College of Mathematical and Physical Sciences Major Program Assessment Reports for 2007-2008
Executive Summary

Major programs in MPS tend to be relatively small in size—instructional credit hours in our college are largely in service/GEC courses. Though small in size, we have a relatively high percentage of honors students, many of whom are intent on going to graduate school in their major field. The average ACT score for incoming MPS majors is projected to be about 28.3, subject to revision after classes start. Nevertheless, our retention rate into the second year is not high, a problem we are attempting to address in various ways. In general, there is a growing emphasis on research projects for our undergraduate students, which includes promoting and enhancing our Research Forum in the spring preceding the Denman. Our major program assessment activities are coordinated through our college Curriculum Committee, several members of which are vice chairs of undergraduate studies in their units.

Actuarial Science (Chunsheng Ban)

The Actuarial Science major is an increasingly popular program offered out of the Mathematics Department. Currently there are approximately 150 students in the program. Assessment of learning outcomes goals occurs on a regular basis via course coordination and evaluation of final examination grades in key courses, analysis of data from annual actuarial student surveys, analysis of student success on professional actuarial examinations administered by the Society of Actuaries and the Casualty Actuarial Society, and analysis of student placement in summer internships and employments. In summary, the satisfaction reported by students in the annual survey is very high; more students passed more professional exams, and more students participated in summer internships or obtained actuarial employment than in any year before.

Astronomy (Paul Martini, Donald Terndrup)

Because the major program in Astronomy is relatively small (about 30 students total with a handful graduating each year), the assessment program is not highly structured. The program is largely based on the Physics major. The main tools for assessment are astronomy courses that address specific learning goals, and individual contact between students and the Director of Undergraduate Studies. The latter takes the form of exit interviews and tracking of admissions to graduate programs in Physics and Astronomy. The Department now runs a directed research program for selected students, who work on an individualized project with a research supervisor; research students must also write a senior thesis and participate in the Denman Undergraduate Research Forum.

Chemistry (Christopher Hadad)

The Chemistry major is a large program by MPS standards, with over 300 students. Embedded standardized questions are used in (general) Chemistry 121-122 and in (organic) Chemistry 255. The latter is the terminal course in the organic chemistry sequence. Student performance on these embedded questions continues to improve. We continue to expand the scope of the novel Research Experiences to Enhance Learning (REEL) in the laboratory programs. These are components of the NSF-funded Undergraduate Research Consortium REEL effort and are being developed and implemented in Chemistry 123, 221, and 225 for broad usage in general, analytical and organic chemistry, respectively, including a rigorous assessment of the impact of these research modules on student learning and STEM retention. The peer mentor program for REEL has provided an excellent vehicle to further train enthusiastic students in Chemistry and related disciplines about the research modules, and also to prepare them for undergraduate research in general. The Arts and Sciences exit survey demonstrates that

Chemistry is attaining its goals of educating and preparing students effectively for future employment. Some divisions within Chemistry are doing marginally better than others – organic and inorganic lead the pack, and biochemistry knowledge is less strong. The possibility of using ACS standardized field tests as final exams in upper level sequences is being explored.

Geological Sciences (Anne Carey)

There are approximately 70 students majoring in Geological Sciences. These students have demonstrated through their performance in the writing- and field work-intensive majors courses a high level of preparedness in the geological sciences. Students can read and evaluate the geological literature critically. Through their thesis research projects, they have developed an in-depth knowledge of one or more specialized areas, have learned to identify geological problems and developed solutions. They have applied their knowledge of modern science, mathematics and computing to solve geological problems. They have learned to work as teams in Earthsci 581 and 582. Graduating senior students have been admitted to graduate programs in Geological Sciences.

Mathematics (Ronald Solomon)

The Department of Mathematics, with over 300 students enrolled in the various versions of its major program, assesses its success in achieving learning outcomes goals on a regular basis via course coordination and evaluation of final examination grades in key courses, analysis of data from departmental and ASC student exit surveys, analysis of student success on professional examinations (GRE, PRAXIS, Actuarial Society, etc.), analysis of student placement in careers, graduate and professional schools. We also regularly compare our program with those at peer institutions. We have just begun sending out electronic alumni surveys for additional assessment data. Based on these assessments, the Department has drafted an ambitious revision of the undergraduate major requirements to introduce more variety and career relevance. In general, it must be said that student satisfaction as reported in both departmental and ASC exit surveys is very high. Nevertheless, improvement is possible in the preparation of students for advanced mathematics, science, and engineering courses. With this in mind, the Department is exploring improvements in the basic calculus and differential equations courses. Also, improvement is needed in the area of involvement of undergraduate majors in research experiences in mathematics.

Physics (Lindsey Perry, Richard Hughes)

There are currently about 180 students majoring in physics. The Physics Undergraduate Studies Committee has finalized a statement of the goals and objectives in the assessment plan. Data have been collected via: Major Fields test, Exit interviews, surveys and discussions with students. Comparing our data with national statistics indicate a fundamental achievement of goals though specific criteria for success in meeting program goals are yet to be finalized. Curricular modifications have been made to address the challenges of a growing program. Supportive mechanisms have been piloted to address undergraduate research and diversity concerns. Assessment tools continue to be considered and modified to reflect changes in the type of data required to assess the program. A success story is that one of the recent physics (and French) graduates, Jessica Hanzlik, became the first female Rhodes Scholarship winner at OSU last year, and the only one since the 1980's.

Statistics

No major program.

MAJOR PROGRAM ASSESSMENT REPORT FORM
2007-2008
Evaluation of Student Learning Outcomes in Major Programs
Colleges of the Arts and Sciences (ASC)
The Ohio State University

College: ___Mathematics and Physical Sciences___

Department(s): ___Mathematics_____

Major: ___Actuarial Science_____

Level (Undergraduate/Graduate): ___Undergraduate_____

Contact Person and e-mail: Chunsheng Ban, cban@math.ohio-state.edu

Chair: ___David Goss_____

Chair Signature: _____

Date: _____

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Reviewed by: _____
Date: _____

Implementation:
_____ Begun _____ Date implemented or planned
_____ Evidence collected
_____ Summary evidence provided
_____ Evidence reviewed by Program
_____ Program improvements attempted/made
_____ Action plan for next year based on evidence/review

Comments:

Assessment Report Summary (75-150 words):

The Actuarial Science Program assesses its success in achieving departmental educational goals on a regular basis via course coordination and evaluation of final examination grades in key courses, analysis of data from our annual actuarial surveys, analysis of student success on professional actuarial examinations administered by Society of Actuary and Casualty Actuarial Society, and analysis of student placement in summer internships and employments. In summary, the satisfaction reported by students in the annual survey is very high; more students passed more professional exams, and more students got summer internships or actuarial employments than any year before.

2007-08 Majors Assessment Report Form

Goals and Objectives (i.e. Expected Learning Outcomes) for Majors (See attached document, "*2005 Major Program Goals and Objectives*"):

- To supply a strong general background in mathematics, statistics, and relevant concepts from the insurance industry
- To prepare students to take some of the national actuarial examinations administered by the Society of Actuaries and the Casualty Actuarial Society

Expected Learning Outcomes (bulleted points above)	**METHODS**[1]		**EVIDENCE**[2]		**USE**[3]		
	Measures/Means Employed	**Criterion**	**Findings/Results**	**Achievement of Criterion**	**Process for Reviewing Findings / Other Data Usage**	**Changes Made**	**Next Steps: Action Plan Short (1-year) and Long Term (up to 5 years)**
To supply a strong general background in mathematics, statistics, and relevant concepts from the insurance industry	Embedded test questions in junior and senior math and statistics courses. Results evaluated quarterly by course coordinators. Relevant questions in annual actuarial survey.	Students get grades of C- or better in the courses	All students get C- or better in the major courses. Less than 10% of students need to retake Math 530 or Stat 420 to get C- or better.	Yes.	Coordinating adviser and instructors of actuarial science periodically review the findings and make recommendations.	None	Numbers of credits will be increased from 3 to 4 in each of Math 618, 630, 631, and 632 to cover material in financial economics.

[1] This corresponds with previous reporting section, "I. Activities in support of outcomes assessment/ Methods employed." See Appendix 1 for Sample Methods.
[2] This corresponds with previous reporting section, "II. Evidence / Expected outcome assessed and results."
[3] This corresponds with previous reporting sections, "III. Data usage / Feedback mechanism / Actions taken," and, "IV. Future planning / Specific Action Plan for the next year."

To prepare students to take some of the national actuarial examinations administered by the Society of Actuaries and the Casualty Actuarial Society	Integrate exam topics into relevant courses' syllabi.	Students pass the professional exams administered by SOA/CAS.	Among current students (including those who just graduated in the spring) 33 or more passed Exam P/1, 21 or more passed Exam FM/2, and 5 or more passed Exam MLC/3L.	Yes.	The coordinating adviser periodically collecting data from students and from SOA.	The coordinating adviser conducted evening study sessions to cover material in financial economics that is newly added in Exam FM.	See above.

Regional Campus Involvement Update: There is no regional campus involvement.
Overall Analysis or Impressions (optional):
Other Activities (optional):

MAJOR PROGRAM ASSESSMENT REPORT FORM
2007-2008
Evaluation of Student Learning Outcomes in Major Programs
Colleges of the Arts and Sciences (ASC)
The Ohio State University

College: Mathematical and Physical Sciences

Department(s): Astronomy

Major: Astronomy

Level (Undergraduate/Graduate): Undergraduate

Contact Person and e-mail: Paul Martini, martini@astronomy.ohio-state.edu

Chair: Bradley Peterson

Chair Signature: _____

Date: September 12, 2008

For Assessment Office Use Only

Reviewed by: _____
Date: _____

Implementation:
_____ Begun _____ Date implemented or planned
_____ Evidence collected
_____ Summary evidence provided
_____ Evidence reviewed by Program
_____ Program improvements attempted/made
_____ Action plan for next year based on evidence/review

Comments:

Assessment Report Summary (75-150 words):

Because the major program in Astronomy is relatively small (about 30 students), the assessment program is not highly structured. The main tools for assessment are courses that address learning goals and individual contact between students and the Director of Undergraduate Studies. The latter takes the form of exit interviews and tracking of admissions to graduate programs in Physics and Astronomy. The Department now runs a directed research program for selected students, who work on an individualized project with a research supervisor; research students must also write a senior thesis and participate in the Denman Undergraduate Research Forum.

2007-08 Majors Assessment Report Form

*Please see EXAMPLE REPORT below for further explanation. If there is not enough space in the chart below, please feel free to add comments and/or appendices as needed.

Goals and Objectives (i.e. Expected Learning Outcomes) for Majors (See attached document, "*2005 Major Program Goals and Objectives*"):

Major: Astronomy

1. Students will understand terminology, methods, and results appropriate to the discipline:
   - The development of modern astronomy, including the contributions of Kepler, Galileo, and Newton; Newtonian physics should be used to explain orbital motion, tides, and precession
   - The origin and nature of the solar system, including the reasons why the terrestrial and Jovian planets differ; the student should be able to explain current ideas for unusual characteristics of each planet, the more notable satellites, ring systems, asteroids, and comets
   - The nature of light and spectral lines, including various ways of how spectral lines are used in astronomy; blackbody radiation
   - What physical laws govern the structure of stars, including how these lead to explanations of stellar evolution; the student should be able to explain why some stars exhibit remarkable behavior, including red giant, helium flash, planetary nebula, white dwarf, and supernova phases
   - The structure of the Galaxy, including how the structure is measured and how it likely originated
   - Characteristics of other galaxies, along with recent theories as to why galaxies came to exhibit such variety
   - Cosmology, including the Big Bang, inflation, and nucleosynthesis; the student should be able to explain how one can measure the standard cosmological parameters
2. Students will understand telescopes and detectors, including types of telescopes, how charge-coupled devices work and how one uses them for observing, and how one calculates signal-to-noise ratios, extinction coefficients, and spatial and spectral resolving power.
   - Students will master these concepts in a lecture / laboratory course as part of the major.
3. Selected students will receive opportunities for directed research with faculty members.

Expected Learning Outcomes (numbered points above)	**METHODS**[1]		**EVIDENCE**[2]		**USE**[3]		
	Measures/Means Employed	**Criterion**	**Findings/Results**	**Achievement of Criterion**	**Process for Reviewing Findings / Other Data Usage**	**Changes Made**	**Next Steps: Action Plan Short (1-year) and Long Term (up to 5 years)**
Astrophysical techniques and results (item 1 above; methodology is similar for all courses)	Examination and homework questions in Astronomy 291, 292, 681, and 682. Curriculum committee establishes a syllabus so that the goals are included in several of the required major classes.	Minimum required average	Passing grade in course is deemed to measure that a student has met the curricular goals for each course.	Yes	Undergraduate studies chair tracks individual performance (grades). Curriculum committee occasionally reviews syllabi.	No changes made.	No action plan at present.
Telescopes and detectors – classroom component (item 2 above)	Examination and homework questions in Astronomy 350	Minimum required average	See above.	Yes	See above. Informal evaluation methods, such as student interviews, have indicated that we need better coordination with Physics 416, especially to avoid duplication of content.	Short term: revised course for Autumn 2008.	Long term: consider revising course to emphasize lab section, hold the course every year, or drop from major program.

[1] This corresponds with previous reporting section, "I. Activities in support of outcomes assessment/ Methods employed." See Appendix 1 for Sample Methods.
[2] This corresponds with previous reporting section, "II. Evidence / Expected outcome assessed and results."
[3] This corresponds with previous reporting sections, "III. Data usage / Feedback mechanism / Actions taken," and, "IV. Future planning / Specific Action Plan for the next year."

Research component (supervised research, item 3 above)	Informal evaluation by research supervisor. Judging of projects in the Denman and other research forums. Evaluation of senior thesis.	S grade in Astronomy 693 (Individual Studies) or H783 (honors research)	Students now have more opportunities to interact individually with faculty in research.	Yes	Informal discussions among faculty as led by the organizer of the research program.	No changes yet undertaken, as the program is only in its second year.	Short term: track current students to detect any changes in rates of admission to graduate school.

Overall Analysis or Impressions (optional):

We have been increasing our coordination with Physics advisers as most of our students are double majors in that program. We have recently changed our recommended path through the major to reflect changes in the Physics requirements, particularly from the introduction of computer programming as a prerequisite to several upper division physics courses. The Director of Undergraduate studies tracks the performance on the general and subject (Physics) portions of the Graduate Record Examinations and admissions to graduate school.

During the last three years, we have seen an increase in the number of graduating seniors who obtain admission to respectable graduate programs. Historically, one or two students went on to graduate study out of about 6 students receiving the B.S; during the last two years, the number has approximately doubled (small numbers require several more years to properly quantify success).

Other Activities (optional):

We have begun a formal program for undergraduate research – SURP (Summer Undergraduate Research Program). Students engage in supervised research over the summer and spend the following academic year preparing to make a presentation at the Denman forum and, in most cases, on a senior thesis. The program is now in its second year. Students are admitted to the program based on GPA and essays; about half of applicants are admitted. In addition to providing research opportunities, one goal of the program is to increase acceptance rates to good graduate programs. It is still too early to evaluate whether this program has yet achieved this goal.

Appendix 1
Sample Assessment Measures

This is not an exhaustive list of all possible assessment measures. If you are using one of these measures in you report, please indicate the additional information requested in parentheses below. If you have any questions about the measures below are or how they can be implemented, please contact Kate Hallihan (hallihan.3@osu.edu) for assistance.

Direct methods:

- National standardized examination (please identify)
- Certification or licensure examinations (please identify)
- Local comprehensive or proficiency examinations
- Embedded testing / test questions (Astronomy 291,292,681,682)
- Evaluation of student work (please indicate evaluators, i.e. faculty, external evaluators, etc., and include rubrics if appropriate)
    - Pre/Post testing
    - Evaluation of student research (internal faculty review of research projects, performance in MAPS and Denman forums)
    - Evaluation of senior thesis or major project
    - Evaluation of Capstone coursework
    - Evaluation of student portfolios
- Practicum, internship, outreach (if student participation % is a goal, otherwise this can be an indirect indicator)
- Other classroom assessment methods (please identify)

Indirect methods:

- Courses that specifically address goals in course content (Curricular Mapping)
- Student survey [entry; mid; exit] (exit interviews of graduating seniors)
- Alumni survey (please identify how many years post-graduation)
- Job or post-baccalaureate education placement information
- Student evaluation of instruction
- Student interview or focus group
- Student or alumni honors achieved
- Peer review of program
- External program review
- Systematic curriculum, grade, and/or syllabus review
- Employer feedback
- Comparison or benchmarking

MAJOR PROGRAM ASSESSMENT REPORT FORM
2007-2008
Evaluation of Student Learning Outcomes in Major Programs
Colleges of the Arts and Sciences (ASC)
The Ohio State University

College: Mathematical and Physical Sciences

Department(s): Chemistry

Major: B.A. in Chemistry & B.S. in Chemistry

Level (Undergraduate/Graduate): Undergraduate

Contact Person and e-mail: Christopher M. Hadad, hadad.1@osu.edu

Chair: Malcolm H. Chisholm

Chair Signature: Malcolm H. Chisholm

Date: August 12, 2008

For Assessment Office Use Only

Reviewed by: _____
Date: _____

Implementation:
_____ Begun _____ Date implemented or planned
_____ Evidence collected
_____ Summary evidence provided
_____ Evidence reviewed by Program
_____ Program improvements attempted/made
_____ Action plan for next year based on evidence/review

Comments:

Assessment Report Summary (75-150 words):

In 2007–2008, the Department of Chemistry continued with its efforts to assess its major program using a variety of evaluation tools. We continued the use of standardized questions in (general) Chemistry 121-122 and also in (organic) Chemistry 255. The latter is the terminal course in the organic chemistry sequence. Student performance is higher on these embedded questions year over year. We continue with our major innovation, that is, novel Research Experiences to Enhance Learning (REEL) in our laboratory programs. These are components of the NSF-funded Undergraduate Research Consortium REEL effort and are being developed and implemented in Chemistry 123, 221 and 255 for broad utility in general, analytical and organic chemistry, respectively, including a rigorous assessment of the impact of these research modules on student learning and STEM retention. The peer mentor program for REEL has provided an excellent vehicle to further train enthusiastic students in Chemistry and related disciplines about research modules, and also to prepare them for undergraduate research in general. The Arts and Sciences exit survey demonstrates that Chemistry is attaining its goals of educating and preparing students effectively for future employment. Some divisions within Chemistry are doing marginally better than others – organic and inorganic lead the pack, and biochemistry knowledge is less strong (note: other department).

