to a completed thesis. Both theses satisfied the thesis learning objectives. Since 1992, 86 master's students have met the learning objectives of a thesis in the Department of Marine Science.

M 9: Participation in a peer-reviewed scientific publication
Master's students will publish part (or all) of the thesis in a reputable scientific journal of regional or national standing in order to learn the following. Learn how to format and edit manuscripts to professional standards. Learn how to draft figures and tables to journal standards. Learn how to select an appropriate journal. Learn how to submit a manuscript to a journal, including writing a cover letter. Learn how to respond to all reviewers’ comments and editors’ instructions and write a letter of response. Learn about copyright laws. Learn how to edit proofs and make appropriate changes. Learn about page charges. Learn about publication in dual media: online and printed. The manuscript will be assessed by peer scientists and journal editors.

Source of Evidence: Academic direct measure of learning - other

Target:
35% of master's students will publish a paper in a reputable state, regional or nation journal and hence satisfy the learning objectives above to the satisfaction of peer scientists.

Findings (2013-2014) - Target: Partially Met
Stennis - Both students who defended in this period have submitted papers for publication, and so have two master's alumni. We await news of their acceptance. Prior to this period, 34.5% (29/84; cumulative semesters) of master's students have published part or all of their thesis.

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

Increase thesis publications
Established in Cycle: 2013-2014
Continue to encourage faculty advisors to facilitate publication of thesis material as students leave for full-time jobs. Conti...

Other Outcomes/Objectives, with Any Associations and Related Measures, Targets, Findings, and Action Plans

O/O 5: Meet programmatic milestones
Master's students will meet their programmatic milestones on time.

Related Measures:

M 10: Timely completion of a Research Prospectus
Master's students will complete their prospectus in a timely fashion as reported by the chair of the thesis committee.

Source of Evidence: Academic indirect indicator of learning - other

Target:
70% of master's students will meet their programmatic milestone of having an approved prospectus within two semesters of completing the core courses. Completion is reported to the Department and the Graduate School by the chair of the thesis committee.

Findings (2013-2014) - Target: Not Met
Stennis - 27% (3/11; summer, fall, spring combined) full-time students completed a prospectus on
time. Three active, full-time, master’s students took an extra semester or more to complete their prospectus. There are nine full-time students and two part-time students who are expected to have had their prospectus approved.

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

Rate of prospectus completion
Established in Cycle: 2013-2014
Most students ultimately complete a satisfactory prospectus. However, some submit the prospectus after the target date. Reasons...

M 11: Completion of course work
Master’s students will complete their course work, excluding Directed Study and Thesis, within two years.

Source of Evidence: Academic indirect indicator of learning - other

Target:
70% of masters students will meet the completion of course work milestone (excluding Directed Study and Thesis units) by the end of the second year. Completion will be audited on an annual basis by the Department using SOAR.

Findings (2013-2014) - Target: Partially Met
Stennis - 56% (5/9; summer, fall, spring combined) finished their course work within 2 years of admission. Two finished in 3 years. Two potentially will finish course work within 2 years at the end of the spring semester (7/9; 78%).

Related Action Plans (by Established cycle, then alpha):
For full information, see the Details of Action Plans section of this report.

Students reduce time to complete coursework
Established in Cycle: 2013-2014
The reasons for delays in course completion are not clear and need to be examined systematically. Possibilities include course ...

M 12: Timely completion of the thesis and comprehensive exam
Master’s students will successfully defend their thesis and pass their comprehensive exam within 2.5 years of entry.

Source of Evidence: Academic indirect indicator of learning - other

Target:
70% of active masters students who have completed a prospectus will complete their thesis within 2.5 years of their entry date and take an oral comprehensive during the closed session of their thesis defense. Success in the defense and oral comprehensive exam is assessed by the thesis committee and reported to the Department and to the Graduate School by the chair of the thesis committee.

Findings (2013-2014) - Target: Partially Met
Stennis - 50% (1/2; summer, fall, spring combined) Two students defended and took the comprehensive exam during the reporting period. One did so within 2.5 years of her admission date.

O/O 6: Employment or enrollment in a PhD program
Students will find employment in a marine science-related field or enroll in a doctoral program.

Related Measures:
**M 13: Master’s students will get a job related to science or enroll in a Ph.D. program**

Students will compete successfully for technical and support positions in marine science-related fields or enroll in a doctoral program relevant to their field of study as evidenced by an annual departmental query to alumni.

