Analysis Questions and Analysis Answers

For Academic Programs

Informed by your assessment activities related to student learning, what changes have you made in your degree program in the last three to five years? Describe the changes (e.g., curriculum revision, new courses, faculty development), the general results that prompted the changes (e.g., student performance on an assessment measure), and any impact on student learning that you might attribute to these changes.

Prior to 2013, analysis of assessment results related to student success with Oral and Written Exit Exams or, alternatively, an Initial Research Review revealed that a significant number of our Non-Thesis Master’s Degree recipients were awarded degrees without completing Department of Chemistry written and oral exit exam requirements. This was possible because students could apply directly to the UA Graduate School for the degree after satisfying its more limited degree requirements (minimum graduate GPA and earned credit hours). Explicit approval from the Chemistry Director of Graduate Studies was not required, and there was no mechanism in place to track which students had applied, or intended to apply, in order to enforce the more demanding Departmental degree requirements prior to degree receipt. In 2013, the faculty approved new departmental protocols to enhance the tracking of graduate students intending to apply for a Non-Thesis Master’s degree and to verify that those students had satisfied both The University and the more extensive Departmental requirements. A primary feature of this revised procedure is that only the Chemistry Director of Graduate Studies, rather than any faculty member, has the departmental authority to approve the UA Graduate School workflow for the Non-Thesis Master’s Degree application. With the new procedures in place, our 2014 findings indicate that 100% of students earning Non-Thesis Master’s Degrees satisfied all UA Graduate School and all Department of Chemistry degree requirements.

Mission / Purpose

The Department of Chemistry is committed to the intellectual, technological, cultural, and economic advancement of the state, region, and nation through the discovery and development of new scientific knowledge. Research programs in the Department are both fundamental (create new knowledge) and applied (solve technical problems). Many of these research endeavors are anchored in interdisciplinary efforts drawing on and adding to the research base within The University. A strong and active research effort allows faculty to enable and keep abreast of the latest scientific advances and to impart new ideas and concepts into the curricula. Research activities play a vital role in the education of the next generation of academic, industrial, and government laboratory scientists who will be called upon to solve new problems. By maintaining these research programs, the Department helps to increase the recognition and reputation for quality of The University of Alabama locally, regionally, nationally, and internationally. Critical research areas include the synthesis and characterization of chemicals and materials and biochemistry. There is a strong emphasis in materials for advanced energy technologies including applications of ‘green chemistry’ and for information storage.

The Department is dedicated to the instruction, training, and intellectual growth of undergraduate students. This mission is accomplished through the use of several mechanisms including 1) classic and innovative classroom and laboratory instruction, 2) student advising, and 3) undergraduate research. The Department reaches out not only to chemistry, science, and engineering majors but also to other non-science majors in its mission. Undergraduate research is strongly encouraged and supported in the Department. There are two basic degree tracks in the Department: a bachelor of science in Chemistry including a Biochemistry track and a Pre-health Professional track leading to a Bachelor’s of Science degree in Chemistry.

The Department offers opportunities for graduate study in a variety of exciting interdisciplinary programs as well as the traditional fields of analytical, inorganic, organic, physical, and biochemistry leading to the Master of Science and the Doctor of Philosophy degrees in chemistry. The Chemistry faculty offer the highest quality graduate education.

Service is an important function of the Department. Faculty and staff are bound by mutual respect and dedication to the field of chemistry and provide their expertise in science to serve the people of Alabama, the region, and the nation. The Department has strong outreach activities and has strong efforts in technology transfer.

Overall, the Department is truly the capstone of chemistry within the state of Alabama and beyond.

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

SLO 1: Fundamental Chemistry Knowledge
Students will apply fundamental and intermediate-level chemistry knowledge in solving problems related to kinetic and thermodynamic principles, chemical reactivity and synthesis, reaction stoichiometry, molecular structure and bonding, and chemical analysis

Connected Documents
Curriculum Maps Chemistry Plan II MS Non-Thesis Option 2013-2014
Curriculum Maps NonThesis Chem MS

Relevant Associations:
Assessment data from more non-thesis MS degree recipients is necessary before considering any changes. No action is warranted for 2011-2012.

Standard Associations

SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations

8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

Strategic Plan Associations

University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 1: ACS Subject Test Scores
Upon entry into the program, students will take American Chemical Society (ACS) Chemical Education Subject Examinations in analytical, biochemistry, inorganic, organic, and physical chemistry to assess baseline fundamental knowledge of chemistry. Upon completion of the degree requirements, students will retake the (ACS) Chemical Education Subject Examination in their designated area of specialization to assess the learning of associated fundamental chemistry concepts since commencing their graduate education.

Source of Evidence: Standardized test of subject matter knowledge

Target:
Higher average % correct answers on ACS Subject Test Score in area of specialization upon degree completion than upon program entry.

M 2: Oral Exams
During the students’ Initial Research Review (IRR), or upon completing the degree if a student elects to forego their IRR, students will be asked questions in an oral examination format before a faculty committee. Questions will probe fundamental and intermediate-level knowledge of kinetic and thermodynamic principles, chemical reactivity and synthesis, reaction stoichiometry, molecular structure and bonding, and chemical analysis, as appropriate. The faculty committee will assign a grade using a scoring rubric on the basis of the student’s command of the concepts.

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

Target:
Average score of >2.0 on related dimension in Oral Plan II MS Examination Assessment Form

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

New Processes for Departmental Approval of Plan II MS Degree Applications
Established in Cycle: 2012-2013

It is unclear why students were approved for non-Thesis (Plan II) MS degrees without having completed the requisite non-Thesis M....

M 7: Percentage of Degrees Awarded without IRR, Oral Exam, or Report
In order to assess the effectiveness of improvement actions proposed in 2011-2012 and 2012-2013 related to ensuring that students do not receive non-thesis Master’s degrees without having satisfied all departmental requirements (but having satisfied all UA Graduate School requirements), we will determine the percentage of degree recipients who failed to complete all Chemistry requirements for a Plan II non-thesis Master’s degree.

Source of Evidence: Administrative measure - other

Target:
0% should receive degrees without having completed all departmental requirements.

Finding (2013-2014) - Target: Met
All 15 of the students who earned Non-Thesis MS degrees completed either an Initial Research Review (IRR) or an Oral Exit Exam prior to receiving their degree. Hence, 0% of students received an MS degree without completing all departmental requirements. This is a significant improvement over previous years when a number of students received MS degrees after satisfying all UA Graduate School requirements but without completing one or more departmental degree requirements. The new departmental protocol for approving the Graduate School workflow for MS degree applicants and for tracking the progress of those students has been an unmitigated success in its first year.

SLO 2: Chemical Terminology
Students will select and express chemical terminology appropriately and convey (oral and written) chemistry results in acceptable technical formats with adequate and appropriate referencing (e.g., American Chemical Society standards)

Connected Documents
Curriculum Maps Chemistry Plan II MS Non-Thesis Option 2013-2014
Curriculum Maps NonThesis Chem MS

Relevant Associations:
Assessment data from more non-thesis MS degree recipients is necessary before considering any changes. No action is warranted for 2011-2012.

Standard Associations

SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations

11 Writing - SLO is related to building on students’ competency in academic writing skills and aims to extend those skills
### Strategic Plan Associations
University of Alabama

1. Promote and enhance areas of academic, scholarship, and research excellence.

### Related Measures

#### M 3: CH 570 Topic Report
In CH 570 Literature and Communication in Graduate Chemistry, students will write a 10 page report on a chemistry-related topic that is approved by the student's research advisor and the course instructor. The quality of the report (i.e., survey of the literature, use of chemistry terminology, clarity of writing, formatting, and citations) will be assessed by class peers, the course instructor, and a volunteer panel of Chemistry faculty members. Scoring will be conducted using a rubric.

Source of Evidence: Written assignment(s), usually scored by a rubric

**Target:**
Average score of >3.2/4.0 on all five dimensions found in the CH 570 Written Report rubric/scoring sheet.

**Finding (2013-2014) - Target: Met**
Assessment data from 23 students averaged a score of 3.4/4.0 with respect to written survey of the literature, and 18 of 23 (78%) students demonstrated competent or exemplary achievement of this dimension. Assessment data from 23 students averaged a score of 3.4/4.0 with respect to proper use of written chemical terminology, and 15 of 23 (65%) students demonstrated competent or exemplary achievement of this dimension. Assessment data from 23 students averaged a score of 3.4/4.0 with respect to clarity of writing and critical analysis, and 19 of 23 (83%) students demonstrated competent or exemplary achievement of this dimension. Assessment data from 23 students averaged a score of 3.3/4.0 with respect to proper style and accepted formatting, and 16 of 23 (70%) students demonstrated competent or exemplary achievement of this dimension. Assessment data from 23 students averaged a score of 3.5/4.0 with respect to adequate referencing and proper use of citations, and 20 of 23 (87%) students demonstrated competent or exemplary achievement of this dimension. Gratifyingly, the majority of the students who took the new course developed improved and competent written technical communication skills. In general, the results are superior to those from students who wrote reports for graded departmental activities (e.g., 2012-2013 Departmental Literature Seminar) without formal instruction, although direct comparisons are not meaningful since different evaluators and slightly different grading scales and dimensions were used for CH 570 than for the Literature Seminar activity. Even so, students in CH 570 did a much better job of referencing information in their written documents and providing ACS accepted formatting of citations than have students who submitted reports for other graduate activities that do not involve formal instruction.

