

Detailed Assessment Report
2010-2011 Polymer Science and Engineering PhD

Mission/Purpose

The Polymer Science and Engineering Ph.D. Degree in the School of Polymers and High Performance Materials is designed as a rigorous curriculum that will be the best possible preparation for post-doctoral studies or for employment in advanced fields in the polymer and materials scientific workforce. Advancement from MS in Polymer Science to PhD in Polymer Science and Engineering: Students advance from the MS program to the doctoral program by the following 3 criteria: • Passing a set of comprehensive examinations given by the Polymer Science faculty • Successfully defending a research prospectus • Successfully defending an independent research proposal.

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

O 1: Grasp fundamentals of polymer science

The students will demonstrate a comprehensive grasp of the fundamentals of polymer science.

Related Measures:

M 1: Dissertation

Students will produce a dissertation that is rated satisfactory by their advisory committee and they will successfully defend this dissertation by public oral presentation to the satisfaction of their committee.

Achievement Target:

100% of students will pass the dissertation on their first attempt. Passing is defined by the committee and judged on 1) Unique contributions to the field of study; 2) Communicating clearly and concisely the role of this contribution to the scientific community; and 3) Writing clearly and technically the objectives, background, and results of their research in the dissertation.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100% (4 of 4) of students defending their dissertation in the Fall passed on their first attempt. Spring 2011--100% (2 of 2) of students defending their dissertation in the Fall passed on their first attempt.

M 3: Comprehensive Exam

Students will demonstrate a comprehensive understanding of the field of polymer science by taking nine comprehensive examinations (three organic, three physical and three practical. (Comprehensive examinations are given on a rotating basis by a variety of polymer science faculty members - in one complete rotation all of the faculty are required to give at least one comprehensive examination in their area of specialty.)

Achievement Target:

90% of students pass 6 of 9 comprehensive examinations, including at least one from each section.

Findings (2010-2011) - Achievement Target: Not Met

Fall 2010--100% (1 of 1) of first time comprehensive exam takers passed 6 of 9 exams, including one from each section Spring 2011--72% (8 of 11) of first time comprehensive exam takers passed 6 of 9 exams, including one from each section.

M 9: Self-efficacy questionnaire

A student self-efficacy survey will be conducted after the comprehensive examinations. Using a scale of 1 (no impact) to 5 (high impact) the student will indicate how preparation for the comprehensive exams impacted their awareness and knowledge of the field of polymer science.

Achievement Target:

90% of respondents will indicate that preparation for the comprehensive examinations gave them a more holistic view of Polymer Science and Engineering.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--survey given in Spring 2011--100% (6 of 6) respondents indicated that preparation for comprehensive exams positively impacted their awareness and knowledge of the field of polymer science

M 10: Seminar Participation

Students will demonstrate sufficient knowledge of polymer science as measured by each student asking relevant questions in School seminars. The graduate coordinator keeps tally of questions using a check off sheet at each seminar.

Achievement Target:

80% of students will ask relevant questions as measured by in at least 10 percent of the School seminars.

Findings (2010-2011) - Achievement Target: Met

Fall 2010-91% of students (50 of 55) in seminars asked a relevant question during at least one seminar. Spring 2011-86% (44 of 51) of students in seminars asked a relevant question during at least one seminar.

O 2: Awareness of field and research

Students will maintain current awareness of the field of polymer science and especially of the areas of research within the School of Polymers at the University of Southern Mississippi.

Related Measures:

M 1: Dissertation

Students will produce a dissertation that is rated satisfactory by their advisory committee and they will successfully defend this dissertation by public oral presentation to the satisfaction of their committee.

Achievement Target:

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Achievement Target:

90% of students pass 6 of 9 comprehensive examinations, including at least one from each section.

Findings (2010-2011) - Achievement Target: Not Met

Fall 2010--100% (1 of 1) of first time comprehensive exam takers passed 6 of 9 exams, including one from each section Spring 2011--72% (8 of 11) of first time comprehensive exam takers passed 6 of 9 exams, including one from each section.

M 4: Alumni Survey

An alumni survey will be given to determine how well the student seminars prepared the students to formulate and ask questions of a technical nature as practicing polymer scientists and engineers. The survey will be a series of questions regarding questions at student seminars with a scaling of 1-5, 1 being no benefit and 5 being very beneficial.