2007-08 Majors Assessment Report Form

Goals and Objectives (i.e. Expected Learning Outcomes) for Majors (See attached document, "*2005 Major Program Goals and Objectives*"):

Major Program: **Chemistry**

- Courses should cover the essential content of modern chemistry.
  - Organic, analytical, physical and inorganic course sequences will be up to date with current principles and pedagogical practice
  - Lab courses in the above areas should serve to reinforce the principles
  - All courses should emphasize scientifically ethical practices
  - A full course in biochemistry will be highly recommended and normally taken by both B.A. and B.S. majors
  - Courses in the major program should deal with chemical applications in other disciplines such as biology, physics and engineering
  - Courses in the major program will demonstrate connections of the subject to frontier areas that are research active
  - Elective courses should be offered in interdisciplinary areas that currently show high potential for rapid development such as nanoscience and environmental science
- Students should develop the required skills of the discipline
  - Students should learn to solve chemistry problems, working both individually and in groups
  - Students should develop effective skills in oral and written communication of scientific knowledge
  - Students should learn to plan experimental procedures, carry out basic chemical procedures, use laboratory equipment, analyze data and prepare laboratory reports
  - Students should learn to follow safe practices in the lab
  - Students should learn how to retrieve information from the chemical literature, and become proficient in online database searching
  - Students should learn how to use modern computer software for graphing, manipulation of symbolic mathematical expressions, and quantum chemical calculations
- Students should be prepared to undertake a broad range of activities that utilize their training in chemistry
  - A large fraction of students will engage in research with faculty members, either by taking research courses or by being employed as laboratory assistants
  - Honors chemistry students should normally write undergraduate theses based on their research with faculty members
  - Students should be successful in gaining admission to prestigious graduate or professional programs
  - Graduates should embark on successful chemistry-related careers

Expected Learning Outcomes (bulleted points above)	**METHODS[1]**		**EVIDENCE[2]**		**USE[3]**		
	Measures/Means Employed	**Criterion**	**Findings/Results**	**Achievement of Criterion**	**Process for Reviewing Findings / Other Data Usage**	**Changes Made**	**Next Steps: Action Plan Short (1-year) and Long Term (up to 5 years)**
Organic, analytical, physical and inorganic course sequences will be up to date with current principles and pedagogical practice	Senior exit survey, evaluations in final course of each sequence	Student responses, and >60% performance on evaluation tests	Exit survey shows student response best for inorganic and organic, less for other course sequences; organic sequence shows >50% performance on optional test; students found Chemistry courses to be challenging	Partial	Undergraduate Curriculum Committee will review recent findings and suggest means for improvement	To be discussed	To be determined.
Lab courses in the above areas should serve to reinforce the principles	REEL evaluation process (not just OSU, unfortunately)	Evaluation >3 on Likert scale for review	Success on all criteria, including students (a) use data to justify their responses to questions, (b) repeat experiments to confirm results,	Success	Further survey of departments that require our lab courses and their desired outcomes for principles and pedagogy	To be discussed with Undergraduate Curriculum Committee	To be determined.

[1] This corresponds with previous reporting section, "I. Activities in support of outcomes assessment/ Methods employed." See Appendix 1 for Sample Methods.
[2] This corresponds with previous reporting section, "II. Evidence / Expected outcome assessed and results."
[3] This corresponds with previous reporting sections, "III. Data usage / Feedback mechanism / Actions taken," and, "IV. Future planning / Specific Action Plan for the next year."

			(c) use multiple sources of information to learn, (d) use educational technology in class, (e) develop scientific literacy skills, and (f) learn about real world applications of science				
All courses should emphasize scientifically ethical practices	Senior exit survey	>70% student response in top 2 categories (Likert ≥ 4)	Only 45% with Likert score ≥ 4	Partial	Review by Undergraduate Curriculum Committee	Will create new course for literature, research and ethics	To be offered in Autumn 2009
A full course in biochemistry will be highly recommended and normally taken by both B.A. and B.S. majors	Evaluation of DARS reports and consultation with Chemistry advisor; number of American Chemical Society certified majors	>70% of students take a biochemistry course	At least 9 of 38 spring 2008 graduates were ACS certified; evaluation in process	Partial	Review by Undergraduate Curriculum Committee	More effective advising, including vice chair being involved in advising freshman class	Autumn 2008
Courses in the major program should deal with chemical applications in other disciplines such as biology, physics and engineering	Evaluation of syllabi and consultation with faculty and Undergraduate Curriculum Committee	Pedagogical consideration of curriculum; Exit survey 90+% satisfaction with major program and breadth	Consideration and implementation by all divisions	Exit survey results	Continuous review by Undergraduate Curriculum Committee	In consideration	
Courses in the major program will demonstrate connections of the subject to frontier areas	Evaluation of syllabi and consultation with faculty and Undergraduate Curriculum	Pedagogical consideration of curriculum; Exit survey 90+% satisfaction	Consideration and implementation by all divisions	Exit survey results	Continuous review by Undergraduate Curriculum Committee	In consideration	

that are research active	Committee	with major program and breadth					
Elective courses should be offered in interdisciplinary areas that currently show high potential for rapid development such as nanoscience and environmental science	Consultation with Chemistry majors for courses of interest to them	Subjective evaluation and demand for courses	Interest was shown for environmental science, nanochemistry and computational chemistry courses for diversity in the undergraduate curriculum	Yes	Review by Undergraduate Curriculum Committee	Created new Chemistry courses in 2007 (611: Nanochemistry; 641: Atmospheric Chemistry; and 644: Computational Chemistry)	To be offered starting in autumn 2008 based on enrollment and student interest (some every year and some every 2 years)
Students should learn to solve chemistry problems, working both individually and in groups	Senior exit survey results	>70% satisfaction by students, more so in upper-division courses, less in lower-division courses	86% of students responded in top 2 categories	Yes	Review by Undergraduate Curriculum committee	More laboratory modules for group work, especially in lower-division courses	To be determined.
Students should develop effective skills in oral and written communication of scientific knowledge	Senior exit survey results and REEL research modules	>70% satisfaction by students	86% of students responded in top 2 categories	Yes	Review by Undergraduate Curriculum Committee	More presentations by students; implemented in Physical Chemistry lab; REEL modules require presentations in general, organic and analytical	To be determined.
Students should learn to plan experimental	Senior exit survey results and REEL research modules	>70% satisfaction by students	86% of students responded in top 2 categories	Yes	Review by Undergraduate Curriculum	More presentations by students,	To be determined.

procedures, carry out basic chemical procedures, use laboratory equipment, analyze data and prepare laboratory reports					Committee	implemented already in physical chemistry lab; REEL modules require presentations in general, organic and analytical	
Students should learn to follow safe practices in the lab	Monitoring safety submissions	Consultation with EHS and Chemistry safety staff	Acceptable level of performance	Yes	Review by Undergraduate Curriculum committee	To be considered.	Not at this time.
Students should learn how to retrieve information from the chemical literature, and become proficient in online database searching	Senior exit survey; REEL evaluations; preparation for future careers	>70% student response in top 2 categories	76% in top 2 categories	Yes	Review by Undergraduate Curriculum Committee	Further improvement by creation of new course for literature, research and ethics	To be offered in Autumn 2009
Students should learn how to use modern computer software for graphing, manipulation of symbolic mathematical expressions, and quantum chemical calculations	Senior exit survey; REEL evaluations; preparation for future careers	>70% student response in top 2 categories	76% in top 2 categories	Yes	Review by Undergraduate Curriculum Committee	REEL inquiry module in quantum chemistry in 121; creation of new course for literature, research and ethics; also creation of computational chemistry course (644)	Chemistry 644 course to be offered in Autumn 2008
A large fraction of students will engage in	Consultation with Chemistry advisor; Senior	>50% of students involved in	62% of senior exit survey students reported that they	Success (but could do even better); difficult	Review by Undergraduate Curriculum	REEL program (peer mentors) provide	New course to be created for

research with faculty members, either by taking research courses or by being employed as laboratory assistants	exit survey	research	were involved in at least 1 research experience – some with multiple experiences.	to track where research is being conducted since our students are very diverse and inter-disciplinary	Committee	research visibility; still need better focus on research; will implement new course in literature, research and ethics	Autumn 2009
Honors chemistry students should normally write undergraduate theses based on their research with faculty members	Consultation with Chemistry advisor	>75% of Honors students involved in research	Quantification in process	Partial	Review by Undergraduate Curriculum Committee	REEL program (peer mentors) provide research visibility; will implement new course in literature, research and ethics; vice chair will become honors advisor for 2008 freshman class in order to facilitate research considerations	New course to be created for Autumn 2009
Students should be successful in gaining admission to prestigious graduate or professional programs	Exit information from chemistry advising	Success of our students being admitted to best graduate and professional schools; high percentage of students in exit survey thought their major	From exit survey, 74% noted that they will attend graduate or professional schools in the next 2 years. At least 6 spring graduates are off to graduate school in chemistry (Illinois-UC and	Only self-reported information is available	Review by Undergraduate Curriculum Committee, in consultation with graduate office	Involve even more students in research; keep in better contact with alumni	To be determined.

		program advising was outstanding	Boston College); many are off to professional programs in disparate disciplines				
Graduates should embark on successful chemistry-related careers	Exit information from chemistry advising	Success of our students being admitted to best graduate and professional schools	From exit survey, 48% are seeking or have obtained employment; only 13% did internships according to exit survey but the information is self-reported. However, 93% thought that their chemistry major program was challenging	Only self-reported information is available	Review by Undergraduate Curriculum committee	Involve even more students in research; keep in better contact with alumni; better use of Career Services office; will implement new course in literature, research and ethics, including job options and resume preparation	To be determined.

Regional Campus Involvement Update:

Some of our regional campus faculty and instructors are developing blended courses, such as Ruth Kinder at the Lima campus with Chemistry 101. Ruth has excellent statistics on the quality of the blended course (with some distance education), and the performance between blended and traditional is similar.

Overall Analysis or Impressions (optional):

Better advising of students for careers and research in chemistry is needed. We will create a new short course for this purpose and offer it for chemistry majors in the autumn quarter of their 2nd year – the course will highlight research and career opportunities as well as provide a venue to discuss ethics, collaborative and inter-disciplinary studies. Getting students involved early in considering research will foster more senior theses, even though 11 out of 38 Spring 2008 graduates had some level of distinction upon graduation.

Other Activities (optional):

More of our students are participating in the chemistry Meek poster session, the MAPS Research Forum, and the Denman Forum.

Appendix 1
Sample Assessment Measures

This is not an exhaustive list of all possible assessment measures. If you are using one of these measures in your report, please indicate the additional information requested in parentheses below. If you have any questions about the measures below are or how they can be implemented, please contact Kate Hallihan (hallihan.3@osu.edu) for assistance.

Direct methods:

- National standardized examination (please identify)
- Certification or licensure examinations (please identify)
- Local comprehensive or proficiency examinations
- Embedded testing / test questions (**Chemistry 121 & 122; Chemistry 255; Chemistry 532**)
- Evaluation of student work (**see attached REEL report**)
    - Pre/Post testing
    - Evaluation of student research
    - Evaluation of senior thesis or major project
    - Evaluation of Capstone coursework
    - Evaluation of student portfolios
- Practicum, internship, outreach (if student participation % is a goal, otherwise this can be an indirect indicator)
- Other classroom assessment methods (please identify)

Indirect methods:

- Courses that specifically address goals in course content (Curricular Mapping)
- Student survey [entry; mid; **exit**]
- Alumni survey (please identify how many years post-graduation)
- Job or post-baccalaureate education placement information
- Student evaluation of instruction
- Student interview or focus group
- Student or alumni honors achieved
- Peer review of program
- External program review
- Systematic curriculum, grade, and/or syllabus review
- Employer feedback
- Comparison or benchmarking

Chemistry Majors Annual Survey Results

Section 1. General Experiences

During your time as a student at Ohio State,

1. How many hours per week did you spend studying/preparing for your classes, on average?

less than 5	2	7%
5-10	8	28%
11-15	7	24%
16-20	6	21%
more than 20	6	21%
Total	29	100%

2. How many times per quarter did you meet with an instructor outside of class, on average?

0	5	18%
1-2	10	36%
3-4	6	21%
5-6	5	18%
more than 6	2	7%
Total	28	100%

For questions 3-7, please respond as: "I participated in the following:"

3. A research-related experience such as working on a research project with a faculty member (do not include serving as a research participant in an experiment):		
0 times	11	38%
1 time	9	31%
2 times	4	14%
3 times	0	0%
more than 3 times	5	17%
Total	29	100%

4. An Ohio State performance or presentation, such as a theater or music performance, research forum, or juried exhibition (do not include participation as an audience member):		
0 times	18	62%
1 time	2	7%
2 times	2	7%
3 times	1	3%
more than 3 times	6	21%
Total	29	100%

5. A university-related internship experience:		
0 times	25	86%
1 time	3	10%
2 times	1	3%
3 times	0	0%
more than 3 times	0	0%
Total	29	100%

6. A university-related volunteer or service activity:		
0 times	16	55%
1 time	0	0%
2 times	4	14%
3 times	1	3%
more than 3 times	8	28%
Total	29	100%

7. A study abroad experience:		
0 times	28	97%
1 time	0	0%
2 times	1	3%
3 times	0	0%
more than 3 times	0	0%
Total	29	100%

8. How challenging did you find your academic course work?					
Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	**Very challenging**	**Somewhat challenging**	**A little challenging**	**Not very challenging**	**Not challenging at all**
	14	11	1	0	1
	52%	41%	4%	0%	4%

For the following questions, please select a number in which 5 indicates "A great extent" and 1 indicates "Not at all." If the question does not apply, select "Not applicable."

9. Overall, how satisfied are you with your experiences in the following areas?						
Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	**A great extent**	**4**	**3**	**2**	**Not at all**	**Not applicable**
Quality of instruction	7	13	8	0	1	0
	24%	45%	28%	0%	3%	0%
Opportunities for interactions with faculty	6	14	4	3	2	0
	21%	48%	14%	10%	7%	0%
Courses in the General Education Curriculum (GEC)	3	9	9	3	4	1
	10%	31%	31%	10%	14%	3%
Courses in my major program	7	19	2	0	1	0
	24%	66%	7%	0%	3%	0%
Advising from university advisors in Denney or Enarson Hall	4	10	6	4	2	3
	14%	34%	21%	14%	7%	10%
Advising from advisors in my major program	17	4	6	1	1	0
	59%	14%	21%	3%	3%	0%

10. How satisfied are you with your overall academic experience?						
Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	**Very satisfied**	**4**	**3**	**2**	**Not at all satisfied**	**Not applicable**
	13	8	7	0	1	0
	45%	28%	24%	0%	3%	0%

Section 2. General Education Curriculum (GEC)

For the following questions, please select a number in which 5 indicates "A great extent" and 1 indicates "Not at all." If the question does not apply, select "Not applicable."

11. To what extent have your knowledge, skills, abilities, and personal development improved in the following areas since you began your education at Ohio State?

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	A great extent	4	3	2	Not at all	Not applicable
Written communication	5 17%	9 31%	8 28%	6 21%	1 3%	0 0%
Oral expression	4 14%	11 38%	9 31%	4 14%	1 3%	0 0%
Foreign language	4 14%	9 31%	9 31%	4 14%	3 10%	0 0%
Mathematical and quantitative skills	16 55%	8 28%	3 10%	1 3%	1 3%	0 0%
Logical and analytical reasoning	17 59%	10 34%	1 3%	0 0%	1 3%	0 0%
Natural science (both biological and physical)	17 59%	10 34%	1 3%	0 0%	1 3%	0 0%
Social science (including individuals, groups, and organizations)	4 14%	12 41%	11 38%	1 3%	1 3%	0 0%
The humanities (literature, culture, and ideas)	6 21%	9 31%	11 38%	1 3%	1 3%	1 3%
Historical perspectives	4 14%	10 34%	12 41%	1 3%	1 3%	1 3%
The arts	2 7%	9 31%	9 31%	2 7%	5 17%	2 7%
Social diversity in the United States	3 10%	6 21%	9 31%	5 17%	3 10%	3 10%
Diversity in world affairs	3 10%	5 17%	11 38%	6 21%	1 3%	3 10%
Non-Western culture and thought	2 7%	6 21%	14 48%	5 17%	1 3%	1 3%
Critical thinking	12 41%	10 34%	6 21%	0 0%	1 3%	0 0%
Use of scientific methods and concepts	19 66%	8 28%	1 3%	0 0%	1 3%	0 0%
Integrating knowledge from different fields	13 45%	8 28%	7 24%	0 0%	1 3%	0 0%

12. To what extent do you think your Ohio State GEC helped prepare you for:

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	A great extent	4	3	2	Not at all	Not applicable
Additional formal education	2 7%	10 34%	3 10%	3 10%	10 34%	1 3%
Your future work/career	3 10%	5 17%	5 17%	6 21%	9 31%	1 3%
Everyday life	5 17%	6 21%	6 21%	5 17%	6 21%	1 3%
Contributing to society	5 17%	6 21%	4 14%	8 28%	5 17%	1 3%
Life-long learning	8 28%	6 21%	3 10%	4 14%	7 24%	1 3%

13. The general education program strives to provide a broad education and help develop general skills across several domains. Overall, to what extent do you agree you achieved these overarching goals through your GEC:

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	Strongly agree	4	3	2	Strongly disagree	Not applicable
	3 10%	7 24%	6 21%	8 28%	4 14%	1 3%

Section 3. Academic Advising in Arts and Sciences

Students graduating from major programs in the Colleges of the Arts and Sciences (ASC) often receive academic advising from a number of people in various offices (i.e. departmental advisor, ASC Advising in Denney Hall, ASC Honors Advising in Enarson Hall).