#### M 4: CH 570 Oral Presentation
In CH 570 Literature and Communication in Graduate Chemistry, students will present a 20 minute PowerPoint seminar on a chemistry-related topic that is approved by the student's research advisor and the course instructor. The quality of the presentation (i.e., critical analysis of data, use of chemistry terminology, clarity of slides, understanding of topic/ability to answer questions, and effective delivery) will be assessed by class peers, the course instructor, and a volunteer panel of Chemistry faculty members. Scoring will be conducted using a rubric.

Source of Evidence: Presentation, either individual or group

**Target:**
Average score of >3.2/4.0 on all five dimensions found in the CH 570 Oral Presentation rubric/scoring sheet.

**Finding (2013-2014) - Target: Met**
Assessment data from 23 students averaged a score of 3.4/4.0 with respect to critical analysis of data, and 18 of 23 (78%) students demonstrated competent or exemplary achievement of this dimension. Assessment data from 23 students averaged a score of 3.4/4.0 with respect to proper use of chemical terminology, and 21 of 23 (91%) students demonstrated competent or exemplary achievement of this dimension. Assessment data from 23 students averaged a score of 3.5/4.0 with respect to effective delivery of the presentation, and 21 of 23 (91%) students demonstrated competent or exemplary achievement of this dimension. Assessment data from 23 students averaged a score of 3.4/4.0 with respect to understanding of topic, and 14 of 23 (61%) students demonstrated competent or exemplary achievement of this dimension. Assessment data from 23 students averaged a score of 3.7/4.0 with respect to quality and clarity of slides, and 22 of 23 (96%) students demonstrated competent or exemplary achievement of this dimension. Gratifyingly, the majority of the students who took the new course developed strong oral presentation skills. In general, the results are superior to those from students who gave graded oral presentations (e.g., 2012-2013 Departmental Literature Seminar) without formal instruction, although direct comparisons are not meaningful since different evaluators and slightly different grading scales and dimensions were used for CH 570 than for the Literature Seminar activity. Even so, students in CH 570 displayed excellent results in terms of proper use of terminology, effective oral delivery, and clarity by the student of the topic and activities in the course. Not surprisingly, critical analysis of data and understanding of topic had lower average scores and fewer competent participants, because those skills are largely developed in other graduate courses and are beyond the purview of CH 570.

#### M 5: Literature Seminar
Students will prepare a 30-minute oral presentation and a written 10 page technical summary about a contemporary chemistry topic of their choice (Departmental Literature Seminar). Faculty attendees will use a detailed scoring rubric to grade the student's level of preparation and organization, oral delivery of the presentation and appropriate use of terminology, and quality and formatting of the written report.

Source of Evidence: Presentation, either individual or group

**Target:**
Average score of >3.2/4.0 or >1.6/2.0 on all related dimensions of the Literature Seminar Assessment Form

#### M 6: Oral Exams
In preparing for the Initial Research Review (IRR), or upon completing the degree if a student elects to forego their IRR, students will prepare a short, written research summary and be asked questions in an oral examination format before a faculty committee. The faculty committee will assign a grade on the basis of the student's ability to communicate technical information clearly and correctly in both the written summary and the oral defense using a
scoring rubric.

Source of Evidence: Academic direct measure of learning - other

**Target:**
Average score of >2.0 on related dimensions in Oral Plan II MS Examination Assessment Form

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

**New Processes for Departmental Approval of Plan II MS Degree Applications**

*Established in Cycle: 2012-2013*
It is unclear why students were approved for non-Thesis (Plan II) MS degrees without having completed the requisite non-Thesis M.

**M 7: Percentage of Degrees Awarded without IRR, Oral Exam, or Report**
In order to assess the effectiveness of improvement actions proposed in 2011-2012 and 2012-2013 related to ensuring that students do not receive non-thesis Master's degrees without having satisfied all departmental requirements (but having satisfied all UA Graduate School requirements), we will determine the percentage of degree recipients who failed to complete all Chemistry requirements for a Plan II non-thesis Master's degree.

Source of Evidence: Administrative measure - other

**Target:**
0% should receive degrees without having completed all departmental requirements.

**Finding (2013-2014) - Target: Met**
All 15 of the students who earned Non-Thesis MS degrees completed either an Initial Research Review (IRR) or an Oral Exit Exam prior to receiving their degree. Hence, 0% of students received an MS degree without completing all departmental requirements. This is a significant improvement over previous years when a number of students received MS degrees after satisfying all UA Graduate School requirements but without completing one or more departmental degree requirements. The new departmental protocol for approving the Graduate School workflow for MS degree applicants and for tracking the progress of those students has been an unmitigated success in its first year.

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

**OthOthm 3: Program Outcome: High Level of Recognized Quality**
The program will improve and sustain a high level of recognized quality.

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Relevant Associations:**
1. Be more attentive and responsive to student concerns.
2. (With contributions from The University administration,) make permanent the four temporary GTA positions that were recently added and add additional positions as needed to meet enrollment demands and to allow a reduction in teaching duties of GTAs.

**Related Measures**

**M 8: Graduate Applications Received**
Annual departmental graduate application data will be compared with the annual CCR Survey application data to determine where we rank nationally among Chemistry departments with regard to number of applicants. This data can serve as a measure of both national and international departmental recognizability and reputation.

Source of Evidence: Administrative measure - other

**Target:**
No target established.

**M 9: Annual Research Expenditures**
Annual departmental research expenditures will be compared with the annual CCR Survey research expenditure data to determine where we rank nationally among Chemistry departments.

Source of Evidence: Administrative measure - other

**Target:**
No target established.

**OthOthm 4: Program Outcome: Sustain Optimal Level of Enrollment**
The program will build and sustain an optimal level of annual program enrollments and degree completion.

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Related Measures**

**M 10: Number of MS Degrees**
Number of MS degrees for last August+December+May commencements [Target: 4 degrees]

Source of Evidence: Administrative measure - other

**Target:**
No target established

**Finding (2013-2014) - Target: Met**
Fifteen (15) students earned MS degrees in 2013-2014, all of which were the Non-Thesis MS (Plan II) option. Although not a requirement, a significant number of continuing students apply for this degree en route to earning their PhD degrees. Others who earn the degree do not complete a significant research project in the program, but rather depart the program after successfully completing their course work and the other requirements for this non-research degree.
M 11: Relation of Number of MS Degrees Awarded to ACHE Standards
Relation of number of MS degrees awarded to ACHE viability standards
Source of Evidence: Professional standards
Target:
Average of 3.75 degrees per year over five years required to meet ACHE viability standards
Finding (2013-2014) - Target: Met
TBD

M 12: Student Faculty Ratio
Total number of graduate students and postdoctoral researchers compared to total number of research active faculty.
Source of Evidence: Academic indirect indicator of learning - other
Target:
4 per research active faculty member = 100

OthOtcm 5: Program Outcome: Highly Valued by Program Graduates
The program will be highly valued by its program graduates and other key constituencies it serves.
Connected Document
Curriculum Maps NonThesis Chem MS

Relevant Associations:
Acquire more satisfaction survey data from graduate students at the department level

Related Measures

M 13: Graduate Student Survey Conducted by Department of Chemistry
Graduate student survey conducted by the Department of Chemistry. A Lickert scale will be used to obtain numerical averages for each question asked.
Source of Evidence: Academic indirect indicator of learning - other
Target:
No target established.

M 14: Graduate Placement
Students who graduated with a non-thesis MS degree in Chemistry (Plan II) within the past year will be asked to complete an anonymous survey. Results will indicate the percentage of respondents who are employed in a science-related field (industry or academics) or who are continuing studies in a science or chemical engineering graduate program.
Source of Evidence: Job placement data, esp. for career/tech areas
Target:
>66% of our Non-Thesis MS degree earners will continue toward a PhD degree in our program or another academic program or find employment in a science- or education-related field.