Achievement Target:

80% of respondents agree that the encouragement to formulate and ask questions has enhanced their ability for scientific enquiry as practicing polymer scientists and engineers.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--Survey given in Spring 2011--100% of respondents (6 of 6) agreed that asking questions in seminars has enhanced their ability as scientists and engineers by indicating 4 (beneficial) or 5 (very beneficial)

M 7: Alumni Survey - II

Alumni will be surveyed to determine if the independent proposal provided them with an advantage in understanding and preparing research proposals and projects. The survey will be scored on a scale of 1 (not helpful) to 5 (very helpful).

Achievement Target:

80% of respondents will average a score between 4 and 5, indicating that that independent proposal provided them with an advantage in preparing research proposals and projects.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--Survey given in Spring 2011--100% of respondents (6 of 6) agreed that the independent research proposal provided and advantage in preparing research proposals and projects

M 9: Self-efficacy questionnaire

A student self-efficacy survey will be conducted after the comprehensive examinations. Using a scale of 1 (no impact) to 5 (high impact) the student will indicate how preparation for the comprehensive exams impacted their awareness and knowledge of the field of polymer science.

Achievement Target:

90% of respondents will indicate that preparation for the comprehensive examinations gave them a more holistic view of Polymer Science and Engineering.

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Achievement Target:

80% of students will ask relevant questions as measured by in at least 10 percent of the School seminars.

Findings (2010-2011) - Achievement Target: Met

Fall 2010-91% of students (50 of 55) in seminars asked a relevant question during at least one seminar. Spring 2011-86% (44 of 51) of students in seminars asked a relevant question during at least one seminar.

O 3: Comprehend, construct, and orally present

Students will be required to demonstrate their ability to comprehend their specialty in polymer science, to construct a research project (under guidance from a faculty adviser), to orally present their research plan, defend it publicly.

Related Measures:

M 1: Dissertation

Students will produce a dissertation that is rated satisfactory by their advisory committee and they will successfully defend this dissertation by public oral presentation to the satisfaction of their committee.

Achievement Target:

100% of students will pass the dissertation on their first attempt. Passing is defined by the committee and judged on 1) Unique contributions to the field of study; 2) Communicating clearly and concisely the role of this contribution to the scientific community; and 3) Writing clearly and technically the objectives, background, and results of their research in the dissertation.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100% (4 of 4) of students defending their dissertation in the Fall passed on their first attempt. Spring 2011--100% (2 of 2) of students defending their dissertation in the Fall passed on their first attempt

M 5: Research Prospectus

Students will present their prospectus of research in written form and defend it publicly to the entire department, to the satisfaction of their advisory committee.

Achievement Target:

80% of students will be able to defend their Prospectus to the department and their committee members regarding their research on their first attempt. Successful defense incorporates 1) a document that clearly and concisely describes the proposed research and its relevance; 2) an oral presentation that clearly demonstrates knowledge of the field of research and has clear goals and objectives for the proposed research; and 3) the ability to answer questions posed by faculty and students in a professional manner.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100% (7 of 7) of student presenting a prospectus of research successfully defended their prospectus. Spring 2011--100% (3 of 3) of student presenting a prospectus of research successfully defended their prospectus

M 6: Research proposal

Students will complete an original research proposal and publicly defend the proposal to the entire department and to the satisfaction of their entire committee.

Achievement Target:

80% of students will successfully defend their proposal to their committee on the first attempt. The success of the proposal depends on 1) the originality of the idea 2) The scientific merit and rationale of the idea 3) a document that clearly and concisely demonstrates an understanding of the field of the proposal 4) an oral presentation that clearly defines the goals, objectives, and rationale for the proposed research, and 5) the ability of the student to answer questions by the faculty and students related to their proposal.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100% (3 of 3) of students presenting a proposal of research successfully defended their proposal to the satisfaction of their committee. Spring 2011--100% of students (9 of 9) presenting a proposal of research successfully defended their proposal to the satisfaction of their committee.

M 8: Conference Presentation

Doctoral students are encouraged to communicate their research by having their work accepted for public presentation at a regional, national, or international scientific conference.

Achievement Target:

75% of the doctoral students will demonstrate the ability to communicate this research by having their work accepted for public presentation at a regional, national, or international scientific conference.