14. Did you receive advising from Arts and Sciences advisors in Denney Hall (first floor)?

Yes	15	52%
No	14	48%
Total	29	100%

For each option below, please select a number in which 5 indicates "A great extent" and 1 indicates "Not at all."

15. To what extent do you agree that your advisor(s) in Denney Hall (first floor):					
Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	**A great extent**	**4**	**3**	**2**	**Not at all**
Treated me with respect	10 67%	5 33%	0 0%	0 0%	0 0%
Understood and explained relevant rules, requirements, and policies	6 40%	6 40%	3 20%	0 0%	0 0%
Explored solutions to problems I was experiencing	6 40%	4 27%	4 27%	1 7%	0 0%
Made appropriate referrals to other university offices or resources	6 40%	5 33%	4 27%	0 0%	0 0%
Followed up on any necessary issues after my initial meeting	5 36%	5 36%	2 14%	1 7%	1 7%

16. Did you receive advising from Arts and Sciences in Enarson Hall (Honors)?		
Yes	10	34%
No	19	66%
Total	29	100%

For each option below, please select a number in which 5 indicates "A great extent" and 1 indicates "Not at all."

17. To what extent do you agree that your advisor(s) in Enarson Hall (Honors):					
Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	**A great extent**	**4**	**3**	**2**	**Not at all**
Treated me with respect	9 90%	1 10%	0 0%	0 0%	0 0%
Understood and explained relevant rules, requirements, and policies	6 60%	4 40%	0 0%	0 0%	0 0%
Explored solutions to problems I was experiencing	6 60%	3 30%	0 0%	0 0%	1 10%
Made appropriate referrals to other university offices or resources	6 60%	3 30%	0 0%	0 0%	1 10%
Followed up on any necessary issues after my initial meeting	5 50%	3 30%	1 10%	0 0%	1 10%

Section 4. Major Program

For the following questions, please select a number in which 5 indicates "A great extent" and 1 indicates "Not at all." If the question does not apply, select "Not applicable."

18. To what extent have your knowledge, skills, abilities, and personal development improved in the following areas based on your major program academic experiences at Ohio State?

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	A great extent	4	3	2	Not at all	Not applicable
Communication	5 17%	13 45%	5 17%	3 10%	3 10%	0 0%
Critical thinking	18 62%	8 28%	2 7%	0 0%	1 3%	0 0%
Analytical reasoning	19 66%	8 28%	1 3%	0 0%	1 3%	0 0%
Ethics and moral reasoning	4 14%	9 31%	7 24%	4 14%	4 14%	1 3%
Knowledge about my major	22 76%	6 21%	0 0%	0 0%	1 3%	0 0%
Integrating knowledge from different fields	11 38%	10 34%	7 24%	0 0%	1 3%	0 0%

19. To what extent do you agree with the following statements about your major?

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	A great extent	4	3	2	Not at all	Not applicable
Lower-division courses adequately prepared me for more advanced study in my major.	12 41%	11 38%	4 14%	1 3%	1 3%	0 0%
Upper-division courses effectively increased my knowledge and skills required in my major.	15 52%	12 41%	1 3%	0 0%	1 3%	0 0%
My major courses supported the goals of my major program.	17 59%	9 31%	2 7%	0 0%	1 3%	0 0%
I had sufficient opportunities for interaction with faculty in my major.	11 38%	10 34%	5 17%	2 7%	1 3%	0 0%
My major provided me with opportunities for practicum, internship or research experiences.	13 45%	7 24%	2 7%	1 3%	4 14%	2 7%
My major courses were effective in preparing me for employment or graduate or professional school.	15 54%	7 25%	4 14%	0 0%	1 4%	1 4%
Overall, I learned the body of knowledge and skills expected in my major.	15 52%	10 34%	3 10%	0 0%	1 3%	0 0%
Overall, I was satisfied with my experience in my major at Ohio State.	16 55%	9 31%	2 7%	1 3%	1 3%	0 0%

Section 5. Plans after Graduation

We are interested in your primary plans after graduation.

20. Additional education (mark all that apply):		
I hope to attend graduate or professional school within the next two years.	23	74%
I plan to pursue additional undergraduate education.	2	6%
I do not plan to pursue additional education in the next two years.	6	19%

If you have been accepted to a graduate or professional school and will be attending within the next year:

21. Please indicate the college or university:		
The Ohio State University	9	41%
Does not apply	6	27%
Other, please specify:	7	32%
Total	22	100%

22. Employment (not including graduate assistantships):		
I am seeking employment in my area of study.	7	24%
I am seeking employment - not necessarily in my area of study.	2	7%
I have secured a job in my area of study.	2	7%
I have secured a job - not in my area of study.	0	0%
I have not begun a job search but plan to do so after graduation.	3	10%
I do not plan to seek employment.	15	52%
Total	29	100%

23. Please indicate the type of employer:		
Business/Finance	0	0%
Arts/Design	0	0%
Communications/Media	0	0%
Agriculture/Forestry	0	0%
Education/Non-Profit	0	0%
Government/Legal/Criminal Justice	0	0%
Health/Science	2	100%
IT/Technology	0	0%
Manufacturing	0	0%
Consumer Services	0	0%
Other, please specify	0	0%
Total	2	100%

24. Other post graduate experiences for next year:		
I plan to participate in a service or volunteer program (for example, Americorps, Teach for America, unpaid internship)	2	8%
I plan to serve in the military	0	0%
Does not apply	23	92%
Other, please specify:	0	0%

25. What is the highest degree you plan to obtain?		
Bachelor's Degree (for example, BA, BS, BFA)	0	0%
Master's Degree (for example, MS, MA, MFA, MSW, MBA, MLA)	8	29%
J.D.	0	0%
Professional Certificate	0	0%
Ph.D. or other doctoral degree	10	36%
M.D.	6	21%
D.D.S. or D.M.D.	0	0%
D.V.M.	0	0%
Pharm. D.	3	11%
Other, please specify:	1	4%
Total	28	100%

26. I have taken the following graduate or professional school admission test (mark all that apply):		
GRE (Graduate Record Examination)	9	33%
LSAT (Law School Admission Test)	0	0%
MCAT (Medical College Admission Test)	4	15%
GMAT (Graduate Management Admission Test)	0	0%
Does not apply	10	37%
Other, please specify	4	15%

ACADEMIC YEAR 06/07

AUTUMN '06

QUESTION 1

QUES.	HEYNS #10	LEUNG #12	LOZA #11	MCCOY # 9	OBA # 3	RANDL #42	WU # 1	TOTAL
Correct	84	237	175	166	160	149	145	1116
Total	166	315	264	305	279	246	268	1843
%	**50.6**	**75.2**	**66.3**	**54.4**	**57.3**	**60.6**	**54.1**	**60.6**

QUESTION 2

QUEST.	#49	#21	#17	#13	#33	#41	# 2	
Correct	134	287	236	247	242	209	215	1570
Total	166	315	264	305	279	243	268	1840
%	**80.7**	**91.1**	**89.4**	**81.0**	**86.7**	**86.0**	**80.2**	**85.3**

QUESTION 3

QUES.	#19	#16	#14	#19	# 8	#24	# 3	
Correct	104	246	217	239	220	176	223	1425
Total	166	315	264	305	279	243	268	1840
%	**62.7**	**78.1**	**82.2**	**78.4**	**78.9**	**72.4**	**83.2**	**77.4**

QUESTION 4

QUEST.	#37	#34	#28	#18	#11	# 6	# 4	
Correct	149	259	221	186	257	208	220	1500
Total	166	314	264	305	279	243	268	1839
%	**89.8**	**82.5**	**83.7**	**61.0**	**92.1**	**85.6**	**82.1**	**81.6**

QUESTION 5

QUEST.	#44	#35	#34	#44	#32	#36	# 5	
Correct	100	213	160	242	184	123	164	1186
Total	166	315	264	305	279	243	268	1840
%	**60.2**	**67.6**	**60.6**	**79.3**	**65.9**	**50.6**	**61.2**	**64.5**

WINTER '07

	OBA #3	PAPPA #10	QUISE #1	RANDL #42	Total
	112	77	87	164	440
	201	173	244	299	917
	55.7	**44.5**	**35.7**	**54.8**	**48.0**
	#33	NA	#2	#41	
	172		207	288	667
	201		244	298	743
	85.6	-	**84.8**	**96.6**	**89.8**
	#8	#14	#3	#24	
	148	134	183	223	688
	201	173	244	299	917
	73.6	**77.5**	**75.0**	**74.6**	**75.0**
	#12	#7	#4	#6	
	151	151	207	247	756
	201	173	244	299	917
	75.1	**87.3**	**84.8**	**82.6**	**82.4**
	#32	#32	#5	#36	
	116	109	122	186	533
	201	173	244	299	917
	57.7	**63.0**	**50.0**	**62.2**	**58.1**

SPRING '07

	CHAN #8	GRAND #46	Total
	133	83	216
	253	179	432
	52.6	**46.4**	**50.0**
	#24	#47	
	212	133	345
	253	178	431
	83.8	**74.7**	**80.0**
	#16	#48	
	176	88	264
	253	179	432
	69.6	**49.2**	**61.1**
	#36	#49	
	164	114	278
	253	179	432
	64.8	**63.7**	**64.4**
	#42	#50	
	83	46	129
	253	179	432
	32.8	**25.7**	**29.9**

SUMMER '07

	HEYNS #10	Total
	25	25
	65	65
	38.5	**38.5**
	#48	
	53	53
	65	65
	81.5	**81.5**
	#19	
	55	55
	65	65
	84.6	**84.6**
	#37	
	49	49
	65	65
	75.4	**75.4**
	#43	
	39	39
	65	65
	60.0	**60.0**

ACADEMIC YEAR 07/08

AUTUMN '07

QUESTION 1

QUES.	GRAND #46	LOZA #11	MCCOY #9	OBA #3	STOLT #2	WU(A/B) #1	WYSLO #11	TOTAL
Correct	132	199	146	160	195	218	151	1201
Total	277	286	268	275	288	404	270	2068
%	**47.7**	**69.6**	**54.5**	**58.2**	**67.7**	**54.0**	**55.9**	**58.1**

QUESTION 2

QUEST.	#47	#17	#13	#33	#4	#2	#17	
Correct	245	246	231	246	244	358	227	1797
Total	277	286	268	275	288	404	270	2068
%	**88.4**	**86.0**	**86.2**	**89.5**	**84.7**	**88.6**	**84.1**	**86.9**

QUESTION 3

QUES.	#48	#14	#19	#8	#5	#3	#14	
Correct	224	231	236	201	213	341	204	1650
Total	277	286	268	275	288	404	270	2068
%	**80.9**	**80.8**	**88.1**	**73.1**	**74.0**	**84.4**	**75.6**	**79.8**

QUESTION 4

QUEST.	#49	#28	#44	#12	#3	#4	#28	
Correct	215	260	209	228	247	350	233	1742
Total	277	286	268	275	288	404	270	2068
%	**77.6**	**90.9**	**78.0**	**82.9**	**85.8**	**86.6**	**86.3**	**84.2**

QUESTION 5

QUEST.	#50	#34	#18	#32	#6	#5	#35	
Correct	156	194	176	183	179	283	172	1343
Total	277	286	268	275	288	404	270	2068
%	**56.3**	**67.8**	**65.7**	**66.5**	**62.2**	**70.0**	**63.7**	**64.9**

WINTER '08

	OBA(A) #3	OBA(B) #3	PITZE #10	SPINN #6	Total
	178	113	97	117	505
	306	210	170	200	886
	58.2	**53.8**	**57.1**	**58.5**	**57.0**
	#33	#33	#2	#31	
	248	162	138	151	699
	306	210	170	200	886
	81.0	**77.1**	**81.2**	**75.5**	**78.9**
	#8	#8	#54	#8	
	251	157	137	151	696
	306	210	170	200	886
	82.0	**74.8**	**80.6**	**75.5**	**78.6**
	#12	#12	#8	#19	
	250	172	142	143	707
	306	210	170	200	886
	81.7	**81.9**	**83.5**	**71.5**	**79.8**
	#32	#32	#50	#24	
	202	136	97	111	546
	306	210	170	200	886
	66.0	**64.8**	**57.1**	**55.5**	**61.6**

SPRING '08

	CHAN #46	HERBE #1	Total
	62	39	101
	135	267	402
	45.9	**14.6**	**25.1**
	#47	#2	
	105	209	314
	135	267	402
	77.8	**78.3**	**78.1**
	#48	#3	
	90	200	290
	135	267	402
	66.7	**74.9**	**72.1**
	#49	#4	
	97	241	338
	135	267	402
	71.9	**90.3**	**84.1**
	#50	#5	
	39	131	170
	135	267	402
	28.9	**49.1**	**42.3**

SUMMER '08

	SPINN Total
	0
	0
	#DIV/0!
	0
	0
	#DIV/0!
	0
	0
	#DIV/0!
	0
	0
	#DIV/0!
	0
	0
	#DIV/0!

OCHEM Diagnostic - CH 255

Autumn 2007		Winter 2008		Spring 2008	
Enrollment	92	Enrollment	77	Enrollment	310
Distribution		**Distribution**		**Distribution**	
0-9	5	0-9	4	0-9	18
10-19	47	10-19	35	10-19	124
20-29	40	20-29	37	20-29	156
30	0	30	1	30	12
Average Score	19	Average Score	18	Average Score	20

Research Experiences to Enhance Learning

Year 3, 2007 Annual Report

Ohio's Evaluation & Assessment Center for Mathematics and Science Education

Miami University
Oxford, Ohio

Jane Butler Kahle	Principal Investigator
Yue Li	Senior Researcher and Statistician
Jennifer McFaddin	Research Associate

Executive Summary

Research Experiences to Enhance Learning (REEL) is a major effort of the chemistry departments in Ohio's two- and four-year institutions to enhance the quality of teaching and learning in first- and second-year chemistry courses. The major, although not only, feature of that enhancement has been the development, delivery, and implementation of research modules that address two themes: *the synthesis/characterization of non-toxic pigments* and *environmental chemistry investigations*. In 2007, 13 institutions of higher education (IHEs) in Ohio were involved in REEL.

Ohio's Evaluation and Assessment Center for Mathematics and Science Education (E & A Center) serves as the external evaluator for REEL. The E & A Center assess progress towards REEL's goals using both quantitative and qualitative methods. Major findings from Spring, Summer, and Fall 2007 are presented below and discussed in detail throughout the report. Overall, the evaluation finds that REEL is successfully addressing its major goals and that the project is changing chemistry education across Ohio.

- REEL's partnership that includes major research universities, four-year primarily teaching institutions, and two-year institutions contributes to an increase in the number of under-represented minority students who have access to cutting-edge research (Table 6).
- REEL's emphasis on inquiry (research) teaching and learning is noted by all students, who study a REEL module, compared to those who do not, but it is particularly noted by women students and students who intend to enter a professional school after graduation. This finding is present in General Chemistry, Organic Chemistry, and Analytical Chemistry (Tables 18-29).
- The Peer Mentor program, developed at The Ohio State University, has had several positive outcomes. Specifically, peer mentors note that their understanding of chemical concepts, their discussions with friends about chemistry, and their future career plans have been positively affected by the experience (Tables 13 & 30).
- There is evidence of increased participation in research by undergraduates with chemistry faculty (Appendices F, G, & H).

MAJOR PROGRAM ASSESSMENT REPORT FORM
2007-2008
Evaluation of Student Learning Outcomes in Major Programs
Colleges of the Arts and Sciences (ASC)
The Ohio State University

College: Mathematical and Physical Sciences

Department(s): School of Earth Sciences

Major: Geological Sciences

Level (Undergraduate/Graduate): Undergraduate

Contact Person and e-mail: carey.145@osu.edu

Chair: Franklin W. Schwartz

Chair Signature: _____

Date: _____

For Assessment Office Use Only

Reviewed by: _____
Date: _____

Implementation:
_____ Begun _____ Date implemented or planned
_____ Evidence collected
_____ Summary evidence provided
_____ Evidence reviewed by Program
_____ Program improvements attempted/made
_____ Action plan for next year based on evidence/review

Comments:

Assessment Report Summary (75-150 words):

Geological Sciences undergraduate majors have demonstrated through their performance in the writing- and field work-intensive majors courses a high level of preparedness in the geological sciences. Students can read and evaluate the geological literature critically. Through their thesis research projects, they have developed an in-depth knowledge of one or more specialized areas, have learned to identify geological problems and developed solutions. They have applied their knowledge of modern science, mathematics and computing to solve geological problems. They have learned to work as teams in Earthsci 581 and 582. Graduating senior students have been admitted to graduate programs in Geological Sciences.