OthOtcm 6: Department Outcome: Student Recruitment
Recruitment of a sufficient number of high quality students into our graduate program with competitive representation by racial and gender minorities
Connected Document
Curriculum Maps NonThesis Chem MS

Related Measures

M 15: Racial Minorities
% Racial minority graduate students [target: national avg. % minority enrollment in chemistry graduate programs = 4.6% for programs with 41-105 graduate students as reported by 2008 ACS Committee on Professional Training Special Report]
Source of Evidence: Administrative measure - other

M 16: Female Enrollment
% Female graduate students [target: national avg. % female enrollment in chemistry graduate programs = 26.1% for programs with 41-105 graduate students as reported by 2008 ACS Committee on Professional Training Special Report]
Source of Evidence: Administrative measure - other

M 17: GRE Scores
New graduate student quality based upon avg. total GRE score [target: avg. GRE > 1150]
Source of Evidence: Academic indirect indicator of learning - other

M 18: ACS Subject Test Scores
New graduate student quality based upon ACS Subject Test score in chemistry division of interest upon arrival in the program [target: avg. ACS placement exam score >50th percentile]
Source of Evidence: Academic indirect indicator of learning - other

OthOtcm 7: Department Outcome: Research
Publication of scholarly research results and application for intellectual property rights
Connected Document
Curriculum Maps NonThesis Chem MS

Relevant Associations:
Change the minimum standard in Measure 2.1 to 1.5/non-first year graduate student and postdoctoral researcher to
more accurately reflect recent publishing activity.

**Related Measures**

**M 19: Peer-reviewed Publications**
Total number of peer-reviewed publications [target: 1.5 per non-first graduate student and postdoctoral researcher (66 non-first year graduate students and 16 postdocs as of Sept. 1, 2011 = 123 targeted publications)]
Source of Evidence: Administrative measure - other

**M 20: Patent Applications**
Total number of patent applications submitted or awarded [target: no target]
Source of Evidence: Activity volume

**M 21: Evaluation of Improvement Actions**
Assess whether the revised target for measure 2.1 is a more accurate reflection of recent Departmental publishing activity than the previous target of 1.0/non-first year graduate student and postdoctoral researcher
Source of Evidence: Administrative measure - other

**OthOtcm 8: Department Outcome: Outreach Program**
Organization of, and participation in, outreach programs to enhance local and regional science education and training

**Connected Document**
[Curriculum Maps NonThesis Chem MS](#)

**Relevant Associations:**
Faculty will be strongly encouraged to conduct satisfaction surveys during outreach events in which surveys are tractable. Events including the NSF sponsored Research Experiences for Undergraduates program, the Alabama Instrumentation and Technology Colloquium, and area K-12 events are expected to implement surveys in 2011-2012.

**Related Measures**

**M 22: Total Events**
Total outreach events organized or participated in by faculty or graduate students [target: 10 activities]
Source of Evidence: Administrative measure - other

**M 23: Informal Evaluation by Faculty, Graduate Students and Participants**
Informal evaluation by faculty, graduate students, and participants
Source of Evidence: Evaluations

**M 24: Survey Administration in Outreach Activities**
Percentage of outreach activities in which surveys or evaluations were administered [target: >33%]
Source of Evidence: Administrative measure - other

**OthOtcm 9: Department Outcome: Professional Networking**
Establish networks with chemists to enhance Departmental recognition and reputation and to disseminate research results at national and international venues

**Connected Document**
[Curriculum Maps NonThesis Chem MS](#)

**Related Measures**

**M 25: Faculty Research Presentations**
Total number of faculty research presentations at regional, national, and international conferences, universities, or with industry [target: 3 per research active faculty member = 75]
Source of Evidence: Administrative measure - other

**M 26: Extramural Research Presentations**
Total number of student or postdoctoral associate extramural research presentations [target: two student/postdoctoral presentations per research active faculty member = 50]
Source of Evidence: Academic indirect indicator of learning - other

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

**Longer Response Time and Reminders for Placement Survey**
The 25% response rate did not provide data from enough of our MS degree earners to be able to draw meaningful conclusions about the value of the Non-Thesis MS program. In 2013-2014, our MS graduates will have an extended period (perhaps 3-4 weeks rather than 5-7 days) of time to respond to the electronic survey. In addition, they will be sent periodic email reminders about completing the survey with the intention of increasing the number of respondents and acquiring more representative results.

**Established in Cycle:** 2012-2013
**Implementation Status:** Planned
**Priority:** Medium
**Responsible Person/Group:** Chemistry Assessment Coordinator and/or Chemistry Director of Graduate Studies

**New Processes for Departmental Approval of Plan II MS Degree Applications**
It is unclear why students were approved for non-Thesis (Plan II) MS degrees without having completed the requisite non-Thesis MS Oral Exit Exam and associated report or a written report associated with their Initial Research Review (IRR). In order for a student to receive a Plan II (non-thesis) MS Degree in Chemistry, the student must first complete an 'Admission to Candidacy' form and receive an authorization signature from the Chemistry Director of Graduate Studies or the Chemistry Chair. To ensure that students are not approved for Plan II MS Degrees prior to completing an appropriate ACS Subject Test in their area of specialization and before completing a technical written report and short oral exam before a faculty committee, the Department will adopt an internal verification checklist for all degree
applicants that will be vetted by the Chemistry Director of Graduate Studies. Once the student has completed all Plan II MS Degree requirements and submitted the internal verification checklist, the Chemistry Director of Graduate Studies will sign the Admission to Candidacy form allowing the student to obtain the degree. The Director will be asked to remind students of the Plan II MS degree requirements (including the ACS Subject Test in their area of specialization AND either satisfactory completion of the IRR with a written report OR an oral Plan II MS Exit Exam with a written report) by email each semester and ensure that all Plan II MS applicants have completed the degree requirements prior to receiving Departmental approval. In addition, students who do not submit a research report during their Initial Research Review will be given an ‘F’ grade for the activity until the report is submitted and evaluated by the student’s faculty committee.

**Established in Cycle:** 2012-2013  
**Implementation Status:** Planned  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**  
- **Measure:** Oral Exams  
- **Outcome/Objective:** Chemical Terminology  
  - Fundamental Chemistry Knowledge

**Implementation Description:** The Chemistry Director of Graduate Studies will distribute a degree checklist to every graduate student in the program and disseminate reminders of degree requirements to graduate students every semester. The Director will also ensure that a research report was included in every student's IRR.

**Projected Completion Date:** 10/2013  
**Responsible Person/Group:** Chemistry Director of Graduate Studies
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The Department offers opportunities for graduate study in a variety of exciting interdisciplinary programs as well as the traditional fields of analytical, inorganic, organic, physical, and biochemistry leading to the Master of Science and the Doctor of Philosophy degrees in chemistry. The Chemistry faculty offer the highest quality graduate education.

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University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures
M 1: ACS Subject Test Scores
Upon entry into the program, students will take American Chemical Society (ACS) Chemical Education Subject Examinations in analytical, biochemistry, inorganic, organic, and physical chemistry to assess baseline fundamental knowledge of chemistry. Upon completion of the degree requirements, students will retake the (ACS) Chemical Education Subject Examination in their designated area of specialization to assess the learning of associated fundamental chemistry concepts since commencing their graduate education.
Source of Evidence: Standardized test of subject matter knowledge

**Target:**
Higher average % correct answers on ACS Subject Test Score in area of specialization upon degree completion than upon program entry.

**Finding (2012-2013) - Target: Met**
Nine (9) students obtained a Plan II master's degree during 2012-2013 academic year. On average, 50% of the questions were answered correctly on the ACS Exam in each student's respective area of specialization upon completing the degree requirements. This is compared to 46% of the questions answered correctly by those students on a comparable ACS Exam upon program entry. This result shows an increased knowledge of fundamental chemistry concepts by the non-Thesis MS degree earners.

**M 2: Oral Exams**
During the students' Initial Research Review (IRR), or upon completing the degree if a student elects to forego their IRR, students will be asked questions in an oral examination format before a faculty committee. Questions will probe fundamental and intermediate-level knowledge of kinetic and thermodynamic principles, chemical reactivity and synthesis, reaction stoichiometry, molecular structure and bonding, and chemical analysis, as appropriate. The faculty committee will assign a grade using a scoring rubric on the basis of the student's command of the concepts.

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

**Target:**
Average score of >2.0 on related dimension in Oral Plan II MS Examination Assessment Form

**Finding (2012-2013) - Target: Partially Met**
Data is available from three of the nine 2012-13 Plan II MS degree recipients. Three of the remaining six students completed this degree requirement in 2009-2010, prior to the collection of data for this measure. Data was not collected by the Department from three of the degree recipients.

Students averaged a score of 2.6/3.0 (n = 13 forms submitted out of 15 possible submissions; 2.0 = competent, 3.0 = exemplary) with respect to chemistry knowledge commensurate with their time in the program. 13 of 13 (100%) faculty ratings indicated competent or exemplary achievement of this dimension by students during their oral examination. Students averaged a score of 2.2/3.0 (n = 13 forms submitted) with respect to detailed knowledge of topics related to their research project (if they are involved in graduate research) including its significance. 12 of 13 (92%) faculty ratings indicated competent or exemplary achievement of this dimension by students during their oral examination. Overall, the graduate students displayed levels of chemistry knowledge slightly above expectations during oral exams; however, data from more degree recipients is required to gain a more accurate reflection of the fundamental chemistry knowledge gained by Plan II MS degree recipients before leaving the program or advancing toward a PhD degree.