Findings (2010-2011) - Achievement Target: Met

Fall 2010-- 100% (4 of 4) of graduating doctoral students had work accepted for presentation at regional, national, or international scientific conferences. Spring 2011--100% (2 of 2) of graduating doctoral students had work accepted for presentation at regional, national, or international scientific conferences.

O 4: Knowledge of theory and develop new knowledge

Students will be required to demonstrate their mastery of the field of polymer science to include knowledge of theory, ability to conceptualize, ability to analyze, compare and contrast their ideas and concepts with current scientists in the discipline, and to independently develop plans to generate new knowledge in the field of polymer science

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M 2: Publication

Doctoral students will demonstrate their ability to communicate their investigative findings by having their work accepted for publication in a peer-reviewed scientific journal.

Achievement Target:

75% of the doctoral students will have parts of their work accepted for publication in a peer-relieved scientific journal within one year of graduation.

Findings (2010-2011) - Achievement Target: Met

Fall 2010-- 100% (4 of 4) of doctoral students graduating were credited with at least a co-authorship of a paper. Spring 2011-- 100% (2 of 2) of doctoral students had at least parts of their work accepted for publication.

M 4: Alumni Survey

An alumni survey will be given to determine how well the student seminars prepared the students to formulate and ask questions of a technical nature as practicing polymer scientists and engineers. The survey will be a series of questions regarding questions at student seminars with a scaling of 1-5, 1 being no benefit and 5 being very beneficial.

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Fall 2010--Survey given in Spring 2011--100% of respondents (6 of 6) agreed that the independent research proposal provided and advantage in preparing research proposals and projects

O 5: Communicate research in written and oral formats

Students will demonstrate the ability to communicate the results of their research in written and oral format.

Related Measures:

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Achievement Target:

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100% (2 of 2) of graduating doctoral students had work accepted for presentation at regional, national, or international scientific conferences.

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

Grasp fundamentals of polymer science

90% of students will grasp the fundamentals of polymer science and pass their comprehensive exam on the first attempt.

Established in Cycle: 2005-2006

Implementation Status: In-Progress

Priority: High

Implementation Description: immediate

Responsible Person/Group: PSRC Graduate Committee faculty

Additional Resources Requested: All resources are in place.

Improve new students backgrounds for PhD study.

The first year graduate adviser will carefully examine the background of new program students, and assign courses to improve upon the students background when that background is deemed insufficient for study at the highest level.

Established in Cycle: 2006-2007

Implementation Status: Finished

Priority: Low

Implementation Description: August 2007

Responsible Person/Group: First year adviser/student services coordinator

Clearly provide "best practices" to students

Students will be presented with clear expectations and "best practices" for approaching graduate coursework and the comprehensive exams during a program orientation at the beginning of the Fall semester

Established in Cycle: 2007-2008

Implementation Status: In-Progress

Priority: High

Implementation Description: Fall semester 2008

Responsible Person/Group: Student Services Coordinator/Director/Assistant Director

Develop new special topics courses

New courses will be developed and offered to students covering recent advances in polymer science and engineering, providing an updated and advanced base of elective courses for students. These courses will cover the topics of composites, Advanced NMR techniques, and synthetic methods and strategies.

Established in Cycle: 2009-2010

Implementation Status: Finished

Priority: Medium

Implementation Description: Spring 2009

Responsible Person/Group: PSC Faculty

Target specific cohorts and modify the timing of the alumni survey

The survey will be provided to targeted graduating cohorts (such as 2 and 5 years prior to the assessment cycle) and made available online (via a web based survey tool) earlier in the assessment period.

Established in Cycle: 2009-2010

Implementation Status: In-Progress

Priority: High

Completion Date: 01/31/2011

Methods of comprehensive examinations

The School will be correlating data related to pass/fail metrics of the comprehensive exams for the last 5 years plus the current cycle in order to attempt to define a reason for the lower than targeted pass rate for the written comprehensive examinations. The graduate curriculum committee will investigate alternative testing schemes as well.

Established in Cycle: 2010-2011

Implementation Status: Planned

Priority: Medium

Responsible Person/Group: graduate curriculum committee; School staff

Additional Resources Requested: none

Analysis Answers

What specifically did your assessments show regarding proven strengths or progress you made on outcomes/objectives?