Major Assessment Report Form Chart # 1:

Goal # 1 Preparedness in the Geological Sciences:
Expected Learning Outcomes (i.e. Learning Objectives)
a) Students will be able to critically read and evaluate geological literature.
b) Students will be able to present geological information in a clear and logical manner, both orally and written.
c) Students will be able to apply geological data to understand the physical, chemical and biological processes and their evolution on Earth.
d) Students will be able to understand the processes and interactions of the lithosphere, hydrosphere, biosphere, atmosphere and cryosphere, including their impact on today's society and their geological history.
e) Students will be able to apply knowledge of appropriate techniques, field methods, field mapping and numerical methods to measure, portray, analyze, and interpret both the present and past Earth.
f) Students will develop the necessary knowledge and skills for admission to graduate school or employment following graduation.
g) Students will develop an in-depth undergraduate/beginning graduate student knowledge of one or more specialized area in the geological sciences
h) Students will be able to identify geological problems and develop solutions

GOAL	**EVIDENCE**				**USAGE/Closing the Loop**	
Expected Learning Outcomes (ELO)	**Measures/Methods**	**Criteria Required to Achieve Goal**	**Were criteria achieved? (Summary of Findings)**	**Discursive Analysis of Findings**	**How is this information being shared and used?**	**Next Steps: Action Plan Short (1-year) and long term**
Goal 1a, b, c, d, g. Preparedness in the geological sciences	Evaluation of student work (writing) by faculty in writing-intensive course Earth Sciences 502	All students pass course; 25% achieve at M.S. level	Yes. Two of 7 students wrote final papers that would have been good drafts of an M.S. thesis.	These results are similar to those of previous years in that approximately one-quarter of students perform at a graduate level and the remaining students' performances ranged from acceptable to needing significant improvement.	This information will be reviewed by the undergraduate committee during Autumn Quarter 2008.	
Goal 1 b, c, e. Preparedness	Evaluation of performance in capstone courses Earthsci 581 & 582	All students pass course; 25% achieve	Yes. Over the past three years, one-fifth	For the past two years, the corporate memory of the group of faculty and GTAs	This information will be	

in the geological sciences		at M.S. level	to one-quarter of students performed at a level of first year graduate students. Only 0–2 students have failed to perform at or above average ability.	involved in teaching these two summer field courses in Utah have allowed a calibration to the pool of students who have taken the courses. Faculty consistently assign grades using comparison with previous years' students in terms of what is average, greater than average or less than average.	reviewed by the undergraduate committee during Autumn Quarter 2008.	
Goal 1b	Oral presentation in classes Poster and oral presentations in Earthsci 421, 423 and 530	100% participation by students enrolled in these three courses	Yes			
Goal 1b	Significant numbers of students participate in MAPS and Denman undergraduate research forums	Over the past three years, participation in the MAPS Research Forum by Geological Sciences majors has been one-third to one-half of the total student involvement.	Yes	Over the past three years, students from first year to graduating seniors have participated in the MAPS and Denman undergraduate research forums. Geological sciences majors have won prizes in both forums in each of the past three years. The high level of participation in these research forums has led to a significant increase in student engagement in their own research and in that of their fellow students.		
Goal 1a, g	Senior thesis evaluation	Faculty evaluation of theses	Not performed this year	Completion of a research project and submittal of a senior thesis is a requirement for graduation with a B.S. degree in Geological Sciences	Evaluation was not performed in 2007–08	Appoint faculty committee to evaluate theses

Other Goals / information not listed in above charts: Significant participation in an organized internship experience. In Summer 2008, eleven undergraduate majors participated in an 8-week internship program. These eleven students are 40% of the students registered as Geological Sciences majors in Summer 08.
Regional Campus Involvement Update: Regional campus faculty are not involved because it is not possible to major in Geological sciences at a regional campus.

MAJOR PROGRAM ASSESSMENT REPORT FORM
2007-2008
Evaluation of Student Learning Outcomes in Major Programs
Colleges of the Arts and Sciences (ASC)
The Ohio State University

College: Mathematics and Physical Sciences

Department(s): Mathematics

Major: Mathematics

Level (Undergraduate/Graduate): Undergraduate

Contact Person and e-mail: Ronald Solomon, solomon@math.ohiostate.edu

Chair: David Goss

Chair Signature: D. Shapiro (for D Goss)

Date: 8/5/08

Assessment Report Summary (75-150 words):

The Department of Mathematics assesses its success in achieving departmental educational goals on a regular basis via course coordination and evaluation of final examination grades in key courses, analysis of data from departmental and ASC student exit surveys, analysis of student success on professional examinations (GRE, PRAXIS, Actuarial Society, etc.), analysis of student placement in careers, graduate and professional schools. We also regularly compare our program with that at peer institutions. We have just begun sending out electronic alumni surveys for additional assessment data. Based on these assessments, the Department has drafted an ambitious revision of the undergraduate major requirements to introduce more variety and career relevance. In general, it must be said that student satisfaction as reported in both departmental and ASC exit surveys is very high. Nevertheless improvement is possible in the preparation of students for advanced mathematics, science, and engineering courses. With this in mind, the Department is exploring improvements in the basic calculus and differential equations courses. Also, improvement is needed in the area of involvement of undergraduate majors in research experiences in mathematics.

For Assessment Office Use Only

Reviewed by: _____
Date: _____

Implementation:
_____ Begun _____ Date implemented or planned
_____ Evidence collected
_____ Summary evidence provided
_____ Evidence reviewed by Program
_____ Program improvements attempted/made
_____ Action plan for next year based on evidence/review

Comments:

MAJOR PROGRAM ASSESSMENT REPORT FORM
2007-2008
Evaluation of Student Learning Outcomes in Major Programs
Colleges of the Arts and Sciences (ASC)
The Ohio State University

College: Mathematics and Physical Sciences

Department(s): _____Mathematics_____

Major: _____Mathematics_____

Level (Undergraduate/Graduate): _____Undergraduate_____

Contact Person and e-mail: Ronald Solomon, solomon@math.ohiostate.edu

Chair: David Goss

Chair Signature: _____

Date: _____

For Assessment Office Use Only

Reviewed by: _____
Date: _____

Implementation:
_____ Begun _____ Date implemented or planned
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Comments:

Assessment Report Summary (75-150 words):

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Major Assessment Report Form: Chart #1

Goal 1. Students master the fundamental areas of mathematics: calculus, differential equations, linear algebra
Expected Learning Outcomes (i.e. Learning Objectives)

1) Students will master the fundamental techniques of differential and integral calculus.
2) Students will acquire basic skills with systems of linear equations, eigenvalue and eigenvector analysis.
3) Students will acquire facility at reading and constructing mathematical proofs.

All traditional undergraduate majors will master the basic concepts of analysis and abstract algebra and their correlation to the more fundamental areas of high school geometry, algebra, and calculus.

4) Students will understand the structure of the real number line and the concepts of continuity, differentiability, and integrability.
5) Students will understand the fundamental number systems (integers, rationals, reals, complexes) and related systems such as finite fields and the Gaussian integers.
6) Students will understand the basic theory of polynomial functions and its abstraction to ring and field theory.
7) Students will understand the concept of congruence and symmetry in geometry and its abstraction to the theory of groups.

GOAL	**EVIDENCE**				**USAGE/Closing the Loop**	
Expected Learning Outcomes (ELO)	**Measures/Methods** See Appendix 1 for sample measures	**Criteria Required to Achieve Goal**	**Were criteria achieved? (Summary of Findings)**	**Discursive Analysis of Findings**	**How is this information being shared and used?**	**Next Steps: Action Plan Short (1-year) and long term**
ELO 1	Embedded test questions in Math 151 and 152. Results evaluated quarterly by course coordinators. ASC Student Exit Survey. Relevant questions assessed by faculty annually	All syllabi contain appropriate content. Minimum course grade of C- required to advance.	Yes.	Tight coordination and minimum grade requirement has improved quality of courses and student learning. Based on our high rates of student satisfaction, our department will consider increasing our minimum criteria in these areas.	Our under-graduate studies committee periodically meets with the course coordinators to review the findings and make recommendations.	A team will be visiting other universities in 2008-9 and making recommendations for improvement of course delivery.
ELO 2& 3	Embedded test questions in Math 568, 571, and 345. Exams reviewed periodically by course	All operational syllabi contain	Yes	Syllabi for these two courses consistently cover the algorithms and proof techniques appropriate to	Math 568 and 571 would be more effective if offered as 5-credit	The problems of time pressure in these courses (particularly 568

	coordinator. Syllabus reviewed quarterly by course coordinator.	appropriate content		the discipline. Math 571 has just been revised to include eigenvector analysis. Math 345 uses specially designed notes of Professor Falkner.	hour courses, but this is precluded by our client departments in the College of Engineering.	and 571) will be alleviated when they become semester courses.
ELO 1,2,3	SEI evaluation. Quarterly, by undergraduate studies committee	SEI evaluations at or above university mean	Yes	This is gratifying.	SEI summaries are submitted by faculty as part of annual salary review process.	None required.
ELO 1,2,3	Departmental Student Exit Survey and ASC Student Exit Survey	Minimum 80% reporting significant improvement in analytical reasoning and knowledge and skills expected in major.	Yes. 96% reported significant improvement in analytical reasoning. 88% reported significant improvement in knowledge and skills expected in major.	This is very gratifying.	Not yet done. Will report to next year's Undergraduate Committee.	None required.
	Alumni Survey (3 years out) Not assessed this year. Will be assessed every third year.	Minimum satisfaction rate of 75% (desired 85%) in Alumni Survey	Not yet polled.	A survey has been drafted and will be sent out electronically in Summer 2008.	Results when received will be reported to the Undergraduate Committee, and discussed.	N/A
ELO 4,5,6,7	Praxis Content Exam	Minimum 90% passing rate.	Yes. 100% passing rate.	This is very gratifying.	No action needed.	None required.

Action Plan:
ELO 1) As noted, a team (Darry Andrews, Elizabeth Ehret) will visit other universities next academic year to explore more effective delivery methods for the basic calculus courses. The goal is to pilot large lectures led by "star" lecturers, implementing state-of-the-art learning technologies.

ELO 2) We will continue to monitor operational syllabi for 568, 571. A major improvement will occur if and when OSU switches to semesters. Since this is predicted for the near future, there is little point in tinkering with the syllabi between now and then.

ELO 3) One area of possible improvement detected in the data reported in the ASC Student Exit Survey is that only 19% of all students agreed to a great extent with the statement: "Lower-division courses adequately prepared me for more advanced study in my major." We will revise the departmental exit survey to probe this statement more carefully. A conjecture is that this relates to the absence of training in logical reasoning in the calculus sequence. If this is confirmed, we will investigate how to remedy this.

ELO 4,5,6, 7) We continually assess the effectiveness of our upper division courses for majors (507, 547-8-9, 580-1-2). Currently, a new set of course notes for Math 580-1-2 is being prepared. The satisfaction reported by students in exit surveys is gratifying, as is the fact that those students preparing for secondary education licensure have 100% success at passing the PRAXIS examination in content mastery.

Major Assessment Report Form: Chart #2

Goal 2. The faculty and staff of the Mathematics Department will provide undergraduate majors with an educational experience that provides a firm grounding in all of the basic areas of mathematical knowledge.

1) Faculty will be recognized by students as excellent educators.
2) The degree program will compare favorably with that of peer institutions.

GOAL	**EVIDENCE**				**USAGE/Closing the Loop**	
Expected Learning Outcomes (ELO)	**Measures/Methods** See Appendix 1 for sample measures	**Criteria Required to Achieve Goal**	**Were criteria achieved? (Summary of Findings)**	**Discursive Analysis of Findings**	**How is this information being shared and used?**	**Next Steps: Action Plan Short (1-year) and long term**
ELO 1	Departmental exit survey and ASC student exit survey.	80% satisfaction with faculty.	Yes: In departmental survey,students expressed satisfaction with almost all faculty. ASC survey indicated 85% satisfaction.	We continue to evaluate new faculty hires based both on research and on teaching abilities.	**N/A**	None required.
ELO 2	Number of undergraduate majors.	As many undergraduate majors as comparably sized peer institutions.	No. We have only 50-75% the number of majors of Illinois, Texas, and UCLA.	Other peer departments have better articulated tracks for undergraduate majors.	This was a significant issue at the Undergraduate Committee this past year, leading to the drafting of a proposed overhaul of the undergraduate major requirements along the lines of those at UCLA.	The degree proposal is being perfected and will be brought to the MAPS Curriculum Committee for approval in Autumn 2008.

Action Plan:
ELO 2) As noted above, a proposal for a total revision of the undergraduate degree requirements to incorporate both more flexibility and more career guidance for students is in the final phases of preparation. The current two degree tracks will be replaced by six degree tracks, following the model of UCLA and other successful peer institutions. This proposal will be brought to the MAPS Curriculum Committee for approval in Autumn 2008.

Major Assessment Report Form Chart # 3:

Goal # 3: The faculty and staff of the Mathematics Department will provide the opportunity for undergraduate majors to participate in research, problem-solving or outreach experience consistent with the students' post graduate plans.

1 Students will have the opportunity to participate in working groups exploring current research problems.
2) Students will have the opportunity to compete in challenging problem-solving competitions.

GOAL	**EVIDENCE**				**USAGE/Closing the Loop**	
Expected Learning Outcomes (ELO)	**Measures/Methods** See Appendix 1 for sample measures	**Criteria Required to Achieve Goal**	**Were criteria achieved? (Summary of Findings)**	**Discursive Analysis of Findings**	**How is this information being shared and used?**	**Next Steps: Action Plan Short (1-year) and long term**
ELO 1&2	ASC Student exit survey	50% participation in research or problem-solving competitions	No. Only 20% participation reported.	Prize competitions have long been a part of the program. Recently, working groups have been introduced. However, more needs to be done to involve a large number of majors in research experiences.	This has been discussed at faculty meetings and will continue to be discussed.	No specific plan has been formulated as yet.

Other Goals / information not listed in above charts:

An additional goal, specific to the honors program, was formulated in the "2005 Major Program Goals and Objectives" document. As

regards the honors program, the success of this program is very high and may be measured by the successful placement of honors graduates in some of the finest graduate and professional degree programs in the Nation.
Regional Campus Involvement Update: A representative of the regional campuses serves on the Undergraduate Committee every year. Moreover, several regional campus colleagues (Kennedy (Mansfield), McEwan (Marion) , Roman (Lima)) serve as the course coordinators for some of our lower division undergraduate courses (050, 075, 116).

Assessment Planning for Evaluation of Student Learning in Major Programs

Assessment Report` Requirements

I. Deadlines

- ***Reports due annually August 15***

II. Format

- Specifications
    - Word document
    - Arial font
    - 12 point size
    - Single spaced
    - Electronic copy (including cover page and attached methods inventory)
    - 1 paper copy (including cover page and attached methods inventory)
- Cover page
    - Attached; include 75-150 word abstract (may be distributed)
- Method inventory
    - Attached; indicate primary methods used in *current report*
- Required Components
    - Activities over previous year in support of assessment
    - Major program objectives and evidence; include a summary of findings, an indication as to whether objectives were met, and a critique of the evidence (e.g., what level of achievement was expected; what was or was not achieved; what was not evaluated in current cycle).
    - Use of information and specific actions taken; indicate how outcome evidence was shared and used for ongoing curricular and instructional changes to improve learning outcomes; indicate how actions will be reviewed and evaluated
    - Future planning and specific action plan for next year; should be part of a multi-year plan
    - Regional campus involvement; if not involved at present, indicate steps planned to do so

ASSESSMENT REPORT
Evaluation of Student Learning Outcomes in Major Programs
Colleges of the Arts and Sciences (ASC)
The Ohio State University

College: College of Mathematical and Physical Sciences

Department(s): Physics

Major: Physics

Level (Undergraduate/Graduate): Undergraduate

Contact Person and e-mail: Richard Hughes, hughes@mps.ohio-state.edu

Chair: James Beatty

Chair Signature: _____

Date: July 28, 2008

Assessment Report Summary (75-150 words):

The Physics Undergraduate Studies Committee has finalized a statement of the goals and objectives in the assessment plan. Data have been collected via: Major Fields test, Exit interviews, surveys and discussions with students. Comparing our data with national statistics indicate a fundamental achievement of goals though specific criteria for success in meeting program goals are yet to be finalized. Curricular modifications have been made to address the challenges of a growing program. Supportive mechanisms have been piloted to address undergraduate research and diversity concerns. Assessment tools continue to be considered and modified to reflect changes in the type of data required to assess the program.

The following is *not* to be filled in by the unit submitting the plan:

Reviewed by: _____
Date: _____
Implementation:

_____ Begun
_____ Evidence collected
_____ Evidence reviewed by Program
_____ Action plan for next year
_____ Date implemented or planned
_____ Summary evidence provided
_____ Program improvements made based on evidence/review

Comments:

- **Assessment Method Inventory**

Please indicate the assessment methods used in the current report; check all that apply.

Direct methods:

__X__ National standardized examination (please identify) _MFT, GRE Summary
_____ Certification or licensure examinations
_____ Local comprehensive or proficiency examinations
_____ Embedded testing
_____ Pre-post testing
_____ Other classroom assessment methods (please identify) _____
_____ Practicum, internship, or research evaluation of student work
_____ Portfolio evaluation of student work
_____ Senior thesis or major project
_____ Capstone course
_____ Other:

Indirect methods:

X Student survey [entry; mid; exit] (please identify) Dept. Exit Survey
____ Alumni survey (please identify years post graduation) _____
X Job or post-baccalaureate education placement
_____ Student evaluation of instruction
X Student interview or focus group
X Student or alumni honors
_____ Peer review of program
_____ External program review
_____ Grade, curriculum, and/or syllabus review
_____ Employer feedback
_____ Outreach participation
_____ Comparison or benchmarking
X Other: GRADE TOPOGRAHY

Evaluators (please indicate if specific to a particular method):
_____ GTA
_____ Contract instructor
_____ Adjunct faculty
X Faculty
_____ External evaluator

X Individual evaluator
X Multiple evaluators

2008 Annual Report of Student Learning Outcomes
Physics Undergraduate Major

I. Activities in support of outcomes assessment/ Methods employed

From July 2007 through June 2008, the Undergraduate Studies Office (USO) and the Undergraduate Studies Committee (UGSC) of the Physics Department Committee (UGSC) has devoted approximately 50% of its efforts toward the collection of, review, and response to outcomes assessment. These activities include:

1. 2007 Annual Report of Student Learning Outcomes, assessment data and were presented, reviewed and discussed. Important areas of concern were identified including: growth of the undergraduate major and its impact on effective pedagogy; increasingly diverse interests of undergraduate majors and its impact on effective mentoring; providing appropriate assistance/preparation for postgraduate plans of the majors including undergraduate research/co-op/internships opportunities, the need for computing / programming experience integrated throughout the curriculum and under representation of women in the major.
2. Major Fields Test (MFT) was used as a direct assessment measurement instrument. All students in Physics 616 (Senior Lab) were required to take the MFT in order to receive a grade in Physics 616 however performance on the MFT played no role in a student's course grade. Thirty seven students took the MFT during the 2007-2008 academic year. Thirty five of these were graduating seniors. Results were collected, summarized, and are attached.
3. Departmental exit interview questions were revised to be quantitative. Questions were added to provide data on areas of concern, including post graduation plans. Exit interviews were attempted for all projected graduates Summer 07 through Spring 08. Of the 50 students who graduated, 50 were interviewed (100%). Results have been summarized and are attached.
4. Grade Topography Data and GRE Summary Statistic Data were collected for core major program courses.
5. Undergraduate research activities of graduates were compiled as part of the departmental exit interview.
6. UGSC revised the assessment plan to reflect current concerns, clarify goals and discuss possible alternate assessment instruments (i.e. embedded questions in core course final exams). Discussion regarding alternate direct assessment instruments and success criteria will continue in autumn 2008.
7. Departmental events continue to be an important mechanism for collecting student feedback and concerns regarding general and specific programmatic issues. These events include but are not limited to: weekly undergraduate TEA's, SPS meetings, end of autumn quarter party, and spring graduation breakfast.