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

**New Processes for Departmental Approval of Plan II MS Degree Applications**
*Established in Cycle: 2012-2013*
It is unclear why students were approved for non-Thesis (Plan II) MS degrees without having completed the requisite non-Thesis M...
a score of 3.7/4.0 (n = 7 students) with respect to choice and description of topic. 7 of 7 (100%) students demonstrated competent or exemplary achievement of this dimension.
a score of 3.2/4.0 with respect to survey of pertinent literature. 7 of 7 (100%) students demonstrated competent or exemplary achievement of this dimension.
a score of 3.3/4.0 with respect to use of chemical terminology. 6 of 7 (86%) students demonstrated competent or exemplary achievement of this dimension.
a score of 3.2/4.0 with respect to quality and clarity of written document. 4 of 7 (57%) students demonstrated competent or exemplary achievement of this dimension.
a score of 1.6/2.0 with respect to proper use of document. 6 of 7 (86%) students demonstrated competent or exemplary achievement of this dimension.
a score of 1.4/2.0 with respect to proper use of citations in document. 4 of 7 (57%) students demonstrated competent or exemplary achievement of this dimension.
a score of 3.3/4.0 with respect to effective delivery of the presentation. 4 of 7 (57%) students demonstrated competent or exemplary achievement of this dimension.
a score of 3.7/4.0 with respect to effective use of allotted time. 6 of 7 (86%) students demonstrated competent or exemplary achievement of this dimension.
and a score of 3.4/4.0 with respect to quality and clarity of slides. 5 of 7 (71%) students demonstrated competent or exemplary achievement of this dimension.

Gratifyingly, the seminar results indicate that the Plan II (non-thesis) Master's degree students developed strong oral presentation skills and acceptable technical writing abilities, although several students failed to properly or adequately reference described research in their written report.

**M 4: Oral Exams**

In preparing for the Initial Research Review (IRR), or upon completing the degree if a student elects to forego their IRR, students will prepare a short, written research summary and be asked questions in an oral examination format before a faculty committee. The faculty committee will assign a grade on the basis of the student's ability to communicate technical information clearly and correctly in both the written summary and the oral defense using a scoring rubric.  

Source of Evidence: Academic direct measure of learning - other

**Target:**

Average score of >2.0 on related dimensions in Oral Plan II MS Examination Assessment Form  

**Finding (2012-2013) - Target: Partially Met**

Four of the Plan II MS degree awardees completed their IRR prior to the requirement for submission of a written report, so no data is available from those students. The Department failed to give the short oral and written exam to three of Plan II MS degree awardees. Hence, assessment data is only available from two of the nine Plan II MS degree recipients.

The two students averaged a score of 2.3/3.0 (n = 8 forms submitted; 2.0 = competent, 3.0 = exemplary) with respect to comprehensiveness, grammar, formatting, and overall quality of their written research report. 1 of 2 (50%) students demonstrated competent or exemplary achievement of this dimension.

Too little data is available to draw meaningful conclusions from these results. We must ensure that all graduate students submit a report either during their Initial Research Review (IRR) or their Plan II MS Degree Exit Exam before the Department approves the awarding of the Plan II MS degree.

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

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

**New Processes for Departmental Approval of Plan II MS Degree Applications**

*Established in Cycle: 2012-2013*

It is unclear why students were approved for non-Thesis (Plan II) MS degrees without having completed the requisite non-Thesis M...  

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

**OthOtm 3: Program Outcome: High Level of Recognized Quality**

The program will improve and sustain a high level of recognized quality.

**Connected Document**

Curriculum Maps NonThesis Chem MS  

**Relevant Associations:**

1. Be more attentive and responsive to graduate student concerns.
2. (With contributions from The University administration,) make permanent the four temporary GTA positions that were recently added and add additional positions as needed to meet enrollment demands and to allow a reduction in teaching duties of GTAs.

**Related Measures**

**M 5: Graduate Applications Received**

Annual departmental graduate application data will be compared with the annual CCR Survey application data to determine where we rank nationally among Chemistry departments with regard to number of applicants. This data can serve as a measure of both national and international departmental recognizability and reputation.

Source of Evidence: Administrative measure - other

**Target:**

No target established.

**Finding (2012-2013) - Target: Met**

146 applications were received, including 52 from domestic applicants and 94 from international applicants.
This places our department between the 2nd quartile (avg. 252 applications) and 3rd quartile (average 114 applications) nationally, based on data from the national 2013 Chemistry Chair's Report.

**M 6: Annual Research Expenditures**
Annual departmental research expenditures will be compared with the annual CCR Survey research expenditure data to determine where we rank nationally among Chemistry departments.

Source of Evidence: Administrative measure - other

**Target:**
No target established.

**Finding (2012-2013) - Target: Met**
2011-2012 total research expenditures (federal, industrial, general + other) = $3.74 million. This places our department firmly between the 2nd quartile (avg. $6.9 million) and 3rd quartile (average $2.2 million) nationally, based on data from the national 2013 Chemistry Chair's Report.

**OthOtm4: Program Outcome: Sustain Optimal Level of Enrollment**
The program will build and sustain an optimal level of annual program enrollments and degree completion.

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Related Measures**

**M 7: Number of MS Degrees**
Number of MS degrees for last August+December+May commencements [Target: 4 degrees]

Source of Evidence: Administrative measure - other

**Target:**
No target established

**Finding (2012-2013) - Target: Met**
Nine (9) students earned MS degrees in 2012-2013, eight of which were the Non-Thesis MS (Plan II) option. Although not a requirement, a significant number of continuing students apply for this degree en route to earning their PhD degrees. Others who earn the degree do not complete a significant research project in the program, but rather depart the program after successfully completing their course work and the other requirements for this non-research degree.

**M 8: Relation of Number of MS Degrees Awarded to ACHE Standards**
Relation of number of MS degrees awarded to ACHE viability standards

Source of Evidence: Professional standards

**Target:**
Average of 3.75 degrees per year over five years required to meet ACHE viability standards

**Finding (2012-2013) - Target: Met**
The average number of MS degrees awarded over the past five years = 7.6 degrees. This value far exceeds the ACHE viability standards.

**M 9: Student: Faculty Ratio**
Total number of graduate students and postdoctoral researchers compared to total number of research active faculty.

Source of Evidence: Academic indirect indicator of learning - other

**Target:**
4 per research active faculty member = 100

**Finding (2012-2013) - Target: Met**
As of fall 2012, the Department supported 94 graduate students and 12 postdoctoral researchers (106 total researchers). This total is comparable to that from fall 2011 (94 and 13 = 107) and shows the Department continues to meet its enrollment goals for students and postdoctoral researchers in the Graduate Program.

**OthOtm5: Program Outcome: Highly Valued by Program Graduates**
The program will be highly valued by its program graduates and other key constituencies it serves.

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Relevant Associations:**
Acquire more satisfaction survey data from graduate students at the department level

**Related Measures**

**M 10: Graduate Student Survey Conducted by Department of Chemistry**
Graduate student survey conducted by the Department of Chemistry. A Lickert scale will be used to obtain numerical averages for each question asked.

Source of Evidence: Academic indirect indicator of learning - other

**Target:**
No target established.

**Finding (2012-2013) - Target: Met**
Thirty two (32) 2012-2013 non-first year graduate students responded to the the survey. Two different Lickert scales were used depending upon the question asked. One scale had five possible responses ranging in value from 0 to 4 points (the values correspond to worded responses ranging from 'not effective or satisfied' (worth 0 points) to 'extremely effective or satisfied' (worth 4 points) along with scored responses in between) while the other scale had seven possible responses ranging in value from 0 to 6 points (the values correspond to worded responses ranging from 'extremely dissatisfied' (worth 0 points) to 'extremely satisfied' (worth 6 points) along with scored responses in between). The average score for "How effective was instruction in your graduate courses?" = 2.56 out of 4.00, with a value of 2.00 equaling 'moderately effective' and 3.00 equaling
very effective’. The average score for “How satisfied were you with course content?” = 4.56 out of 6.00, with a value of 4.00 equalling ‘slightly satisfied’ and 5.00 equalling ‘satisfied’. The average score for “How satisfied were you with course offerings in the graduate curriculum?” = 4.56 out of 6.00, with a value of 4.00 equalling ‘slightly satisfied’ and 5.00 equalling ‘satisfied’. The average score for “How satisfied were you with classroom and research facilities?” = 3.31 out of 4.00, with a value of 3.00 equalling ‘very satisfied’ and 4.00 equalling ‘extremely satisfied’. The average score for “How satisfied were you with the guidance and instruction from your research advisor?” = 5.13 out of 6.00, with a value of 5.00 equalling ‘satisfied’ and 6.00 equalling ‘extremely satisfied’. The average score for “How satisfied were you with graduate program overall?” = 5.03 out of 6.00, with a value of 5.00 equalling ‘satisfied’ and 6.00 equalling ‘extremely satisfied’. Results from other questions asked, but not scored, included: 25 of 32 respondents claimed there are adequate opportunities available to interact with graduate students outside of their research group, 17 of 24 respondents claimed they have/are receiving adequate preparation to meet their career objectives, 29 of 30 respondents felt they are receiving a competitive stipend and benefits, and 21 of 26 respondents claimed the compensation for a teaching assistant is commensurate with the TA workload. Overall, the responses were quite positive and reflect the strengths of the graduate program in terms of its courses, facilities, research experiences, and overall environment. Less than 10% of responses to any one question were negative and a much greater percentage, in all cases, was strongly positive.