Source of Evidence: Alumni survey or tracking of alumni achievements

**Target:**
70% of master's students will find a job in science or matriculate into a Ph.D. Program within a 1 year of graduation, based on results from an annual questionnaire to alumni.

**Findings (2013-2014) - Target: Met**
Stennis - 71% (5/7) of master's students who graduated in the preceding period (1 year ago) have secured a job related to his/her field. One graduate is employed in insurance, and one is raising her children.

**Details of Action Plans for This Cycle (by Established cycle, then alpha)**

**Continuous emphasis on student completion of RCR training**

We plan to include a face-to-face component in the next evaluation period and have already made partial progress to this objective.

**Established in Cycle:** 2013-2014
**Implementation Status:** Planned
**Priority:** High

**Relationships (Measure | Outcome/Objective):**
Measure: Successful completion of Ethics in Research training | Outcome/Objective: Interdisciplinary/multidisciplinary understanding of Marine Science

**Projected Completion Date:** 06/30/2014
**Responsible Person/Group:** DMS marine science faculty through department chair

**Field/laboratory work**

None needed. However, we are considering improvements to the field research requirement to meet the needs of our students. We are also considering procedures to evaluate laboratory and other methods of data collection learned by master's students as they start their thesis research.

**Established in Cycle:** 2013-2014
**Implementation Status:** Planned
**Priority:** High

**Relationships (Measure | Outcome/Objective):**
Measure: Field Research element | Outcome/Objective: Specialized research skills

**Implementation Description:** We are considering a better way to consistently evaluate student learning objectives in the field. In addition, because all second-year master's students have spent time in the lab learning techniques for their research, we also need a mechanism to consistently evaluate student learning objectives in the lab.

**Responsible Person/Group:** DMS faculty through department chair

**Identify reasons for delayed prospectus submissions**

Most students ultimately complete a satisfactory prospectus. However, some submit the prospectus after the target date. Reasons for not completing a research prospectus on time need to be clarified. Possible reasons are 1) poor tracking by advisor, and 2) issues with successful completion of the Qualifying Exam. We also need
to investigate whether or not students are prepared to compose a prospectus by the target date.

**Established in Cycle:** 2013-2014  
**Implementation Status:** Planned  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**  
**Measure:** Successful completion of a Research Prospectus  
**Outcome/Objective:** Specialized research skills

**Responsible Person/Group:** DMS faculty advisors through departmental chair

**Increase thesis publications**  
Continue to encourage faculty advisors to facilitate publication of thesis material as students leave for full-time jobs. Continue outreach efforts to alumni for publication information. Improve tracking of and communication with students after graduation.

**Established in Cycle:** 2013-2014  
**Implementation Status:** Planned  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**  
**Measure:** Participation in a peer-reviewed scientific publication  
**Outcome/Objective:** Written formats of research findings

**Responsible Person/Group:** Faculty advisors through department chair

**Rate of prospectus completion**  
Most students ultimately complete a satisfactory prospectus. However, some submit the prospectus after the target date. Reasons for not completing a research prospectus on time need to be clarified. Possible reasons are 1) poor tracking by advisor, and 2) issues with successful completion of the Qualifying Exam. We also need to investigate whether or not students are prepared to compose a prospectus by the target date.

**Established in Cycle:** 2013-2014  
**Implementation Status:** Planned  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**  
**Measure:** Timely completion of a Research Prospectus  
**Outcome/Objective:** Meet programmatic milestones

**Projected Completion Date:** 09/29/2014  
**Responsible Person/Group:** DMS faculty through department chair

**Revise assessment of success of student learning objectives in the Core Courses**  
We are dissatisfied with these results and are considering a change to the measure. Most students should pass the whole exam on the first try. We are considering changing the exam or changing the measure entirely to another evaluation option for the core course curriculum.

**Established in Cycle:** 2013-2014  
**Implementation Status:** Planned  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**
**Measure:** Departmental Oral Qualifying Examination  | **Outcome/Objective:** Interdisciplinary/multidisciplinary understanding of Marine Science

**Implementation Description:** Because many master’s students in recent years are not fully passing the Qualifier Exam on their first try, we plan to re-evaluate our approach. The teaching faculty in the Marine Science program will decide if the exam can be modified to reach our objectives or if we should take a different approach to evaluate programmatic success.

**Responsible Person/Group:** DMS Marine Science Faculty through department chair

**Students reduce time to complete coursework**
The reasons for delays in course completion are not clear and need to be examined systematically. Possibilities include course offerings out-of-sync with some programs of study; delays due to tardy completion of other milestones.