The results of all assessment tests, interviews, and surveys are attached in Appendix B of this report and will be reviewed during the first UGSC meeting in Autumn 2008.

II. Evidence / Expected outcome assessed and results

The major program objectives and evidence are:

GOAL #1 Undergraduate Physics majors will acquire a basic mastery of the four fundamental areas of physics.

Direct measures: MFT Assessment Indicators, MFT subscores & GRE Statistics are at or above national average. Grade Topography data for Physics 555, 631, 621 have been collected and reviewed by UGS.

Indirect measures: Exit Interview: Students self report agreement with goal statement at an average score of 4.11 out of 5 where 5 is strong agreement that this goal has been met. Other data include student recognition that 555, 631, and 621 prepare them well for their post graduate pursuits.

GOAL #2 Undergraduate Physics majors will develop powerful analytical and problem solving skills.

Direct measures: MFT Assessment Indicators, MFT subscores & GRE Statistics are at or above national average. Grade Topography data for Physics 261, 262, 263 have been collected and reviewed by UGS.

Indirect measures: Exit Interview: Students self report agreement with goal statement at an average score of 3.93 out of 5 where 5 is strong agreement that this goal has been met. Other data include student recognition that 261, 262, and 263 prepare them well for their post graduate pursuits.

GOAL #3 Undergraduate Physics majors will acquire a basic mastery of experimental physics.

Direct measures: Grade Topography data for Physics 416, 517 and 616 have been collected and reviewed by UGS.

Indirect measures: Exit Interview: Students self report agreement with goal statement at an average score of 3.91 out of 5. 62% of students interviewed felt there were a sufficient number of labs in the curriculum however approximately 4% commented that a computer programming course should be required and another 6% commented that optics should be included. A few students commented with concerns about the statistics presented in 416 as being inadequate, too directed, or not related to physics. A few students commented that they liked the independence of 616 and felt the other lab courses should be similarly independent.

Student Honors / Research Activity - 2 physics students were awarded prizes in the Denman Research Forum and 7 physics students have been awarded scholarships to pursue their undergraduate research during the summer of 2008.

GOAL #4 Undergraduate Physics majors will acquire a basic mastery of data reduction and error analysis.

Direct measures: Grade Topography data for Physics 416, 616 and 621 have been collected but are not yet analyzed.

Indirect measures: Exit Interview: Students self report agreement with goal statement at an average score of 4.0 out of 5. When specifically responding to experiences in 416 and 616, a few students commented that the statistics presented in 416 is inadequate, too directed, or not related to physics. Also note the comments in Goal #3 above.

Student Honors/ Research Activity: See comments in Goal #3 above.

GOAL #5 Undergraduate Physics majors will be able to effectively communicate their physical understanding both professionally and colloquially (orally and in writing). Relevant courses include Physics 555, Physics 596 and Physics 616.

Direct measures: Grade Topography data for Physics 555, 596 and 616 have been collected but not yet analyzed.

Indirect measures: Exit Interview: Students self report agreement with goal statement at an average score of 3.91 out of 5. Some students commented that some Physics 596 instructors teach the course in such a way that it should be introduced earlier in the curriculum.

Student Honors/ Research Activity: See comments in Goal #3 above. Also note an increased participation and attendance in public presentation of research such as MAPS Research Forum and Denman. This year the undergraduate physics student presence at the 2008 MAPS Research Forum almost doubled compared with 2007, though the number of participants across the college remained approximately constant.

GOAL #6 Undergraduate majors will be apprised of and encouraged to participate in academic research, industrial research and/or outreach activities which are consistent with their interest, ability and postgraduate plans.

Direct measures: Exit Interview: 33 Graduates had, upon graduation, participated in at least one research/co-op or intern experience. 9 out of the 33 students who said they had research experiences had 1 experience; 12 out of 33 had 2 experiences; 12 out of 33 reported 3 or more experiences. Here an experience is defined as activity with a single research group or organization. Graduates averaged 6.5 quarters of undergraduate research/co-op/intern experience

Indirect measures: 20 Physics majors[1] participated in the MAPS Research Forum. This is up from 14 Physics majors in SP07. 19 Physics majors participated in the Denman Research Forum. This is up from 11 Physics majors last year. Ann Elliot won first prize in Physics and Nathaniel Ross won first prize in Astronomy at the 2008 MAPS Research Forum. Caitlin Malone won 2nd place and Daniel Chait won 3rd place in the 2008 Denman Research Forum in the Mathematical and Physical Sciences Division.

[1] Some physics majors presented work done with researchers in other departments or at other institutions

Criteria for meeting learning objectives is a priority for the UGSC during the 2008-2009 academic year. While these criteria are yet to be defined, data collected from direct and indirect assessment instruments this year (Major Fields Test, exit interviews, grade topography, undergraduate research activity, student honors and faculty honors) indicate that our majors are performing above national averages in most learning objectives. See Appendix B for summarized data.

Possible areas of weakness include: mastery of experimental techniques and data reduction (Goals 3 and 4). A direct measure of achievement in these goals has not been firmly established. Capstone experiences have been identified but they were not evaluated in the current cycle. This is discussed further in Section III and IV of this report. Grade Topography Data have been collected but not analyzed. These data may provide further insight into areas of strength and weakness.

OTHER FINDINGS: Through exit interviews, departmental surveys, demographic data and student feedback at departmental events such as the weekly social events with the students, we receive significant information about student perception of the program and issues of concern. Through the exit interviews (summarized in Appendix B), we see that 72% of students felt the program as it currently exists, is sufficiently diverse though 18% commented that optics and / or a particles class should be offered, and 4% commented that a nanoscience course should be offered. All three of these courses will be offered at least one quarter during the 2008-2009 school year. The faculty members are perceived as very accessible, knowledgeable and helpful. This perception was further validated when the University Distinguished Teaching Award 2008 was given to Dr. Robert Perry. Students rate their comfortableness / acceptance in the department at 3.8 out of 5. Students greatly appreciate and utilize the undergraduate lounge however they also comment on the strong need for computer upgrades (computer upgrades will be complete by Autumn 2008), better computer accessibility, basic maintenance of furniture and structure i.e. chairs, tables, new carpet, new coat of paint, etc.

Other positive indicators regarding the overall program include: Number of graduating seniors stayed the same relative to last year. Time to complete the degree for students graduating during the 2007-2008 assessment cycle averaged approximately 14 quarters - down from 15 quarter last year. 36% of the graduating seniors received some type of Latin Honor upon graduation. 9 women graduated with a bachelor's degree in physics in 2007-2008. This corresponds to 18% of the graduating class. In 2006-2007, there were 13 female graduates constituting 26% of the graduating class. Nationally, the percentage of women receiving physics bachelor's degrees has increased from 9% in 1978 to 23% in 2004. Given the small numbers of women in our program, it will be important to monitor both the number and percentage of women graduates over the next several years to assess whether the data reflect a positive trend toward agreement with national norms.

The Major Fields Test (MFT) was continued in 2007-2008 as a direct assessment instrument. While it does not test all learning objectives in our assessment plan (See Appendix A for current assessment plan), it does provide a standardized measure of goals 1, 2 and 4. Its strengths are standardization and the ability to compare with schools nationwide. Its weaknesses include summary reports that do not easily correlate with our learning objectives and questionable preparation of the students taking the exam.

In our implementation, all students taking Physics 616 (Senior Experimental Lab) are required to take the test in order to receive a grade in the course. Since this course is typically taken in the final year of a student's academic curriculum, we were able to sample 70% of graduating seniors. Though we advised students to use this exam as an opportunity preparation for the GRE Subject test, many students took the exam without preparation. It is therefore likely that we do not have an accurate indication of the best abilities of our students. It can be argued, however, that we do have a "worst case" measure of the "walking around the lab" knowledge of a typical graduating senior. When viewed from this perspective, the greater than 65th percentile achievement of our students on all aspects of the exam might be interpreted as indicating that we are meeting the objectives of: mastery of four fundamental

areas of physics, development of powerful analytical and problem solving techniques, and ability to communicate physics effectively colloquially and professionally. Critiques of this evaluation include: 1. The assessment indicators and subscores for the exam do not correlate directly with our specific learning objectives. 2. Our perceived academic peers are not among the pool of schools currently using this instrument. 3. It is unclear what level of knowledge we have evaluated given the uneven preparation of students taking this exam. These data will be discussed with the UGSC in autumn 2008. An alternate direct measure under consideration is tracking a set of "MFT-like" questions embedded in core course exams.

GRE Subject score summary statistics were gathered in the hopes of using this data as a direct measure of student achievement. Unfortunately, these data rely on a student self reporting his undergraduate institution. Apparently many OSU students decide against making this identification. Those who did show that OSU students perform at or above the mean of all US students taking the GRE Subject test. Since the GRE Subject test is a well respected measure of student mastery of fundamental physics and problem solving, this provides us with an indicator that in the past OSU students have met goals 1 and 2.

Our primary indirect measures are: departmental exit interview and honors/achievements of students and faculty. Of the 4 instruments, we currently rely most heavily on the exit interviews. One strength of the exit interviews is the ability to obtain detailed knowledge from a significant fraction of the student population. Since our interviews were conducted at the time that graduation paperwork was completed, we had a 100% participation rate. This strong response rate lends credibility to conclusions reached from the data. Another strength of the interview is the opportunity to clarify questions that might be misunderstood if given in the form of a survey and to probe deeper on areas of concern. One critique is that the subjective nature of an interview can lead to data that may be subject to interpretation. Also, since this data is collected before graduation, it does not reflect last minute changes in the student perceptions, activities, etc. To address some of these concerns, exit interview questions for 2007-2008 were modified to be, whenever possible, quantitative which has increased the usefulness of the data and eased its analysis.

III. Data usage / Feedback mechanism / Actions taken

All data from 2006-2007 Annual assessment report were presented to the UGSC during a meeting autumn 2007. Data were discussed, particular points of concern were noted and became action points for the committee this year. Primary areas of concern noted were:

1. The bimodal distribution of student abilities/interests in conjunction with increasing class size creates an increasingly challenging environment for effective teaching. Though of concern in all upper division courses, it was particularly notable in quantum mechanics where terminal Bachelors students only need an overview of the material but graduate school bound students require a more rigorous offering. This problem was the subject of significant discussion during the UGSC monthly meetings. As a result of these discussions as well as meeting with students in Physics 262 (course prior to quantum mechanics), Physics 632 (2nd course in quantum mechanics), and SPS, a possible solution was piloted in Autumn 2007.

Two quantum courses were offered in Autumn 2007. One course, 631, is more mathematically rigorous than the previous quantum physics offering. The second course, 594, provides an overview of modern physics and introductory quantum, but without the mathematical rigor. After the initial offering, student /instructor feedback was collected and discussed at a UGS meeting Winter 2008. During this meeting, the committee decided to continue offering two quantum courses Autumn 2008.

2. The graduating class of 2006-2007 consisted of 26% women. The graduating class of 2007-2008 consisted of 18% women. The entire major program in 2005-2007 consists of approximately 15% women. Nationally, women constitute 24% (or more) of the undergraduate physics majors. These data indicate a significant under representation of women within our undergraduate physics curriculum. Initial attempts to address this concern included special attention to advising, distributing information about various conferences and events targeted toward women in science, and quarterly meetings with the vice-chair and chair. Ultimately 3 of our majors were selected to attend the 2nd Annual Conference for Undergraduate Women in Physics. The UGSO supported the application and travel to the conference. Upon return, the attendees decided to form their own organization, Women in Physics (WIP), which had its kickoff in April of 2007. This organization hosted a summer camp for Jr. High School girls from June 23 to June 27, 2008. The camp, named Girls Reaching to Achieve Sports and Physics (GRASP), was created to encourage girls to pursue a career in science. Already, the retention of women within the program is showing signs of improvement (the graduating class of 2005-2006 was comprised of only 7% women). As indicated above, women comprised 18% of the 2007-2008 graduating class. Projections for next year's class appear similar. Given the small numbers of women in our program, it will be important to monitor both the number and percentage of women graduates over the next several years to assess whether the data reflect a positive trend toward agreement with national norms.

3. The proposed use of Physics 616 as a capstone experience forced a close examination of the state of the course. Student feedback indicated that the course needed to be "updated". Dr. Gan, a regular instructor of the course, made a presentation regarding the status of equipment, physical environment, and pedagogical issues facing instructors and students of the course. In response, the course received new computing equipment and four new experiments during the 2007-2008 academic year.

4. A GRE Subject test preparation course was sponsored by the UGSO but run by the Society of Physics Students during Summer 2007. That was the second time the course was offered after multiple student requests as well as growing concerns among members of the UGSC regarding student preparation for their post graduate plans were expressed. The success of this intervention is difficult to measure since test scores are private. Students participating in the first offering of the course provided significant and helpful critiques toward improving the course. These suggestions have been incorporated in this summer's offering of the course. In order to provide a more quantitative measure of success for this intervention, it is possible that questions about the GRE test scores could be collected as part of the exit interview. An indirect measure would be a survey of acceptance into graduate schools of choice.

5. Although the 2006-2007 Annual report indicated that the rate of student participation in undergraduate research activity is equal to the national average (30%), several other factors indicate that a broader range of undergraduate research opportunities need to be afforded to our majors. These factors include: relatively high unemployment rate of our majors, difficulty in physics graduate school placement for some highly qualified students, and exit interview comments indicating that undergraduate research is "difficult" to find. These factors reflect the growing importance of undergraduate research participation and publication in graduate school and private sector employment applications. The UGSO utilized several techniques to help promote undergraduate research activity during 2007-2008. These include:
a. Creation of an employment/co-op/summer REU website which hosts information about employment opportunities, coop opportunities, Summer REU's, as well as programs run by the university Undergraduate Research Office and college career services offices.
b. Increased one-on-one assistance given to majors to find appropriate opportunities
c. Continuation of the Grilly Summer Research Scholarship which will provide partial funding for 7 undergraduates to do research during the summer of 2008.
d. Financial assistance for printing posters for the MAPS Research Forum and the Denman Research Forum..

These methods have resulted in an increase in the number of presentations made and scholarships awarded to students. Thus far, there have been no significant changes in the percentage of students participating in research activity. This will be discussed in the autumn 08 meeting.

Finally, in an attempt to accurately address the possibilities within Physics and correlate them with the diverse interests of incoming students, members of the UGSO taught a freshmen survey course to provide students with a stronger first introduction to members of the department, an introduction to key departments and services within the department and the university, as well as degree requirements and options within the program. A scheduling event was held in Spring 2008, to provide a "mass advising "opportunity so that students could have questions about the program or scheduling answered directly.

6. During the 2007-2008 academic year 517 and 416 upper division labs were updated. The number of work stations in both 517 and 416 were increased by 30% In order to accommodate more students. The location of both classes was changed to larger rooms with brand new computers.

7. During the upcoming academic year, there will be new classes available for technical electives, and will be offered at least one quarter during the year. These classes include: nanotechnology, atomic and molecular physics, detector physics, biophysics, and methods of theoretical physics. We will also continue offering optics and computational physics as technical electives. The nanotechnology and optics courses are both listed under "594", with the hopes that they will eventually become permanent classes in the department.

IV. Future planning / Specific Action Plan for the next year

During 2008-2009, the UGSO and UGSC plan to:

1. Review of Assessment Data[2] during the second departmental meeting in Autumn 08. Target concerns:

   a. Review of MFT data - define criteria for successful achievement of goals or pilot new instrument
   b. Define criteria for success for all learning objectives in the assessment plan.
   c. Review placement of 596 in curriculum
   d. Implement direct measures for assessing goals 3 and 4.

2. Respond to the assessment data presented (AU08). This may include:

   a. Update exit interview data and other surveys to collect necessary information.
   b. Implement programs or interventions to deal with areas of weakness: laboratory experience, # of initially unemployed majors, preparation for post graduate plans, diversity, etc.

3. Review and continue 616 upgrade

4. Continue to support and monitor the Women in Physics organization

5. Plan 594 to become part of the curriculum

6. Evaluate mechanisms to increase undergraduate research opportunities for students and implement

7. Define course objectives for major program courses.

[2]. Review of Exit Interview Data; Grade Topography Data; MFT Data; Recruitment and Retention Data; Evaluation of 631/594; Evaluation of 616; Post Graduate Statistics, etc.

V. Regional campus involvement.

Regional campus involvement has not yet been addressed within our departmental model. This will be a topic of discussion during the first UGSC meeting in autumn 2008.

Appendix A: 2008 Revision of Assessment Plan

ASSESSMENT PLAN - DRAFT JUNE 2008

The Assessment Plan for the Undergraduate Physics Major Program attached is a "living" document. The Undergraduate Studies Committee (hereafter UGSC), in conjunction with other appropriate constituencies, will meet annually to discuss results of assessment instruments. All contents of the plan including mission, goals, learning objectives and/or assessment instruments may be modified in total or in part. Modifications may be made to this document in response to assessment instrument outcomes and/or in an effort to reflect the changing needs of the students, department or university. All modifications will require the approval of the Undergraduate Studies Committee.

MISSION STATEMENT:

The undergraduate Physics degree program at The Ohio State University provides physics majors with an understanding and appreciation of the fundamental physical principles that govern our universe through a challenging, state-of-the-art curriculum.

GOALS OF THE UNDERGRADUATE PROGRAM

1. Undergraduate Physics majors will acquire a basic mastery of the four fundamental areas of physics. Relevant courses include: Physics 555, Physics 621, and Physics 631

   LEARNING OBJECTIVES

   a. Students will understand both the relative strengths and ranges of the four fundamental forces: Gravitation, Electromagnetic, Weak and Strong.
   b. Students will understand the use and limitations of Classical Mechanics.
   c. Students will learn how to apply Maxwell's Equations for Electricity and Magnetism, and students will understand how these equations are related to optics and special relativity.
   d. Students will understand and know how to apply the postulates of quantum mechanics in a wide range of physical models.
   e. Students will know and understand the fundamental laws of thermodynamics.