**M 11: Graduate Placement**

Students who graduated with a non-thesis MS degree in Chemistry (Plan II) within the past year will be asked to complete an anonymous survey. Results will indicate the percentage of respondents who are employed in a science-related field (industry or academics) or who are continuing studies in a science or chemical engineering graduate program.

**Source of Evidence:** Job placement data, esp. for career/tech areas

**Target:**

>66% of our Non-Thesis MS degree earners will continue toward a PhD degree in our program or another academic program or find employment in a science- or education-related field.

**Finding (2012-2013): Target Not Met**

50% of survey respondents (1 of 2) are continuing in our graduate program, while the other respondent is employed in a non-science/non-education related field. We will need a response rate far greater than this year’s 25% (2 respondents of 8 degree earners) to draw meaningful conclusions about placement of our Plan II Non-Thesis MS Degree earners. Data from the 2013-2014 survey will provide more evidence of the perceived quality of this degree.

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

**Longer Response Time and Reminders for Placement Survey**

Established in Cycle: 2012-2013

The 25% response rate did not provide data from enough of our MS degree earners to be able to draw meaningful conclusions about ...

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

**OthOtm6: Department Outcome: Student Recruitment**

Recruitment of a sufficient number of high quality students into our graduate program with competitive representation by racial and gender minorities

**Connected Document**

Curriculum Maps NonThesis Chem MS

**Related Measures**

**M 12: Racial Minorities**

% minority graduate students [target: national avg. % minority enrollment in chemistry graduate programs = 4.6% for programs with 41-105 graduate students as reported by 2008 ACS Committee on Professional Training Special Report]

**Source of Evidence:** Administrative measure - other

**M 13: Female Enrollment**

% Female graduate students [target: national avg. % female enrollment in chemistry graduate programs = 26.1% for programs with 41-105 graduate students as reported by 2008 ACS Committee on Professional Training Special Report]

**Source of Evidence:** Administrative measure - other

**M 14: GRE Scores**

New graduate student quality based upon avg. total GRE score [target: avg. GRE > 1150]

**Source of Evidence:** Academic indirect indicator of learning - other

**M 15: ACS Subject Test Scores**

New graduate student quality based upon ACS Subject Test score in chemistry division of interest upon arrival in the program [target: avg. ACS placement exam score >50th percentile]

**Source of Evidence:** Academic indirect indicator of learning - other

**OthOtm7: Department Outcome: Research**

Publication of scholarly research results and application for intellectual property rights

**Connected Document**

Curriculum Maps NonThesis Chem MS

**Relevant Associations:**

Change the minimum standard in Measure 2.1 to 1.5/non-first year graduate student and postdoctoral researcher to more accurately reflect recent publishing activity.

**Related Measures**
M 16: Peer-reviewed Publications
Total number of peer-reviewed publications [target: 1.5 per non-first graduate student and postdoctoral researcher (66 non-first year graduate students and 16 postdocs as of Sept. 1, 2011 = 123 targeted publications)]
Source of Evidence: Administrative measure - other

M 17: Patent Applications
Total number of patent applications submitted or awarded [target: no target]
Source of Evidence: Activity volume

M 18: Evaluation of Improvement Actions
Assess whether the revised target for measure 2.1 is a more accurate reflection of recent Departmental publishing activity than the previous target of 1.0/non-first year graduate student and postdoctoral researcher
Source of Evidence: Administrative measure - other

OthOtm 8: Department Outcome: Outreach Program
Organization of, and participation in, outreach programs to enhance local and regional science education and training
Connected Document
Curriculum Maps NonThesis Chem MS
Relevant Associations:
Faculty will be strongly encouraged to conduct satisfaction surveys during outreach events in which surveys are tractable. Events including the NSF sponsored Research Experiences for Undergraduates program, the Alabama Instrumentation and Technology Colloquium, and area K-12 events are expected to implement surveys in 2011-2012.

Related Measures
M 19: Total Events
Total outreach events organized or participated in by faculty or graduate students [target: 10 activities]
Source of Evidence: Administrative measure - other

M 20: Informal Evaluation by Faculty, Graduate Students and Participants
Informal evaluation by faculty, graduate students, and participants
Source of Evidence: Evaluations

M 21: Survey Administration in Outreach Activities
Percentage of outreach activities in which surveys or evaluations were administered [target: >33%]
Source of Evidence: Administrative measure - other

OthOtm 9: Department Outcome: Professional Networking
Establish networks with chemists to enhance Departmental recognition and reputation and to disseminate research results at national and international venues
Connected Document
Curriculum Maps NonThesis Chem MS
Relevant Measures
M 22: Faculty Research Presentations
Total number of faculty research presentations at regional, national, and international conferences, universities, or with industry [target: 3 per research active faculty member = 75]
Source of Evidence: Administrative measure - other

M 23: Extramural Research Presentations
Total number of student or postdoctoral associate extramural research presentations [target: two student/postdoctoral presentations per research active faculty member = 50]
Source of Evidence: Academic indirect indicator of learning - other

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

Longer Response Time and Reminders for Placement Survey
The 25% response rate did not provide data from enough of our MS degree earners to be able to draw meaningful conclusions about the value of the Non-Thesis MS program. In 2013-2014, our MS graduates will have an extended period (perhaps 3-4 weeks rather than 5-7 days) of time to respond to the electronic survey. In addition, they will be sent periodic email reminders about completing the survey with the intention of increasing the number of respondents and acquiring more representative results.
Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
Measure: Graduate Placement
Outcome/Objective: Program Outcome: Highly Valued by Program Graduates

Responsible Person/Group: Chemistry Assessment Coordinator and/or Chemistry Director of Graduate Studies

New Processes for Departmental Approval of Plan II MS Degree Applications
It is unclear why students were approved for non-Thesis (Plan II) MS degrees without having completed the requisite non-Thesis MS Oral Exit Exam and associated report or a written report associated with their Initial Research Review (IRR). In order for a student to receive a Plan II (non-thesis) MS Degree in Chemistry, the student must first complete an "Admission to Candidacy" form and receive an authorization signature from the Chemistry Director of Graduate Studies or the Chemistry Chair. To ensure that students are not approved for Plan II MS Degrees prior to completing an appropriate ACS Subject Test in their area of specialization and before completing a technical written report and short oral exam before a faculty committee, the Department will adopt an internal verification checklist for all degree
applicants that will be vetted by the Chemistry Director of Graduate Studies. Once the student has completed all Plan II MS Degree requirements and submitted the internal verification checklist, the Chemistry Director of Graduate Studies will sign the Admission to Candidacy form allowing the student to obtain the degree. The Director will be asked to remind students of the Plan II MS degree requirements (including the ACS Subject Test in their area of specialization AND either satisfactory completion of the IRR with a written report OR an oral Plan II MS Exit Exam with a written report) by email each semester and ensure that all Plan II MS applicants have completed the degree requirements prior to receiving Departmental approval.

**Established in Cycle:** 2012-2013  
**Implementation Status:** Planned  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**
- **Measure:** Oral Exams  
- **Outcome/Objective:** Chemical Terminology  
- | Fundamental Chemistry Knowledge

**Implementation Description:** The Chemistry Director of Graduate Studies will distribute a degree checklist to every graduate student in the program and disseminate reminders of degree requirements to graduate students every semester. The Director will also ensure that a research report was included in every student's IRR.

**Projected Completion Date:** 10/2013

**Responsible Person/Group:** Chemistry Director of Graduate Studies
University of Alabama

Detailed Assessment Report
2011-2012 Chemistry M.S. (Non-Thesis Option)
As of: 7/17/2014 08:06 AM CENTRAL

Mission / Purpose

The Department of Chemistry is committed to the intellectual, technological, cultural, and economic advancement of the state, region, and nation through the discovery and development of new scientific knowledge. Research programs in the Department are both fundamental (create new knowledge) and applied (solve technical problems). Many of these research endeavors are anchored in interdisciplinary efforts drawing on and adding to the research base within The University. A strong and active research effort allows faculty to enable and keep abreast of the latest scientific advances and to impart new ideas and concepts into the curricula. Research activities play a vital role in the education of the next generation of academic, industrial, and government laboratory scientists who will be called upon to solve new problems. By maintaining these research programs, the Department helps to increase the recognition and reputation for quality of The University of Alabama locally, regionally, nationally, and internationally. Critical research areas include the synthesis and characterization of chemicals and materials and biochemistry. There is a strong emphasis in materials for advanced energy technologies including applications of 'green chemistry' and for information storage.