The School of Polymers and High Performance Materials has continued the tradition of students having their work accepted for presentation and publications (Objective 3). Publication of student work is an important part of a research intensive program, as it provides feedback for the student not only from peers and mentors in the School of Polymers and High Performance Materials, but also from peers world-wide. Presentations also continue to contribute to the development of our students beyond the walls of the facilities and campus. Presentation and publication skills are imperative for today's scientists, as communication of the relevance of their work becomes more important due to increased focus on scientific funding and tangible results from that funding are sought after.

What specifically did your assessments show regarding any outcomes/objectives that will require continued attention?

After succeeding in increasing the pass rate of the comprehensive exams during the last cycle, the pass rate on the first attempt of the written comprehensive exams again fell below the target threshold (Outcomes 1 and 2). The school had a slightly larger cohort participating in the exams than previous years, which may have led to less time available to spend on one-on-one assistance outside the classroom. The faculty are seeking a sustainable remedy to the issue of falling below the targeted passing rate by students, including mandatory help sessions. Other suggestions for improvement have come forward, and the graduate curriculum committee has been given the task of investigating alternative testing methods. The School is looking back over the past 5 years and will monitor the exams during the current cycle to determine the correlation of exam pass/fail rates with course performance, times of exams, and exam committee.

Annual Reports

Program Summary

During the 2010-2011 assessment cycle, the School of Polymers and High Performance Materials (SPHPM) has continued to strive to meet goals set forth by the University, especially in the area of being a premier research university. The SPHPM is a research focused program at all educational levels. The research conducted by the faculty and students is internationally respected and renowned, as evidenced by the number of publications and invited presentations given each year (over approximately 50 in each category for the previous calendar year). The faculty have increased their effort spent in outreach activities, including Dr. Daniel Savin participating in the National Kids Science Challenge and Dr. Robert Lochhead appearing in several videos related to efforts to help clean the BP oil spill, most notably for National Geographic. Dr. Derek Patton was recently awarded a National Science Foundation Career award, a prestigious grant that allows Dr. Patton to work with several students at all levels on cutting edge ideas. The PhD program continues to expose students to the highest level of research, instruction, and mentoring available. The bulk of a PhD student's time is spent on research, which directly leads to increased publications and presentations. This leads to the national standing and reputation with employers and funding agencies that the school currently enjoys.

Continuous Improvement Initiatives

The School of Polymers and High Performance Materials will continue to seek new avenues of funding that enhance the student experience and provide greater opportunities for learning for our students. Recently, more attention has been paid to those students who are considering a career in academia at any level by pursuing grants such as the National Science Foundation GK-12 program, which sends graduate students to local grade schools in order to experience teaching at the K-12 levels. Also, the Graduate Assistantships in Areas of National Need (GAANN) program is focused on provided assistantships for students whose career goal may be teaching at any level. Numerous students are taking advantage of these programs to move their careers toward academia. The School is also continuing to refine the "Best Practices of Successful Students" that is given to all incoming graduate students. Specifically, an addition to the document from this year's experience will encourage students to visit and interact with any prospective research adviser's current group of students at least one month prior to making a decision about their choice of adviser. Also, alumni survey response continues to be an issue and the School staff will connect with willing alumni to aid in determining better approaches to surveying.

Closing the Loop

Over the course of this cycle, the PhD program in Polymer Science and Engineering has attempted to assist students who may not be properly prepared by their backgrounds for graduate study. Students have been evaluated through transcript information and entrance exam performance to determine whether or not the students have similar backgrounds as their peers. If students are found to be deficient in a category, that student is counseled by a faculty member who recommends whether or not further action is necessary. Further action may consist of sending a student to a lower level (undergraduate) course or mentoring by the faculty. Additionally, the faculty closely monitor performance in the core coursework, and if any student appears to be struggling may recommend that the student drop that class and take a lower level course prior to attempting the dropped course again. While this does set a student back in terms of milestone completion, the extra time and work is preferable to a student being forced to leave the program due to a poor background. Additionally during this cycle, new special topics courses have been added for our students to use as research tools. The courses, a composites course, a molecular modeling course, and a scattering course, address the need for students with advanced polymer science and engineering degrees to be versed in these topics. In particular, composites and molecular modeling were recommended by employers who were hiring our students into the composites industry for internships and full-time work, such as GE Aviation, Boeing, and Northrop Grumman/ Ingalls. These two courses have been met with

enthusiastic approval by our current students, who believe that these related areas are an important part of their potential career paths. As the courses are refined, they will be moved from a Special Topics course to a traditional course.