2. Undergraduate Physics majors will develop powerful analytical and problem solving skills. Relevant Courses include Physics 261, 262, and 263

   LEARNING OBJECTIVES

   a. Students will develop the ability to model physical quantities and relationships mathematically and/or symbolically.
   b. Students will develop the ability to draw logical conclusions from physical data, theory, and models. This includes, but is not limited to: examining and evaluating assumptions, distinguishing relevant from irrelevant facts, recognizing contradictions, exploring implications and consequences.

CONTINUATION OF GOAL #2:

c. Students will develop the ability to use and manipulate mathematical techniques to solve physics problems.
d. Students will develop the ability to use and understand graphical techniques to extract statistical information from data.
e. Students will develop the ability to use computer software and/or create algorithms to simulate systems, model experiments, model theory and predict outcomes.

3. Undergraduate Physics majors will acquire a basic mastery of experimental physics. Relevant courses include Physics 416, 517 and 616.

LEARNING OBJECTIVES

a. Students will learn how to use basic laboratory instruments and equipment to conduct an experiment.
b. Students will experimentally test physical systems.
c. Students will learn how to present the results of their experiments both orally and in written reports.

Examples of standard measurement techniques: use of digital oscilloscope, digital multimeter, and computer interface (i.e. LabView). Additionally, depending on the student's choice of physics major option, familiarity with optical interferometers, semiconductor detectors, multichannel analyzers, etc. may be expected.
Examples of standard measurements include: Magnetic Susceptibility, Compton scattering, Hall Effect, X-ray Diffraction, etc.

4. Undergraduate Physics majors will acquire a basic mastery of data reduction and error analysis. Relevant Courses include Physics 416, 616 and 621.

LEARNING OBJECTIVES

a. Students will understand the origins of experimental uncertainties, both systematic and random.
b. Students will learn to perform meaningful statistical analyses of data.
c. Students will acquire the skills to quantitatively analyze physical data and understand the limitations of measurement.

Examples of basic statistical analysis, data reduction and error analysis include, but are not limited to: the ability to report uncertainty in a measurement, the ability to propagate error through an experiment, understanding the difference between random and systematic error in an experiment, knowledge of normal distributions, understanding the use of standard deviations and confidence limits, understanding appropriate criteria for rejection of data, understanding least squares fitting of data.

5. Undergraduate Physics majors will be able to effectively communicate their physical understanding both professionally and colloquially (orally and in writing). Relevant courses include Physics 555, Physics 596 and Physics 616.

CONTINUATION OF GOAL #5

LEARNING OBJECTIVES

a. Students will learn to create graphics that clearly communicate scientific data
b. Students will learn to explain and defend scientific arguments in a written form.

6. Undergraduate majors will be apprised of and encouraged to participate in academic research, industrial research and/or outreach activities which are consistent with their interest, ability and postgraduate plans.

LEARNING OBJECTIVES

a. Students who participate in research activities will learn how to integrate their physics education while approaching a technical problem.
b. Students who participate in research activities will develop non-academic, professional skills appropriate for their postgraduate plans.

METHODS OF ASSESSMENT:

Below are assessment instruments both currently collected and/or being considered for use. Results from these methods are either made available immediately after collection OR will be made available at the annual UGSC meeting to review of the Assessment Plan.

Direct Methods of Assessment :

During the 07-08 academic year, the Undergraduate Studies Office collected data from:

a. Major Field Test
b. GRE Subject Test (via Summary Statistics)

These instruments are intended to assess student achievement in goals: 1, 2, and 4

The use of embedded questions and/ or Pre- Post- testing is under consideration pending the information obtained from the instruments currently in use. It has been proposed that advise from our Physics Education Research group should be sought for the construction of an instrument or embedded questions to ask in our upper division courses (Physics 555, 631, and 621). Finally, a capstone experience for all majors is under consideration. Implementation issues, modifications in course objectives, and curricular issues remain to be discussed and/or resolved.

Proposed Criteria / Outcome: Criteria are yet to be determined. Currently, all students taking Physics 616 are required to take the Major Fields Test in order to receive a grade in Physics 616. Currently it is argued that success in meeting student goals 1, 2, 4 would be indicated by passing the subtopics that correlate with stated learning objectives. A passing standard however is yet to be determined by UGSC.

Indirect Methods:

For indirect methods 1-6, the proposed criterion is a perception of excellence among students, faculty and peer institutions at meeting the stated outcomes and learning objectives for the applicable goal.

1. Exit Interviews. Exit Interviews are currently conducted on all graduating seniors. The interview includes questions on student perception of curricular strengths, faculty strengths, as well as perceived needs in the program. Data is also collected regarding research activity, honors and post graduate plans of the students.

2. Town Halls, SPS Meetings with Vice Chair, Student surveys, and Scheduling Events: These events/instruments are used currently to obtain student input on the program and to address student concerns.

3. Grade and syllabus review: Proposed as a means of assessing and standardizing student achievement of learning objectives. Not implemented

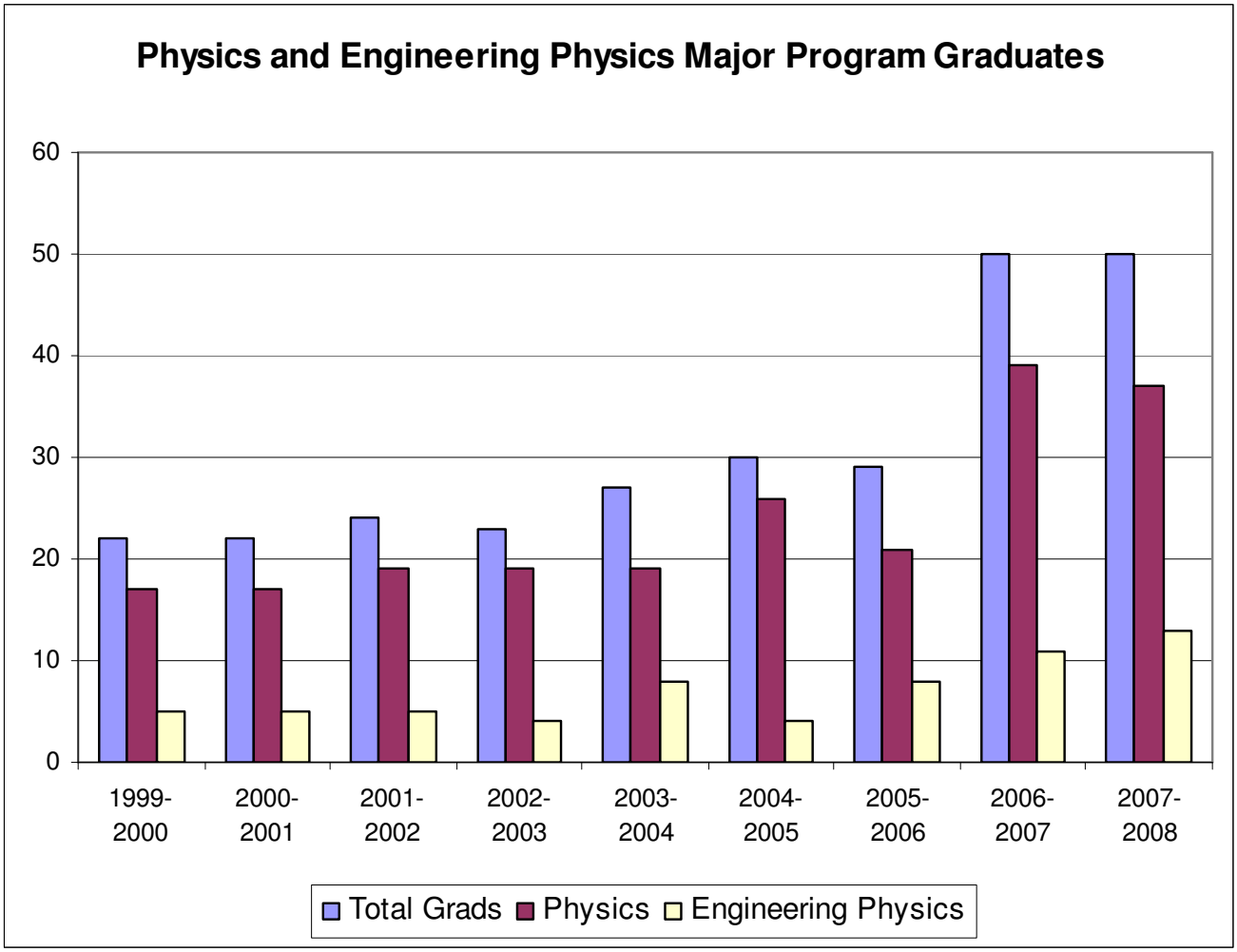
4. Alumni Surveys: Pilot Alumni surveys implemented to assess achievement of all student and program goals.

5. Grade Topography Data: These data consist of plotting the number of students receiving a final course grade versus final course grade for each class of each course. The idea is that if we assume our students are more or less of the same caliber and that instructors hold similar standards, then the unique learning objectives / syllabii for each course will result in a stable pattern of grade distribution for a given course. Significant deviations from such a pattern would provide direct evidence of either: student learning variability or faculty pedagogical variability. In either case, a close examination of the course, the instructors and the students would then be warranted.

Appendix B: Number of Graduating Seniors Chart, Graduating Class Statistics, Time to Degree Chart, Post Graduate Plans and Placement Charts, Grade Topography Data, GRE Summary Statistics, Exit Survey Data Summary, Undergraduate Research Activity Summary, MFT Summary, Table of Student Honors and Awards, Post Graduation Activity

NUMBER OF GRADUATING SENIORS CHART 1999 - 2008*

* Numbers are for Summer to Spring for the Academic Year Listed. These results in some variation from graphs presented in previous reports.



GRADUATING CLASS STATISTICS:

Undergraduate Majors/Minors Graduating from Summer 07 through Spring 08

DEGREE TYPE	**OPTION / SPECIALIZATION**	
ASC	Option A	18
	Option B	6
	Option C	1
	Option D	1
	Option E	2
	Option F	9
	TOTAL	**37**
EP		
	Aeronautical	1
	Electrical and Computer	6
	Biomedical	1
	Mechanical	3
	Computer Science and Engineering	2
	TOTAL	**13**
TOTAL MAJORS GRADUATED SU07 - SP08		**50**
Physics Minors		**4**

* One major completed the requirements for the degree but did not pay final fees and so has not officially received his degree

DEMOGRAPHICS		**ASC Physics**	**ENG Physics**	**TOTAL**
MALE		29	12	41 (82%)
FEMALE		8	1	9 (18%)
Non Caucasian Ethnicity				4 (8%)
	Asian	0	2	
	African American	0	1	

MULTIPLE DEGREES/MAJORS		
	Double (Dual Degree)	12
	Triple	0
	TOTAL	12 (24%)
AREAS OF OTHER MAJOR		
	Astronomy	6
	Math	2
	Accounting	1
	French	1
	Geography	1

	Chemical Engineering	1

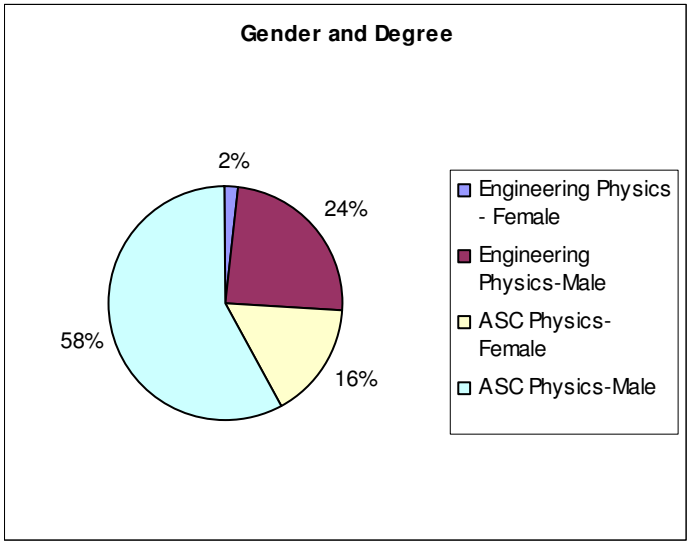
Minors earned by Physics and Engineering Physics majors: 11

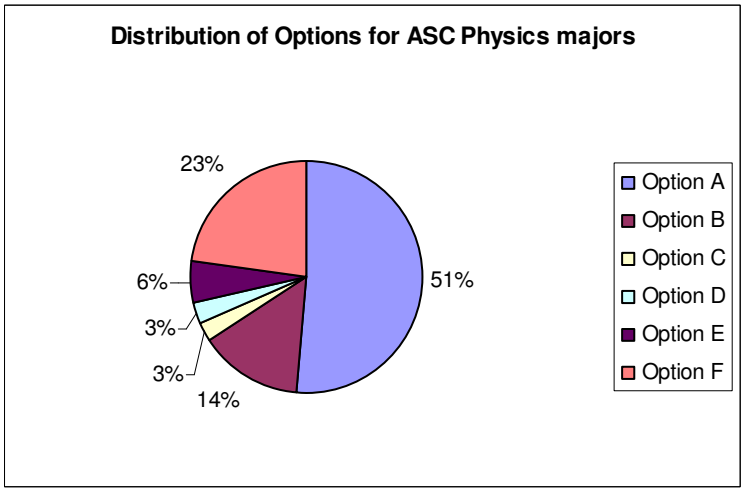
Areas: Biochemistry, General Business, Philosophy, Russian, Economics (2), Math (2), English, History of Art.

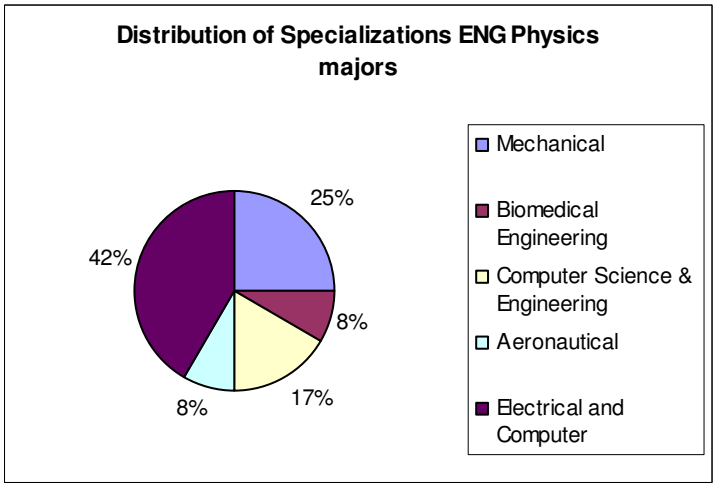
ACADEMIC PERFORMANCE		
GPA	Average	3.19
	High	3.98
	Low	2.05
HONORS STUDENTS		
	HONORS COLLEGE	14
	SCHOLAR	1
	TOTAL	15 (30%)
LATIN HONORS AWARDED		
	SUMMA CUM LAUDE	6
	MAGNA CUM LAUDE	6
	CUM LAUDE	6
	With DISTINCTION	?
	TOTAL	?

Average Number of Quarters to Graduate: 14.7 (High 47, Low 6) The number of quarter reported here are only quarters while attending OSU. Some students bring in a significant amount of course work from another institution which decreases this average.

Average Number of Earned Credit Hours to Graduation: 244.7 (High 347, Low 194) The Physics and Engineering Physics programs require 191 and 192 credit hours, respectively for graduation. The earned credit hours reported here include all earned hours whether at OSU or at another institution. Some students bring in a significant amount of course work from another institution which increases the average.