The Department is dedicated to the instruction, training, and intellectual growth of undergraduate students. This mission is accomplished through the use of several mechanisms including 1) classic and innovative classroom and laboratory instruction, 2) student advising, and 3) undergraduate research. The Department reaches out not only to chemistry, science, and engineering majors but also to other non-science majors in its mission. Undergraduate research is strongly encouraged and supported in the Department. There are two basic degree tracks in the Department: a bachelor of science in Chemistry including a Biochemistry track and a Pre-health Professional track leading to a Bachelor's of Science degree in Chemistry.

The Department offers opportunities for graduate study in a variety of exciting interdisciplinary programs as well as the traditional fields of analytical, inorganic, organic, physical, and biochemistry leading to the Master of Science and the Doctor of Philosophy degrees in chemistry. The Chemistry faculty offer the highest quality graduate education.

Service is an important function of the Department. Faculty and staff are bound by mutual respect and dedication to the field of chemistry and provide their expertise in science to serve the people of Alabama, the region, and the nation. The Department has strong outreach activities and has strong efforts in technology transfer.

Overall, the Department is truly the capstone of chemistry within the state of Alabama and beyond.

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

SLO 1: Fundamental Chemistry Knowledge
Students will demonstrate and apply fundamental and intermediate-level chemistry knowledge in solving problems related to kinetic and thermodynamic principles, chemical reactivity and synthesis, reaction stoichiometry, molecular structure and bonding, and chemical analysis.

Connected Document: Curriculum Maps NonThesis Chem MS

Relevant Associations:
Assessment data from more non-thesis MS degree recipients is necessary before considering any changes. No action is warranted for 2011-2012.

Standard Associations
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

General Education/Core Curriculum Associations
8 Mathematics - SLO is related to the essential characteristics and basic processes of inquiry and analysis in the discipline, encourages the development of critical thinking and requires students to analyze, synthesize and evaluate knowledge

Strategic Plan Associations
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

Related Measures

M 1: ACS Subject Test Scores
Upon entry into the program, students will take American Chemical Society (ACS) Chemical Education Subject Examinations in analytical, biochemistry, inorganic, organic, and physical chemistry to assess baseline fundamental knowledge of chemistry. Upon completion of the degree requirements, students will retake the (ACS) Chemical Education Subject Examination in their designated area of specialization to assess the learning of associated fundamental chemistry concepts since commencing their graduate education.
Source of Evidence: Standardized test of subject matter knowledge

**Target:**
Higher average % correct answers on ACS Subject Test Score in area of specialization upon degree completion than upon program entry.

**Finding (2011-2012) - Target: Met**
Eight (8) students obtained a Plan II master's degree during 2011-2012 academic year. On average, 62% of the questions were answered correctly on the ACS Exam in each student's respective area of specialization upon completing the degree requirements. This is compared to 50% of the questions answered correctly by those students on a comparable ACS Exam upon program entry. This result shows an increased knowledge of fundamental chemistry concepts by the non-Thesis MS degree earners.

**M 2: Oral Exams**
Upon completing the degree, students will be asked questions in an oral examination format before a faculty committee. Questions will probe fundamental and intermediate-level knowledge of kinetic and thermodynamic principles, chemical reactivity and synthesis, reaction stoichiometry, molecular structure and bonding, and chemical analysis, as appropriate. The faculty committee will assign a grade using a scoring rubric based upon the student's command of the concepts.

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

**Target:**
Average score of >2.0 on related dimension in Oral Plan II MS Examination Assessment Form

**Finding (2011-2012) - Target: Not Met**
The Department failed to give the short oral and written exam to its eight Plan II MS degree awardees. No assessment data is available.

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

**New Processes for Student Receipt of Admission to Candidacy Form Signature Established in Cycle: 2011-2012**
It is unclear why students were approved for non-Thesis MS degrees without having completed the requisite non-Thesis MS Oral Ex...

**SLO 2: Chemical Terminology**
Students will select and express chemical terminology appropriately and convey (oral and written) chemistry results in accepted technical formats with adequate and appropriate referencing (e.g., American Chemical Society standards)

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Relevant Associations:**
Assessment data from more non-thesis MS degree recipients is necessary before considering any changes. No action is warranted for 2011-2012.

**Standard Associations**
SACS 3.3.1
3.3.1.1 Educational programs, to include student learning outcomes

**General Education/Core Curriculum Associations**
11 Writing - SLO is related to building on students' competency in academic writing skills and aims to extend those skills

**Strategic Plan Associations**
University of Alabama
1.1 Promote and enhance areas of academic, scholarship, and research excellence.

**Related Measures**

**M 3: Literature Seminar**
Students will prepare a 30-minute oral presentation and a written 10 page technical summary about a contemporary chemistry topic of their choice (Departmental Literature Seminar). Faculty attendees will use a detailed scoring rubric to grade the student's level of preparation and organization, oral delivery of the presentation and appropriate use of terminology, and quality and formatting of the written report.

Source of Evidence: Presentation, either individual or group

**Target:**
Average score of >3.2/4.0 or >1.6/2.0 on all related dimensions of the Literature Seminar Assessment Form

**Finding (2011-2012) - Target: Met**
Data was available from six of the eight students who earned Plan II (non-thesis) Masters degrees. The two other students gave departmental seminars before the scoring rubrics were used for assessment (i.e., prior to August 2010). Assessment data from the six students averaged:

- a score of 3.7/4.0 (n = 6 students) with respect to choice and description of topic. 6 of 6 (100%) students demonstrated competent or exemplary achievement of this dimension.

- a score of 3.4/4.0 with respect to survey of pertinent literature. 4 of 6 (67%) students demonstrated competent or exemplary achievement of this dimension.

- a score of 3.5/4.0 with respect to proper use of chemical terminology. 6 of 6 (100%) students...
demonstrated competent or exemplary achievement of this dimension.

a score of 3.3/4.0 with respect to quality and clarity of written document. 5 of 6 (83%) students demonstrated competent or exemplary achievement of this dimension.

a score of 1.7/2.0 with respect to proper formatting of document. 5 of 6 (83%) students demonstrated competent or exemplary achievement of this dimension.

a score of 1.8/2.0 with respect to proper use of citations in document. 6 of 6 (100%) students demonstrated competent or exemplary achievement of this dimension.

a score of 3.4/4.0 with respect to effective delivery of the presentation. 6 of 6 (100%) students demonstrated competent or exemplary achievement of this dimension.

a score of 3.4/4.0 with respect to effective use of allotted time. 5 of 6 (83%) students demonstrated competent or exemplary achievement of this dimension.

and a score of 3.5/4.0 with respect to quality and clarity of slides. 6 of 6 (100%) students demonstrated competent or exemplary achievement of this dimension.

Gratifyingly, the seminar results indicate that the Plan II (non-thesis) Master's degree students developed strong oral presentation skills and commendable technical writing abilities. The only area where improvement may be required is in ensuring the students provide an adequate overview of published reports associated with their selected topics.

**M 4: Oral Exams**

Upon completing the degree, students will prepare a short, written research summary and be asked questions in an oral examination format before a faculty committee. The faculty committee will assign a grade for both the written summary and the oral defense using a scoring rubric based upon the student's ability to communicate technical information clearly and correctly.

Source of Evidence: Academic direct measure of learning - other

**Target:**

Average score of >2.0 on related dimensions in Oral Plan II MS Examination Assessment Form

**Finding (2011-2012) - Target: Not Met**

The Department failed to give the short oral and written exam to its eight Plan II MS degree awardees. No assessment data is available.

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

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

**New Processes for Student Receipt of ‘Admission to Candidacy’ Form Signature**

*Established in Cycle: 2011-2012*

It is unclear why students were approved for non-Thesis MS degrees without having completed the requisite non-Thesis MS Oral E...

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

**OthOtcn 3: Program Outcome: High Level of Recognized Quality**

The program will improve and sustain a high level of recognized quality.

**Connected Document**

Curriculum Maps NonThesis Chem MS

**Relevant Associations:**

1. Be more attentive and responsive to graduate student concerns.
2. (With contributions from The University administration,) make permanent the four temporary GTA positions that were recently added and add additional positions as needed to meet enrollment demands and to allow a reduction in teaching duties of GTAs.

**Related Measures**

**M 5: Graduate Students**

1. Quality graduate students. (As suggested by entering GRE scores, job placements, and research productivity).
2. Competitive graduate stipends. (Near the average in the CCR survey and comparable to the best in the Southeast chairs survey. The highest in A&S.)