**Established in Cycle:** 2013-2014  
**Implementation Status:** Planned  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**

**Measure:** Completion of course work  | **Outcome/Objective:** Meet programmatic milestones

**Projected Completion Date:** 06/30/2015  
**Responsible Person/Group:** DMS faculty through the department chair

**Analysis Questions and Analysis Answers**

**What specifically did your assessments show regarding proven strengths or progress you made on outcomes/objectives?**
We are pleased with the learning outcomes demonstrated by the written and defended prospectus, written and defended thesis, and oral presentation of research (talk or poster) at scientific meetings. Students demonstrate command of their subject and facility in weaving in relevant, multidisciplinary threads into their work. They "get" how their questions usually require knowledge of both the biological and physical environments of the ocean. The students have learned basic field and laboratory techniques for their thesis, they know how to organize presentations and papers in the scientific style, and they are well on their way to finding that fertile, scientific frontier that generates useful, scientific hypotheses. We are gratified that our students are finding employment in science after graduation or are continuing in a Ph.D. program. This tells us that others value our students’ accomplishments.

**What specifically did your assessments show regarding any outcomes/objectives that will require continued attention?**
Aspects of our master’s program in Marine Science need further attention. We have struggled with the method of evaluation of the core courses and commit herein to find a solution. The core courses provide the basis for a broad, multidisciplinary knowledge of the ocean environment that we view as fundamental to ocean science. We need a satisfactory method for evaluating the learning outcomes of our students so we can improve the core courses as needed. By discussions with the core of instruction we will choose a path: 1) improve the Qualifying Exam and improve preparation for the exam so student pass on the first try, or 2) institute rubrics to evaluate learning outcomes directly from the core courses, or 3) perhaps institute another strategy that the core of instruction can suggest. Solving this issue will affect other perceived problems; it will help reduce time to an approved prospectus, completion of courses, and completion of a thesis.

We would like to find better ways to directly evaluate the field and laboratory experience of master’s students. All students are getting this training, and their success in writing/presenting a thesis suggests that they have attained their learning objectives, but it would be useful to directly measure learning outcomes at the time they are doing the field and lab work and to do so in a consistent way, based on consensus among the thesis advisors.
Program Summary

Nineteen students have been enrolled in the master’s program in Marine Science during the 2013-2014 period. Most are full-time students and, in this group, five are first-year students and nine are more advanced. Part-time students are a minority of five who attend while holding down full-time jobs at the Stennis Space Center. Of these, three are first year and two are more advanced. The master’s students as a whole are equitably distributed across the emphasis areas with six in Geological Oceanography, six in Biological Oceanography, five in Physical Oceanography, and two in Marine Chemistry.

Master’s students continue to be an integral participant in extramural research in the Department of Marine Science. All full-time students are funded by grants to faculty in the department, and only 3.5 student slots (7 semesters annually) are funded as teaching assistantships. All master's students beyond the first year have presented talks/posters on their research at local, state or national scientific meetings except two. All students except first-year students have apprenticed in field as well as laboratory work. One current master’s student has submitted a paper for publication of part of her thesis in Limnology and Oceanography this year prior to her defense. Two master's alumni have submitted papers for publication this year, also in well-regarded journals.

Continuous Improvement Initiatives

We have identified several actions as a part of our continuous improvement initiatives for the coming year. We will re-evaluate our Departmental Qualifying Examination. This examination is administered after the students have completed their cores courses. The goal of the exam is to determine if the students understand the interdisciplinary/multidisciplinary nature of marine or hydrographic science. However, the implementation of the exam in its present form has created unintended problems. A majority of students in recent years do not pass the exam on their first try, leading to delays in completing all subsequent milestones. It is unclear whether students accurately demonstrate their understanding in the tense oral format of the exam. It is unclear if the exams help faculty improve their courses. Hence, we recommend that the faculty re-assess the exam and consider other options as well in the upcoming year.

A primary focus for improvement in the Department of Marine Science is to be more effective at collecting, organizing and documenting data on student progress toward meeting the master's program milestones, as well as Ph.D. milestones. Our current system is cumbersome, divided among multiple databases, and some items are inconsistently reported to the staff.

Another area of interest is to encourage our master’s students to publish their research.

Closing the Loop

In the assessment of our master’s in Marine Science program for 2013-2014, we have realized that our prior Action Plans were not effective and we have chosen to discontinue all of them in favor of the revised plans detailed above in the Assessment Report. The same has been done for the Ph.D. programs.