Gender and Degree
2%
24%
58%
16%
Engineering Physics - Female
Engineering Physics-Male
ASC Physics-Female
ASC Physics-Male

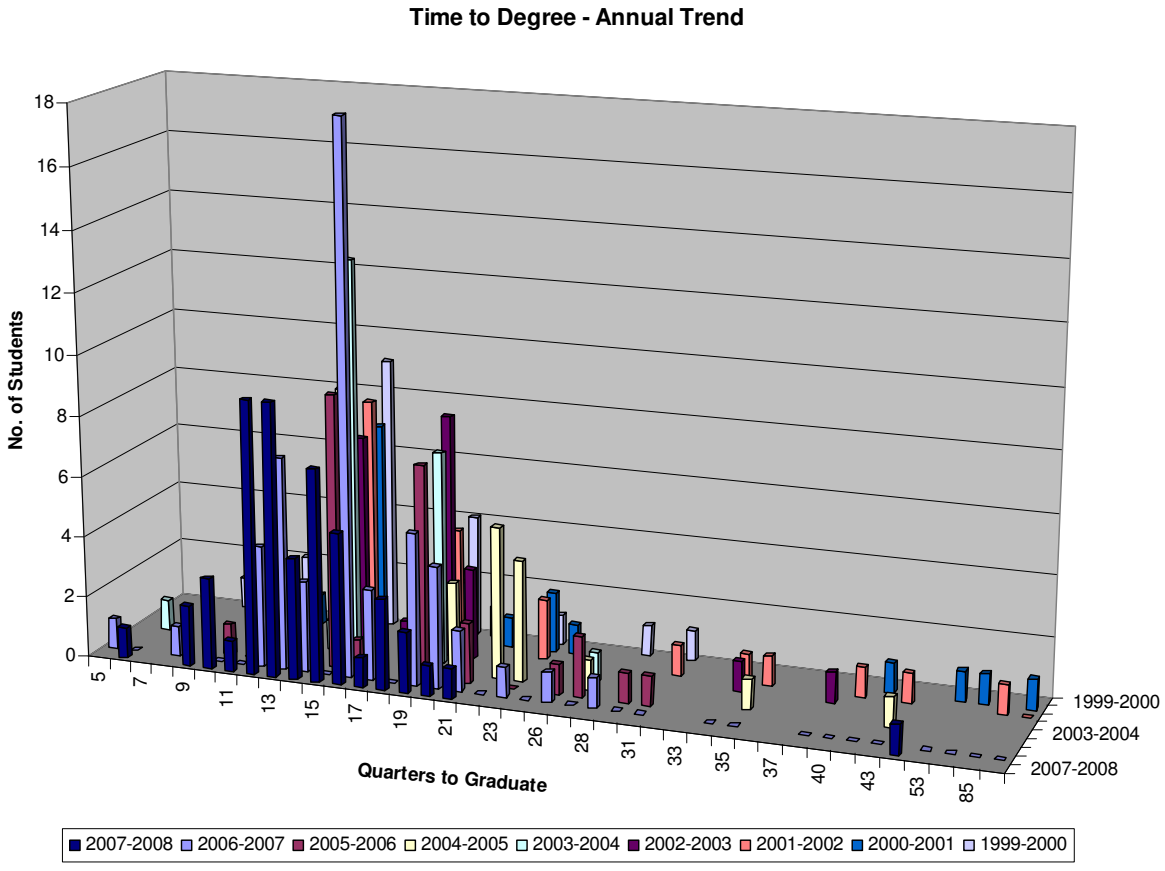

Distribution of Options for ASC Physics majors
23%
51%
6%
3%
3%
14%
Option A
Option B
Option C
Option D
Option E
Option F


Distribution of Specializations ENG Physics majors
25%
42%
8%
8%
17%
Mechanical
Biomedical Engineering
Computer Science & Engineering
Aeronautical
Electrical and Computer

TIME TO DEGREE CHART

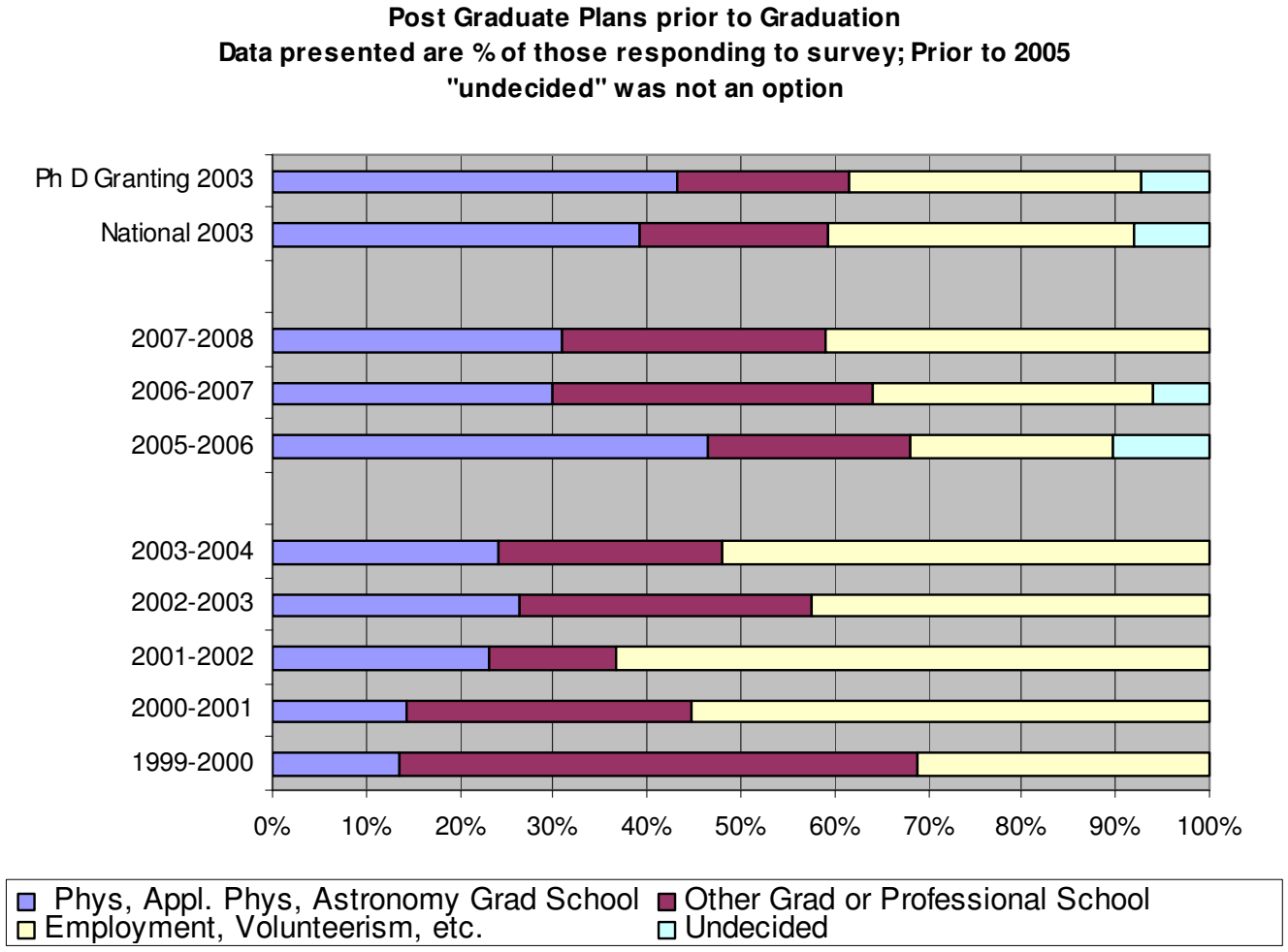
The following chart shows the number of quarters between first enrollment in the university and graduation for each academic year.

AY (SU-SP)	# of Grads	Ave. Time to Degree	Median Time to Degree	High	Low
1999-2000	22	16.86	15	31	8
2000-2001	22	24.95	18	89	11
2001-2002	24	23.88	18.5	85	11
2002-2003	23	18.91	19	38	11
2003-2004	27	16.11	15	27	6
2004-2005	30	20.11	19.5	43	12
2005-2006	29	18.82	19	31	10
2006-2007	50	15.68	15	28	5
2007-2008	50	14.7	13	47	6
TOTAL	277	18.89	16.5	89	5



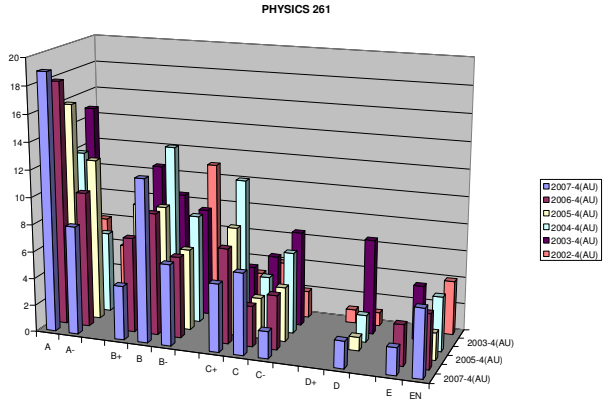
POST GRADUATE PLANS OF GRADUATING SENIORS PRIOR TO GRADUATION

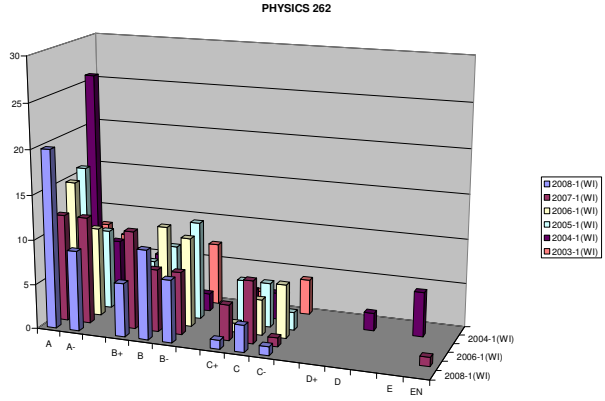
A note of caution: During 1999 -2004 the response rate for the Exit Survey was over 90%. For 2006-2007 and 2007-2008, the response rate was 100% and 98%, respectively. In 2005-2006, the response rate was significantly less (~63%).

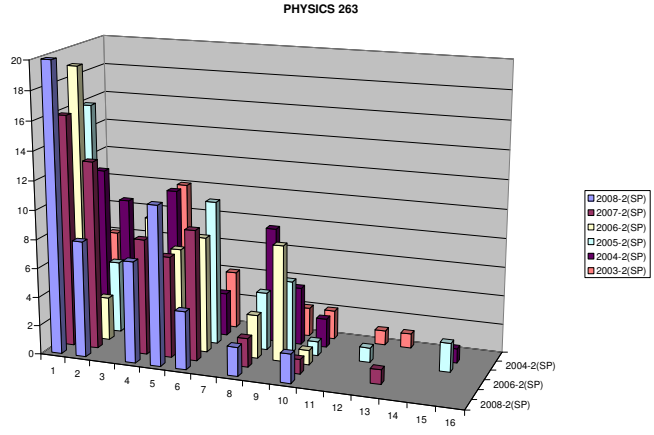


GRADE TOPOGRAPHY DATA

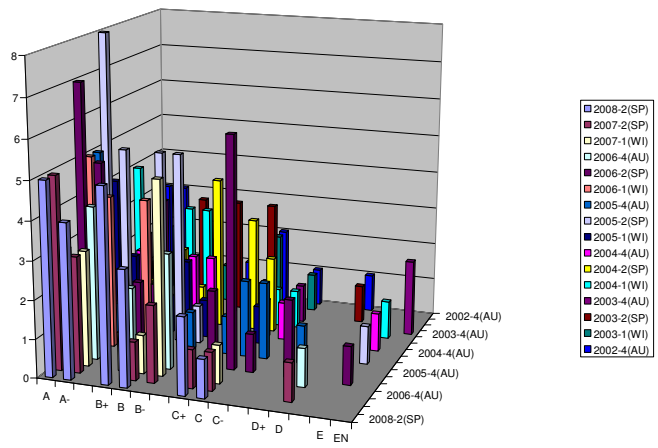
Number of students receiving specific grades versus quarter for core Physics courses



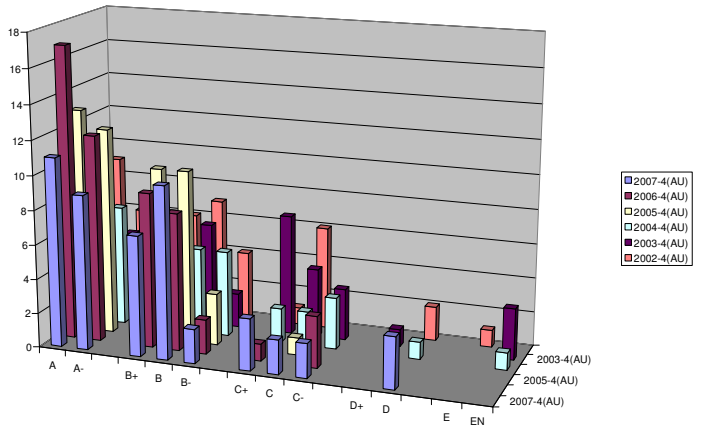




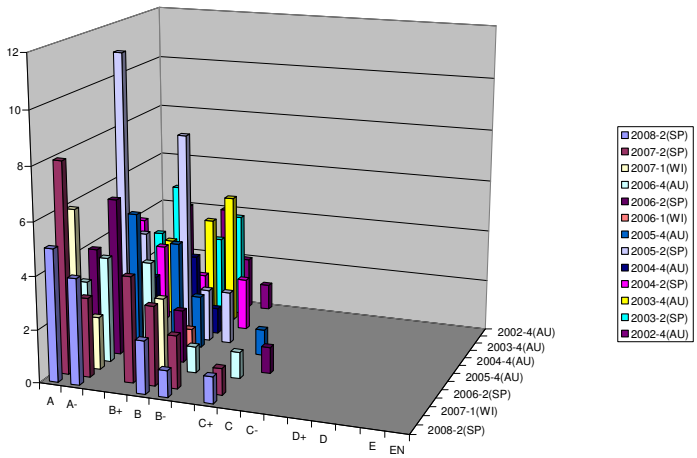
PHYSICS 416



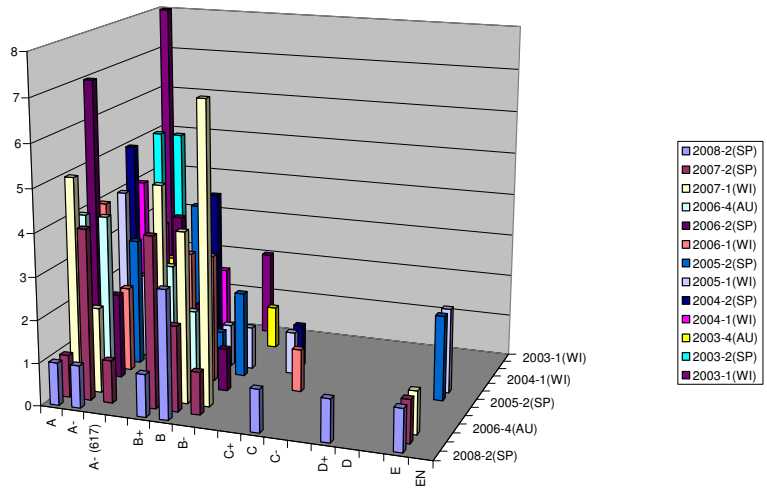
PHYSICS 555



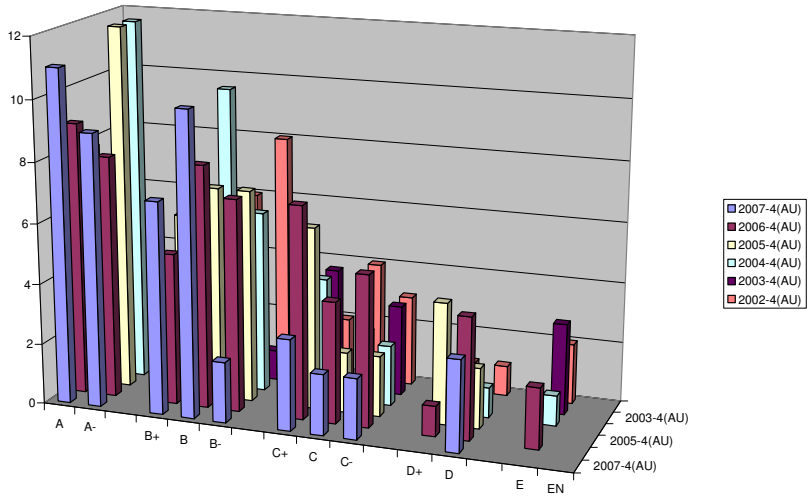
PHYSICS 596



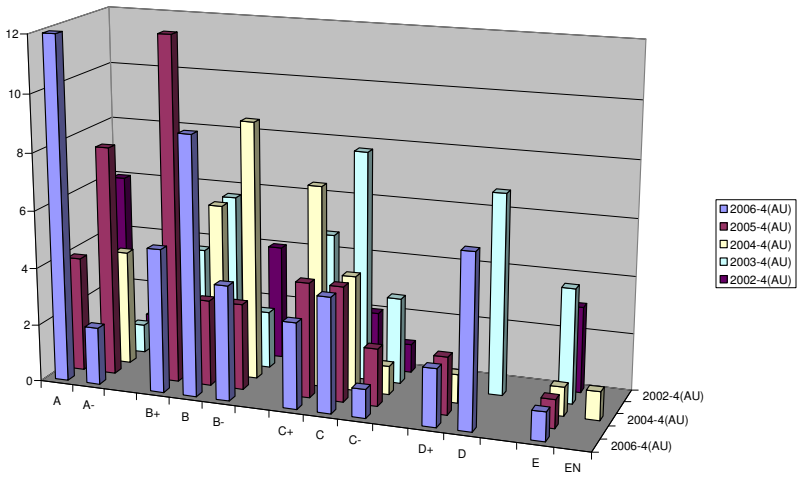
PHYSICS 616 and 617



PHYSICS 631



PHYSICS 621



GRE SUMMARY STATISTICS DATA: 2000 - 2005

*AU 2005 data and beyond had not yet been summarized when the summaries were ordered.

YEAR	OSU-HIGH	OSU - LOW	OSU-AVERAGE	US MEDIAN
2000-2001	990	400	720	720
2001-2002	890	600	750	745
2002-2003	790	500	650	645
2003-2004	NR			
2004-2005	NR			

EXIT SURVEY ACADEMIC YEAR 2007 – 2008, DATA SUMMARY:

Summary of data gathered on Graduating Undergraduate Majors from Summer 07 through Spring 08

Program Goals

Students were asked to indicate whether they agreed that their undergraduate physics / engineering physics program provided them with the following skills. 5 = strong agreement with the statement.

1. Mastered the fundamental areas of physics: classical mechanics, electricity & magnetism, quantum mechanics, and thermodynamics: 4.30+/- 0.71

2. Developed analytical and problem solving skills necessary to understand and analyze physical systems: 4.77 +/- 0.48

3. Acquired a basic mastery of experimental physics: 3.78 +/- 0.94

4. Acquired a basic mastery of data reduction and error analysis: 4.08 +/- 0.99

5. Acquired an ability to effectively communicate scientific understanding colloquially and professionally. 4.08 +/- 0.80

Courses/ Curriculum

Students were asked to indicate the importance of each sequence in the program, the degree to which those courses prepared them for their personal post graduate pursuits, and to indicate which courses were favorites. 5 indicates very important, prepared student well, and was a favorite course.

	FAVORITE COURSE (5) / WORST COURSE (1)	IMPORTANCE	PREPARATION
Mechanics (Physics 261, 262, 263, 664)	4.09 +/- 1.20	4.08 +/- 1.19	3.93 +/- 0.99
Undergraduate Seminar (Physics 295)	4.27 +/- 0.98	3.72 +/- 1.14	4.61 +/- 0.65
Fields and Waves (Physics 555,656,657)	3.38 +/- 1.26	3.84 +/- 0.96	3.47 +/- 1.29
Intro. to Quantum (Physics 631, 632, 633)	4.42 +/- 1.93	4.06 +/- 1.30	3.50 +/- 1.34
Statistical Physics (Physics 621, 622)	3.49 +/- 1.09	3.1 +/- 1.36	3.46 +/- 1.05
Senior Seminar (Physics 596)	3.22+/- 1.39	3.57 +/- 1.34	3.98 +/- 1.33

	FAVORITE COURSE (5) / WORST COURSE (1)	IMPORTANCE	PREPARATION
Experimental Physics (Physics 416)	3.55 +/- 1.33	3.89 +/- 1.32	3.94 +/- 0.99
Electronics Lab (Physics 517)	3.52 +/- 1.45	3.63 +/- 1.46	3.65 +/- 1.27
Advanced Physics Lab (Physics 616)	3.85 +/- 1.55	3.79 +/- 1.52	4.14 +/- 1.45

Programmatic Questions:

1. Were there enough upper division labs? Yes = 31, No =7, Maybe= 5

Most common comment - need for newer equipment. Labs need to be more independent - similar in style to 616. A few students suggested a capstone class.

2. Was there a sufficiently diverse set of physics courses in the curriculum? If not, what would you add? Yes = 36, No = 5, Maybe= 4

Most common comment - need an optics course, a nanoscience course, a biophysics course, a modern physics course, and a particle physics course. All of which are now being offered at least one quarter during the 2008-2009 school year.

3. To what extent were the faculty accessible and helpful to you? 4.42 out of 5 (5 = very helpful.)

Special mention was made of Furnstahl, Perry, Kilcup, and Winer.

4. To what extent did you *PARTICIPATE* in SPS or Sigma Pi Sigma events? 1.96 out of 5

(5 = all time). Most who did not participate felt this did not impact their program. Some students mentioned specifically how useful it was to meet with the faculty and have an opportunity to personally ask individual questions about research.

5. To what extent did you feel included as part of the department? 3.80 out of 5.

(5= strongly felt part of the community)

6. To what extent did you utilize the student lounge area in Smith Labs? 3.87 out of 5

(5 = all time)

Several comments were made that the lounge needs attention: new furniture, more access to computers, 24 hour access to the study lounge. Students commented that the computers are old. All the computers in the study lounge are scheduled to be replaced during Summer 2008.

UNDERGRADUATE RESEARCH ACTIVITY
(SUMMER 2007-SPRING 2008)

No. of presentations made at MAPS Research Forum: 20
In 2007 there were 14 student presentations from Physics.
No. of presentations made at Denman Competition: 19
Two prize winners, 2rd and 3rd place, were physics majors presenting physics research.
In 2007 there were 11 student presentations from Physics.

Presentations at April 2008 APS meeting in St. Louis, Missouri: Jessica Hanzlik, Doug Schaefer, Kevin Coburn, Caitlin Malone, Anne Elliott, and Lindsey Perry

Presentations at the 2008 Women in Physics Conference at University of Michigan: Lindsey Perry and Caitlin Malone

Presentations at the 2007 APS meeting in Oxford, Ohio: Jessica Hanzlik, Caitlin Malone, and Lindsey Perry

GRADUATING SENIORS:
66% (33 of the 50) graduating students interviewed had participated had either an undergraduate research experience, co-op, or internship relevant to their postgraduate plans.

Average time involved in undergraduate research: 6.5 quarters
Maximum time: 15 quarters
Median time: 6.0 quarters

In 2003, 71% of the nation's physics graduating seniors had participated in some type of undergraduate research before graduation. In 2007-2008, 66% of the graduates participated in one or more research experience before graduation. In 2003, 63% of the nation's physics graduating seniors participated in more than one research project before graduation. In 2007-2008, 48% of OSU physics graduates participated in more than one research project before graduation.

In 2003, 80% of the nation's physics graduating seniors doing research received monetary compensation, 51% received credit hours, 12% received no compensation. Over 95% of OSU Physics majors doing research/ participating in a co-op or participating in an internship, either received monetary compensation or credit hours.

In 2003, 28% of the nation's physics graduating seniors who were doing research submitted a paper to a peer reviewed journal. 35% had their work presented at a national meeting. We currently do not have statistics for OSU graduates.

Approximately 28% of OSU Graduates participated in a research project outside of the OSU Physics department, 16% of OSU graduates participated in an REU program, 22% of OSU graduates participated in a Co-op or internship prior to graduation
National data from the AIP Statistical Research Center; Senior Report 2003.

MAJOR FIELDS TEST SUMMARY

TOTAL TEST

Score Range	Number in Range	Percent Below
200	0	100
195-199	0	100
190-194	0	100
185-189	0	100
180-184	0	100
175-179	3	92
170-174	4	81
165-169	5	68
160-164	3	59
155-159	3	51
150-154	5	38
145-149	1	35
140-144	6	19
135-139	4	8
130-134	0	8
125-129	3	0
120-124	0	0

	Subscore 1		Subscore 2	
	Introductory Physics		Advanced Physics	
Score Range	Number in Range	Percent Below	Number in Range	Percent Below
100	0	100	0	100
95-99	0	100	0	100
90-94	0	100	0	100
85-89	0	100	0	100
80-84	4	89	0	100
75-79	3	81	1	97
70-74	2	76	1	95
65-69	1	73	4	84
60-64	5	59	7	65
55-59	3	51	4	54
50-54	2	46	4	43
45-49	2	41	4	32
40-44	6	24	5	19
35-39	5	11	3	11
30-34	0	11	2	5
25-29	4	0	2	0
20-24	0	0	0	0

	MEAN	Standard Deviation	HIGH
Total Test Scaled Score	154	15	178
Subscore 1	54	16	83
Subscore 2	52	13	76

	MEDIAN
Total Test Scaled Score	153
Subscore 1	52
Subscore 2	52

TABLE OF STUDENT HONORS AND AWARDS 2007-2008

ASC Research Award:

Jessica Hanzlik (Au 2008) – French
Doug Schaefer (Au 2008) - Physics

Ohio Board of Regents Graduate Fellowship:

Rachel Mauk

2008 Rhodes Scholarship:

Jessica Hanzlik

NSF Graduate Research Fellowship:

Jessica Hanzlik
Garrett Elliott (Honorable Mention)
Greg Kestin (Honorable Mention)

Goldwater Recipients:

2008 Douglas Schaefer
2008 Christine Zgrabik
2007 Greg Kestin
2006 Michael Chmutov
2005 Dominick Olivito
2004 Tom Weisgarber
2003 Jason Randel
2002 Michael Tychonievich
2001 Karoline Gilbert
2000 Matthew Buoni
1999 Matthew Dorsten
Ilya Finkler
1997 James Baumgardner
1996 Garth Robins
1995 Jeffrey Fox

Honors Collegium

Christine Zgrabik - SR
Liana Bonanno – SR
Douglas Schaefer – SR
Randal Morgan - JR
Tyler Merz – SO
Jessica Roeder - FR

POST GRADUATION ACTIVITY SUMMARY

Undergraduate Majors/Minors Graduating from Summer 07 through Spring 08

Response Rate: 98%

Graduate School	Physics, Applied Physics, Mathematical Physics	13
	Astronomy	1
	Mathematics, Applied Math or Statistics	1
	Physical Therapy/Biomed Engineering	1
	Student Affairs	1
	Education	1
	Engineering	3
	Atmospheric Science	1
	Business- Accounting	1
	Law School	2
Professional School	Medicine	1
	Flight School	0
Continuing Education - non Graduate		1
Employed, Volunteering		10
Seeking Employment		12
TOTAL		49

Of those seeking employment, 6 are seeking permanent work, the other 6 will apply to graduate school in Engineering, Math, physics, or Education in the future.

Grad Schools that accepted our students include: University of Chicago, Oxford University, University of Washington, and Ohio State University

MAJOR PROGRAM ASSESSMENT REPORT FORM
2007-2008
Evaluation of Student Learning Outcomes in Major Programs
Colleges of the Arts and Sciences (ASC)
The Ohio State University

College: College of Mathematical and Physical Sciences

Department(s): Physics

Major: Physics

Level (Undergraduate/Graduate): Undergraduate

Contact Person and e-mail: Richard Hughes, hughes@mps.ohio-state.edu

Chair: James Beatty

Chair Signature: _____

Date: July 30, 2008

For Assessment Office Use Only

Reviewed by: _____
Date: _____

Implementation:
_____ Begun _____ Date implemented or planned
_____ Evidence collected
_____ Summary evidence provided
_____ Evidence reviewed by Program
_____ Program improvements attempted/made
_____ Action plan for next year based on evidence/review

Comments:

Assessment Report Summary (75-150 words):
The Physics Undergraduate Studies Committee has finalized a statement of the goals and objectives in the assessment plan. Data have been collected via: Major Fields test, Exit interviews, surveys and discussions with students. Comparing our data with national statistics indicate a fundamental achievement of goals though specific criteria for success in meeting program goals are yet to be finalized. Curricular modifications have been made to address the challenges of a growing program. Supportive mechanisms have been piloted to address undergraduate research and diversity concerns. Assessment tools continue to be considered and modified to reflect changes in the type of data required to assess the program.

2007-08 Majors Assessment Report Form

*Please see EXAMPLE REPORT below for further explanation. If there is not enough space in the chart below, please feel free to add comments and/or appendices as needed.

Goals and Objectives (i.e. Expected Learning Outcomes) for Majors (See attached document, "*2005 Major Program Goals and Objectives*"):

- Undergraduate Physics majors will acquire a basic mastery of the four fundamental areas of physics
- Undergraduate Physics majors will develop powerful analytical and problem solving skills
- Undergraduate Physics majors will acquire a basic mastery of experimental physics
- Undergraduate Physics majors will acquire a basic mastery of data reduction and error analysis
- Undergraduate Physics majors will be able to effectively communicate their physical understanding both professionally and colloquially (orally and in writing).
- Undergraduate majors will be apprised of and encouraged to participate in academic research, industrial research and/or outreach activities which are consistent with their interest, ability, and postgraduate plans

Expected Learning Outcomes (bulleted points above)	**METHODS[1]**		**EVIDENCE[2]**		**USE[3]**		
	Measures/Means Employed	**Criterion**	**Findings/Results**	**Achievement of Criterion**	**Process for Reviewing Findings / Other Data Usage**	**Changes Made**	**Next Steps: Action Plan Short (1-year) and Long Term (up to 5 years)**
Undergraduate Physics majors have acquired a basic mastery of the four fundamental areas of physics	**Direct measures:** students in the senior physics lab take the Major Fields Test (MFT)	MFT scores at or above national average	The MFT scores from the 2007-2008 academic year show an average of 154, which is higher than the national average of 148.8	Yes	Undergraduate studies committee will meet and review the data during the second meeting Autumn Quarter 2008	No changes	Continue distributing the MFT, and make sure scores are at or above national average

[1] This corresponds with previous reporting section, "I. Activities in support of outcomes assessment/ Methods employed." See Appendix 1 for Sample Methods.
[2] This corresponds with previous reporting section, "II. Evidence / Expected outcome assessed and results."
[3] This corresponds with previous reporting sections, "III. Data usage / Feedback mechanism / Actions taken," and, "IV. Future planning / Specific Action Plan for the next year."

	Grade topography data for Physics 555, 631, and 621	No major changes from previous years	Grade topographies look very similar to previous years.	Yes	Same as above	No changes	Continue monitoring grade topographies
	Indirect measures: Exit interviews	An average score of at least 3 out of 5 where 5 is strong agreement that this learning outcome goal has been met	Graduates reported an average of 4.11 out of 5	Yes – well above	Same as above	No changes	Continue analyzing the responses of the exit interviews
Undergraduate Physics majors have developed powerful analytic and problem solving skills	**Direct Measures:** Major Fields Test	MFT scores at or above national average	The MFT scores from the 2007-2008 academic year show an average of 154, which is higher than the national average of 148.8	Yes	Undergraduate studies committee will meet and review the data during the second meeting Autumn Quarter 2008	No changes	Continue distributing the MFT, and make sure scores are at or above national average
	Grade topographies for physics 261, 262, and 263	No major changes from previous years	Grade topographies look very similar to previous years	Yes	Same as above	No changes	Continue monitoring grade topographies
	Indirect Measures: Exit interviews	An average score of at least 3 out of 5 where 5 is strong agreement that this learning outcome goal has been met	Graduates reported an average of 3.93 out of 5	Yes	Same as above	No changes	Continue analyzing the responses of the exit interviews
Undergraduate Physics majors have acquired a	**Direct Measures:** Grade topographies for physics 416,517, and 616	No major changes from previous years	Grade topographies look very similar to previous years	Yes	Undergraduate studies committee will meet and	No changes	Continue monitoring grade

basic mastery of experimental physics					review the data during the second meeting Autumn Quarter 2008		topographies
	Indirect Measures: Exit interviews	An average score of at least 3 out of 5 where 5 is strong agreement that this goal has been met	Graduates reported an average of 3.91 out of 5	Yes	Same as above	Physics 517 and 416 were updated. The number of work stations in each class was increased by 30% to accommodate more students. The location of the classes was changed to larger rooms with new computers. Physics 616 also received new computing equipment as well as four new experiments.	Continue analyzing the responses of the exit interviews
	Monitor undergraduate research activity	The number of physics students participating in undergraduate research and summer internships/co-ops/research is a significant fraction of the total number of undergraduates	The number of students participating in both the MAPS and the Denman research forums almost double compared to last year. 2 physics students won prizes in this years Denman research forum, and 7 students were awarded scholarships to pursue their research during the summer of 2008	Yes	Same as above	More advertising of research forums and summer research scholarships.	Continue advertising research forums and research scholarships. Increase the advertisement of internships and co-ops.

Undergraduate Physics majors have acquired a basic mastery of data reduction and error analysis	**Direct Measures:** Grade topographies for physics 416, 616, and 621	No major changes from previous years	Grade topographies look very similar to previous years	Yes	Undergraduate studies committee will meet and review the data during the second meeting Autumn Quarter 2008	No changes	Continue monitoring grade topographies
	Indirect Measures: Exit interviews	An average score of at least 3 out of 5 where 5 is strong agreement that this learning outcome goal has been met	Graduates reported an average of 4.0 out of 5	Yes	Same as above	No changes	Continue analyzing the responses of the exit interviews
Undergraduate Physics majors are able to effectively communicate their physical understanding both professionally and colloquially	**Direct Measures:** Grade topographies for physics 555, 596, and 616	No major changes from previous years	Grade topographies look very similar to previous years	Yes	Undergraduate studies committee will meet and review the data during the second meeting Autumn Quarter 2008	No changes	Continue monitoring grade topographies
	Indirect Measures: Exit interviews	An average score of at least 3 out of 5 where 5 is strong agreement that this learning outcome goal has been met	Graduates reported an average of 3.91 out of 5	Yes	Same as above	No changes	Continue analyzing the responses of the exit interviews
	Monitor participation in research forums and science conferences	The number of physics students participating in Denman/MAPS research	The number of students participating in both the MAPS and the Denman research forums almost double compared to last year.	Yes	Same as above	Financial assistance for poster printing for students participating in the MAPS or	Continue encouraging students to participate in conferences and research forums

		forums and science conferences is a significant fraction of the number of undergrad doing research	Students from the department participated in several APS conferences and the Undergraduate Women in Physics Conference at University of Michigan during the 2007-2008 academic year			Denman research forums or for students travelling to physics conferences	
Undergraduate majors are apprised of and encouraged to participate in academic research, industrial research, and/or outreach	**Direct Measures:** Exit interviews	At least 75% of the graduates have participated in at least 1 research/co-op/internship activity	66% of the 2007-2008 graduates have participated in at least one research/intern/co-op experience prior to graduation. Graduates reported an average of 6.5 quarters or undergraduate research/intern/co-op experience.	No	Undergraduate studies committee will meet and review the data during the second meeting Autumn Quarter 2008	Increased capacity of the Grilly Summer Research Scholarship from 4 undergraduates in 2007 to 7 undergraduates in 2008	Creation of employment/co-op/REU website which would have information about summer employment opportunities as well as summer scholarships.
	Indirect Measures: Monitor participation in the MAPS and Denman research forums	The number of participants is a significant fraction of the number of undergraduates doing research	20 physics majors participated in the 2008 MAPS forum (up from 14 in 2007). 19 participated in the 2008 Denman forum (up from 11 in 2007). 2 physics students were awarded prizes in the MAPS forum, and 2 students were awarded prizes in the Denman forum (2^{nd} and 4^{th} place).	Yes	Same as above	Financial assistance for poster printing for students participating in the MAPS and/or Denman research forums.	Continue encouraging students to participate in the MAPS and Denman research forums

Regional Campus Involvement Update:

We will meet with the regional campuses in order to share our assessment plans, and share ideas on how to increase the percentage of undergraduates involved in research/internships/co-ops and outreach activities.

Other Activities (optional):

We would like to increase the fraction of undergraduates who have had at least 1 co-op/research/internship experience from 66% in the 2007-2008 academic year to at least 75% during the 2008-2009 academic year.

Appendix 1
Sample Assessment Measures

This is not an exhaustive list of all possible assessment measures. If you are using one of these measures in you report, please indicate the additional information requested in parentheses below. If you have any questions about the measures below are or how they can be implemented, please contact Kate Hallihan (hallihan.3@osu.edu) for assistance.

Direct methods:

- National standardized examination (please identify)
- Certification or licensure examinations (please identify)
- Local comprehensive or proficiency examinations
- Embedded testing / test questions (please indicate course)
- Evaluation of student work (please indicate evaluators, i.e. faculty, external evaluators, etc., and include rubrics if appropriate)
    - Pre/Post testing
    - Evaluation of student research
    - Evaluation of senior thesis or major project
    - Evaluation of Capstone coursework
    - Evaluation of student portfolios
- Practicum, internship, outreach (if student participation % is a goal, otherwise this can be an indirect indicator)
- Other classroom assessment methods (please identify)

Indirect methods:

- Courses that specifically address goals in course content (Curricular Mapping)
- Student survey [entry; mid; exit] (please identify)
- Alumni survey (please identify how many years post-graduation)
- Job or post-baccalaureate education placement information
- Student evaluation of instruction
- Student interview or focus group
- Student or alumni honors achieved
- Peer review of program
- External program review
- Systematic curriculum, grade, and/or syllabus review
- Employer feedback
- Comparison or benchmarking