Source of Evidence: Academic indirect indicator of learning - other

**M 6: Graduate Student Relationships with Faculty**

1. Increase the number of GTA positions to coincide with laboratory teaching needs.
2. Improve the rapport between the faculty and graduate students.
3. Increase graduate student enrollment.

Source of Evidence: Academic indirect indicator of learning - other

**M 7: In Response to Improvement Actions...**
In response to Improvement Action 1, the department enacted the following:

Reinvigorate the Graduate Student Organizations: The department currently hosts two student organizations with graduate student members. The Chemistry Graduate Students Organization (CGSO) is open to all graduate students in the department and is supervised by Dr. Stephen Wojski. This group has become more active in recent years, particularly as a social organization for the department's graduate students. The group holds tailgating parties during football season and other social events for the students throughout the year. The UA chapter of the National Organization of Black Chemists and Chemical Engineers (NOBCChE) is advised by Dr. Joseph Thrasher who helped found the UA chapter. This organization is open to all students in chemistry and chemical engineering, but primarily consists of chemistry graduate students. This group has hosted seminar speakers in the department and runs and "Adopt a Classroom" public service project. In this project, the NOBCChE chapter raises funds to purchase supplies for an area elementary school classroom each year. The department has also hosted a Student Chapter of the American Chemical Society chapter, which was historically focused on undergraduate students. Drs. Busenlehner and Frantom have worked with a group of graduate students to reinvigorate this chapter and involve both graduate and undergraduate students. This item is complete, although continued effort is required to keep the student organizations viable and active.

Explore adding graduate student representation to department committees: No action has yet been taken on this item. This item will be addressed as part of the overall discussion of department governance. Input will be sought from the graduate students through CGSO as to whether they wish to participate on departmental committees.

Establish a graduate student lounge: While the faculty is in favor of identifying space for graduate and/or undergraduate student lounges, space and money constraints have not yet allowed such a space to be identified in Shelby. The chair will hold discussions with the VP for Research, who manages Shelby Hall, and the Dean's Office about ways this could be implemented.

Continue to monitor and address graduate student concerns about the cumulative exams. The Department recently changed its cumulative exam policy to allow graduate students to pass exams in all areas of chemistry (analytical, inorganic, organic, physical, and biochemistry). This was done in part to address student concerns that exams in certain areas were often easier than exams in other areas, as well as to be mindful about how the field of chemistry has become increasing inter- and multidisciplinary. Thus, we feel that this concern has already been adequately addressed, but it will continue to be monitored by the Graduate Director. Progress: At the time of the Eight-Year review, the department had changed the cumulative exam requirement so that students could choose to take exams in all areas of chemistry. This was done in part to address concerns about the inequality in exam difficulty in different divisions as well as to meet the needs of students who may bridge multiple research areas. This change addressed many of the student concerns. This past year, the faculty partially modified this policy so that students would have to pass at least two exams in their major area of study. This modification was enacted so that students would need to demonstrate cumulative knowledge in their major area of study. The Department will continue to monitor this requirement and reconsider as part of the overall graduate program review. This item is substantially complete, but we continue to monitor the most pedagogically effective and fair way to administer this requirement. The cumulative exam requirement will be reviewed with student input as part of the overall graduate curriculum review.

Address student concerns about inequality of domestic/international (no ITAP pass) TA duties. Progress: The Chair, Graduate Director, and Undergraduate Director (TA supervisor) continue to work to ensure equitable TA assignments for all students. It is recognized that non-lab TA assignments do involve less work, particularly since General Chemistry courses have gone exclusively to electronic grading. Efforts continue to address these inequalities. The department has enacted rules that reduce the TA stipend to a 75% stipend for international students who do not pass the ITAP exam within their first two years in the program. This was done to provide motivation for students to pass the exam and become eligible to serve as in lab TAs. This item is complete, but continued effort to ensure equitable workloads is required.

In response to Improvement Action 2, the department enacted the following:

Progress: Currently, the department has 32.4 hard TA lines, which include the "hardening" of the 5 soft TA lines mentioned in the original action plan. Chemistry will have 8 soft-money TAs in 2010-11 for a total of 40.4 TA lines, which is approaching the goal identified in the Eight-Year Review (27.4 + 5 + 12 = 44.4). The significant growth in TA lines has come about as the result of enrollment growth primarily in the 100-level courses. Thus, we have not been able to address issues with our TA workloads or the ability to improve student learning by holding graduate student-led recitations with these additional TAs. The Department appreciates the responsiveness of the Dean and Provost to provide resources to cover the increased enrollment in our service courses. We hope to continue to work with the administration to make these soft-money positions permanent as warranted by continued high enrollment. We also hope to work with the administration on strategies to more effectively teach our undergraduate students through increased use of graduate students in instruction. While this will require additional resources, we also feel that it will have a very beneficial effect on both undergraduate learning and retention, but also on the development of our graduate students. This item is ongoing, but is not complete. The department will continue to work with the administration to ensure that the necessary TA resources to effectively teach our large service courses are available.

As part of our next 5-year plan, we will be looking to develop strategies to significantly grow the graduate program through growth in TA, RA, and fellowship lines. Our goal will be a graduate student population of 120 by 2016 (from 78 currently), which is based on 4 students per faculty with a goal to grow the faculty to 30 by 2016 from our current 25. To achieve this goal, we would anticipate having 55 TA lines. With our current enrollment, the addition of 12 TA lines would allow us to reduce the GTA assignment to 2 labs/week with the addition of 2 recitations per week. Contact hours per week would decrease from 9 to 8. To achieve this goal incrementally, we could implement the GRA-led
recitations in CH 101/102 first (8 TAs) and then eventually include CH 104/105 organic chemistry labs (4 additional TA). Of course, continued growth in enrollment will also require additional TAs to cover new lab sections. Assuming 55 TA lines, 65 GRA and fellowship lines would be required to meet our goal of 120. Currently, we have approximately 30 GRA lines, 8 students on fellowship, and 4 self-support. Thus to reach our goal, the number of RA lines would need to increase from 30 to 55, which would increase from our current average of 1.3 GRA/faculty to 1.8 GRA/faculty (assuming 30 faculty in 2018). Assuming that each external grant will support 1 GRA, meeting these goals would require on average that 0.5 additional grant be in force/faculty member annually. Chemistry faculty is committed to aggressively seeking funding to meet these goals. Our more aspirational goal would be to increase the GRA/GTA ratio from the current value of 0.8 to 1.5. Doing so with 50 TA lines would lead to a graduate population of approximately 135 assuming fellowship numbers remain constant. To achieve this goal, the Chemistry Chair will work to ensure all faculty are aggressively seeking external funding. In 09-10, an average 6.8 contract and grant submissions were made by chemistry faculty with a total value of $55 million ($2.3 million/faculty). New awards totaled $5.6 million in 09/10. Our goal will be to increase submissions to 8/faculty with a total value of $75 million and new awards of $7.5 million over the next 5 years.

Source of Evidence: Academic indirect indicator of learning - other

**OthOtcn 4: Program Outcome: Sustain Optimal Level of Enrollment**
The program will build and sustain an optimal level of annual program enrollments and degree completion.

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Related Measures**

**M 8: Number of MS Students**
Number of students in the MS program for the last three fall semesters [Target: 5-10 students]
Source of Evidence: Administrative measure - other

**M 9: Degree Completion**
Number of MS degrees for last August+December+May commencements [Target: 4 degrees]
Source of Evidence: Administrative measure - other

**M 10: ACHE Standards**
Relation of number of MS degrees awarded to ACHE viability standards [Target: average of 3.75 degrees per year over five years required to meet ACHE viability standards]
Source of Evidence: Professional standards

**OthOtcn 5: Program Outcome: Highly Valued by Program Graduates**
The program will be highly valued by its program graduates and other key constituencies it serves.

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Relevant Associations:**
Acquire more satisfaction survey data from graduate students at the department level

**Related Measures**

**M 11: Graduating Student Survey**
Graduate student survey conducted by the Program Review Committee in 2006-2007.
Source of Evidence: Academic indirect indicator of learning - other

**M 12: Department Survey**
Graduate student survey conducted by the Department of Chemistry
Source of Evidence: Academic indirect indicator of learning - other

**M 13: Satisfaction Survey**
Beginning in Fall 2011, graduating MS students will be asked to complete a satisfaction survey similar to that used during the eight-year Program Review conducted in 2006-2007. The survey will also seek information related to post graduation employment or postdoctoral education plans.
Source of Evidence: Student satisfaction survey at end of the program

**OthOtcn 6: Department Outcome: Student Recruitment**
Recruitment of a sufficient number of high quality students into our graduate program with competitive representation by racial and gender minorities

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Related Measures**

**M 14: Student: Faculty Ratio**
Total number of graduate students and postdoctoral researchers [target: 4 per research active faculty member = 100]
Source of Evidence: Academic indirect indicator of learning - other

**M 15: Racial Minorities**
% Racial minority graduate students [target: national avg. % minority enrollment in chemistry graduate programs = 4.6% for programs with 41-105 graduate students as reported by 2008 ACS Committee on Professional Training Special Report]
Source of Evidence: Administrative measure - other

**M 16: Female Enrollment**
% Female graduate students [target: national avg. % female enrollment in chemistry graduate programs = 26.1% for
programs with 41-105 graduate students as reported by 2008 ACS Committee on Professional Training Special Report
Source of Evidence: Administrative measure - other

**M 17: GRE Scores**
New graduate student quality based upon avg. total GRE score [target: avg. GRE > 1150]
Source of Evidence: Academic indirect indicator of learning - other

**M 18: ACS Subject Test Scores**
New graduate student quality based upon ACS Subject Test score in chemistry division of interest upon arrival in the program [target: avg. ACS placement exam score >50th percentile]
Source of Evidence: Academic indirect indicator of learning - other

**OthOtcn 7: Department Outcome: Research**
Publication of scholarly research results and application for intellectual property rights

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Relevant Associations:**
Change the minimum standard in Measure 2.1 to 1.5/non-first year graduate student and postdoctoral researcher to more accurately reflect recent publishing activity.

**Related Measures**

**M 19: Peer-reviewed Publications**
Total number of peer-reviewed publications [target: 1.5 per non-first year graduate student and postdoctoral researcher (66 non-first year graduate students and 16 postdocs as of Sept. 1, 2011 = 123 targeted publications)]
Source of Evidence: Administrative measure - other

**M 20: Patent Applications**
Total number of patent applications submitted or awarded [target: no target]
Source of Evidence: Activity volume

**M 21: Evaluation of Improvement Actions**
Assess whether the revised target for measure 2.1 is a more accurate reflection of recent Departmental publishing activity than the previous target of 1.0/non-first year graduate student and postdoctoral researcher
Source of Evidence: Administrative measure - other

**OthOtcn 8: Department Outcome: Outreach Program**
Organization of, and participation in, outreach programs to enhance local and regional science education and training

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Relevant Associations:**
Faculty will be strongly encouraged to conduct satisfaction surveys during outreach events in which surveys are tractable. Events including the NSF sponsored Research Experiences for Undergraduates program, the Alabama Instrumentation and Technology Colloquium, and area K-12 events are expected to implement surveys in 2011-2012.

**Related Measures**

**M 22: Total Events**
Total outreach events organized or participated in by faculty or graduate students [target: 10 activities]
Source of Evidence: Administrative measure - other

**M 23: Informal Evaluation by Faculty, Graduate Students and Participants**
Informal evaluation by faculty, graduate students, and participants
Source of Evidence: Evaluations

**M 24: Survey Administration in Outreach Activities**
Percentage of outreach activities in which surveys or evaluations were administered [target: >33%]
Source of Evidence: Administrative measure - other

**OthOtcn 9: Department Outcome: Professional Networking**
Establish networks with chemists to enhance Departmental recognition and reputation and to disseminate research results at national and international venues

**Connected Document**
Curriculum Maps NonThesis Chem MS

**Related Measures**

**M 25: Faculty Research Presentations**
Total number of faculty research presentations at regional, national, and international conferences, universities, or with industry [target: 3 per research active faculty member = 75]
Source of Evidence: Administrative measure - other

**M 26: Extramural Research Presentations**
Total number of student or postdoctoral associate extramural research presentations [target: two student/postdoctoral presentations per research active faculty member = 50]
Source of Evidence: Academic indirect indicator of learning - other
### Details of Action Plans for This Cycle (by Established cycle, then alpha)

#### New Processes for Student Receipt of Admission to Candidacy Form Signature

It is unclear why students were approved for non-Thesis MS degrees without having completed the requisite non-Thesis MS Oral Exit Exam and associated report. We will immediately establish measures and controls to ensure this does not happen in the future. In order for a student to receive a Plan II (non-thesis) MS Degree in Chemistry, the student must first complete an 'Admission to Candidacy' form and receive an authorization signature from the Chemistry Director of Graduate Studies or the Chemistry Chair. To ensure that students are not approved for Plan II MS Degrees prior to completing an appropriate ACS Subject Test in their area of specialization, and before completing a technical written report and short oral exam before a faculty committee, the Department will adopt an internal verification checklist for all degree applicants that will be vetted by the Chemistry Director of Graduate Studies. Once the student has completed all Plan II MS Degree requirements and submitted the internal verification checklist, the Chemistry Director of Graduate Studies will sign the Admission to Candidacy form allowing the student to obtain the degree. To facilitate assessment and completion of the degree requirements, a new rubric dimension will be added to the Initial Research Review (IRR) Assessment Form related to faculty assessment of the quality of a written technical report. This will allow either the IRR (with inclusion of a previously optional technical report) or a separate short Oral Exit Exam (which necessarily includes a technical report) to serve as the Oral Exam requirement for the Plan II MS Degree.

**Established in Cycle:** 2011-2012  
**Implementation Status:** Planned  
**Priority:** High  
**Relationships (Measure | Outcome/Objective):**  
Measure: Oral Exams  
Outcome/Objective: Fundamental Chemistry Knowledge  
**Implementation Description:** The proposed changes will be discussed at the August 2012 Department of Chemistry faculty meeting and presumably implemented shortly thereafter. These changes are not expected to require faculty approval, since they are changes in documentation of progress toward the Plan II MS degree and not actual changes to the degree requirements.  
**Projected Completion Date:** 09/2012  
**Responsible Person/Group:** Chemistry Director of Graduate Studies

#### New Processes for Student Receipt of 'Admission to Candidacy' Form Signature

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**Established in Cycle:** 2011-2012  
**Implementation Status:** Planned  
**Priority:** High  
**Relationships (Measure | Outcome/Objective):**  
Measure: Oral Exams  
Outcome/Objective: Chemical Terminology  
**Implementation Description:** The proposed changes will be discussed at the August 2012 Department of Chemistry faculty meeting and presumably implemented shortly thereafter. These changes are not expected to require faculty approval, since they are changes in documentation of progress toward the Plan II MS degree and not actual changes to the degree requirements.  
**Projected Completion Date:** 09/2012  
**Responsible Person/Group:** Chemistry Director of Graduate Studies
Curriculum Maps #1 (In which courses or in what activities or assignments are Student Learning Outcomes Addressed)

Use “Introduce” when outcome is first address; “Reinforce” when outcome is reinforced; and “Master” when outcome is expected to be mastered. Note that you do not need to obtain a measure from every course in which an outcome is addressed (see Map #2)

<table>
<thead>
<tr>
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<th>Student Learning Outcome 1</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fundamental and intermediate-level chemistry knowledge</td>
<td>Oral and written technical communication skills</td>
</tr>
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<tr>
<td>Oral Exit Exam/Written Research Synopsis</td>
<td>Reinforce</td>
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</table>
Curriculum Map II  (What assessment measures will be employed in which courses/activities/assignments for each Student learning Outcome)

Indicate which measure is being obtained in which course by typing “Measure n.n” in the appropriate cell. If you’d rather use a description of the measure, that is fine. Also, indicate the year/semester in which the measure will be obtained (e.g., Fall 2011). Student learning outcomes must be assessed at least once within a 2 ½ year period. Note that a measure does not need to be obtained from every course in which an outcome is covered (see Map #1).

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<td>oral exit exam (short defense) (Fall 2011/Spring 2012)</td>
<td>written research summary and oral exit exam graded using rubric (Fall 2011/Spring 2012)</td>
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Student Learning Outcome 1  
Fundamental and intermediate-level chemistry knowledge

Student Learning Outcome 2  
Oral and written technical communication skills
Curriculum Maps – Plan II (Non-Thesis Option)

Curriculum Maps #1 (In which courses or in what activities or assignments are Student Learning Outcomes Addressed?)

Use “Introduce” when outcome is first address; “Reinforce” when outcome is reinforced; and “Master” when outcome is expected to be mastered. Note that you do not need to obtain a measure from every course in which an outcome is addressed (see Map #2)

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| Departmental Literature Seminar  |                           | Introduce                 |
| CH 570 Topic Report              |                           | Introduce                 |
| CH 570 Oral Presentation         |                           | Introduce                 |
|                                  | Master                    |                           |

| ACS Standardized (Exit) Exams    |                           |                           |
|                                  | Master                    |                           |

| Oral Exit Exam or Initial Research Review (IRR)/Written Research Synopsis | Reinforce | Reinforce |
Curriculum Map II  (What assessment measures will be employed in which courses/activities/assignments for each Student learning Outcome?)

Student learning outcomes must be assessed at least once within a 2 ½ year period. Note that a measure does not need to be obtained from every course in which an outcome is covered (see Map #1).

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<td>CH 570 Topic Report</td>
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<td>CH 570 Oral Presentation</td>
<td></td>
<td>20 minute oral presentation before peers, course instructor, and guest faculty (Fall 2013)</td>
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Optional Additional Narrative: