Analysis Questions and Analysis Answers

For Academic Programs

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

1) We have increased our emphasis on conceptual problem solving in our General Physics classes, in order to improve student learning gains measured by the conceptual diagnostic exams we use in these courses. This increased emphasis has led to improved learning gains in our 2nd semester General Physics classes, which have recently achieved parity with the learning gains typical of our 1st semester General Physics classes.

2) In our Introductory Astronomy classes, we found student learning gains were relatively weak in one area: the nature of light and matter. This led us to emphasize this area more in our classes and to revise the phrasing of related diagnostic questions. Our most recent average learning gain in this area was the highest we have seen, and with the smallest dispersion among sections (implying the improvement occurred in most of our Intro Astronomy classes).

3) To increase the participation of our majors in our annual administration of the Major Field Test in Physics (which is our main program assessment tool), we experimented with an earlier administration date this Spring 2014. We had 32 sophomore, junior, & senior physics majors (out of 78) take the Physics Major Field Test, which was 60% more than the 20 who took it last year (out of 63); the fraction of SO, JR, & SR majors taking the test increased from 32% to 41%; their overall performance this year was similar to last year, continuing to be significantly better than national norms.

Mission / Purpose

The mission of the Department of Physics and Astronomy at the University of Alabama is multi-fold. Through our undergraduate programs, we prepare students for graduate work in physics or astronomy, or for immediate employment in physics-related jobs. We play a vital role in the education of other science and engineering students, and promote the understanding of science through our general studies courses. Our graduate programs prepare students for teaching and/or research positions in colleges and universities, and research positions in government and industrial laboratories. Our research contributes new knowledge in the fields of physics and astronomy. It is part of our mission to secure adequate external funding to support departmental research activities. Through public outreach and involvement within our professions, we serve to improve the public understanding and promote the advancement of science.

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

SLO 1: Basic physics knowledge

We expect students who successfully complete our introductory physics courses will demonstrate adequate knowledge of basic physics to prepare them for more advanced courses in physics.

Connected Document

Physics BS Curriculum Maps

Relevant Associations:

Improvement action: We will continue to implement the following measures to aid faculty in their professional development based on the assessment:

1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty;  
2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 
3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.  
4) We will discuss possible causes of the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses during the upcoming Fall semester.

Related Measures

M 1: Force Concept Inventory

In our 1st-semester general physics courses (PH101, PH105, PH125) we use the Force Concept Inventory (FCI), a standardized and nationally adopted exam, which assesses basic knowledge of forces. We use pre- and post-tests to assess learning gains, which are defined as the difference in average scores: \((\text{post-test} - \text{pretest})\) divided by the maximum possible gain: \((\text{max} - \text{pretest})\). This measure addresses the improvement action.

Source of Evidence: Standardized test of subject matter knowledge

Connected Document

Physics BS Curriculum Maps
Target: National baseline values

Finding (2013-2014) - Target: Partially Met

In 2013-14, our FCI (Force Concept Inventory) learning gains in our various sections of 1st-semester general physics ranged from 13% to 49%, with an average (median) of 30% (30%).

The distribution was as follows: 13, 15, 18, 18, 24, 27, 29, 29, 30, 31, 35, 35, 37, 39, 41, 45, 49%.

National baseline values for FCI gains are 23% for traditional courses and 48% for courses with interactive engagement (R.R. Heke 1998, Am. J. Phys., 66, 64).

The graph below shows our yearly average of FCI gains – no trend is obvious.

The graph below compares the distribution over time of gains in our studio (integrated lectures & labs) sections since 2005 to gains in our non-studio (separate lectures & labs) sections. There is rough parity between studio and non-studio courses in the last 2 years.

The graph below compares the distribution over time of gains in our calculus-based versions of these courses (PH 105, 125) to the non-calculus version (PH 101). Calculus-based courses tend to have larger gains than non-calculus.

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

Professional development

In our 1st-semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Heke 1998, Am. J. Phys. 66, 64). In our 2nd-semester general physics courses, the average CSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 40% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses. One possibility is that the non-calculus course covers more subjects than the calculus-based course.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
- Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
- Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge

Implementation Description: We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.

Peer evaluation

Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
- Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
- Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
- Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
- Measure: Lab Exam | Outcome/Objective: Astronomy knowledge
- Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Responsible Person/Group: Peer evaluation committee

M 2: Conceptual Survey in Electricity and Magnetism

In our 2nd-semester general physics courses (PH102, PH106, PH126) we use the Conceptual Survey in Electricity
and Magnetism (CSEM), a standardized exam. We use pre- and post-tests to assess learning gains, which are defined as the difference in average scores: (post-test – pretest) divided by the maximum possible gain: (max – pretest). This measure addresses the improvement action.

Source of Evidence: Standardized test of subject matter knowledge

Connected Document
Physics BS Curriculum Maps

Target:
National baseline values

Finding (2013-2014) - Target: Partially Met
In 2013-14 Our CSEM (Conceptual Survey of Electricity & Magnetism) learning gains ranged from 16% to 46%, with an average (median) of 29% (27%). The distribution was as follows: 16, 17, 17, 19, 22, 22, 31, 37, 39, 39, 45, 46%. National baseline values for CSEM gains are 23% for calculus based and 25% for non-calculus classes (D.P. Maloney et al. 2001, Phys.Educ.Res.,Am.J.Phys.Suppl., 69, 12).

The graph below shows our yearly average of CSEM gains – the trend is slowly rising since 2009-10.

The graph below compares the distribution over time (since 2007) of gains in our studio (integrated lectures & labs) sections to those in our non-studio (separate lectures & labs) sections. Studio sections generally have larger gains than non-studio sections.

The graph below compares the distribution over time of gains in our calculus-based versions of these courses (PH 106, 126) to the non-calculus version (PH 102). It is clear that the calculus-based courses tend to have better gains than the non-calculus course.

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

Professional development
In our 1st-semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64). In our 2nd-semester general physics courses, the average CSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 40% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses. One possibility is that the non-calculus course covers more subjects than the calculus-based course.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge

Implementation Description: We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.

Peer evaluation
Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
Measure: Lab Exam | Outcome/Objective: Astronomy knowledge
Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge
SLO 2: Astronomy knowledge
We expect students who successfully complete our introductory astronomy courses will demonstrate a broad knowledge of astronomy and that they can apply their knowledge to successfully complete astronomy laboratories.

Related Document
Physics BS Curriculum Maps

Relevant Associations:
Improvement action: We will continue to refine the diagnostic lab exam in the coming year.

Related Measures
M 3: Fundamental astronomy questions
In our introductory astronomy classes (AY101, AY204, AY206) we use pre- and post-tests to assess learning gains. These tests are composed of 20 fundamental questions covering the full range of topics covered in these survey courses: the appearance of celestial objects in the sky; the history of astronomy; the nature of planetary systems, stars, galaxies, and the universe.

Source of Evidence: Faculty pre-test / post-test of knowledge mastery
Connected Document
Physics BS Curriculum Maps

Target:
Learning gains of at least 30%

Finding (2013-2014) - Target: Met
In 2013-14, our learning gains in our various sections of introductory astronomy ranged from 49% to 74%, with an average of 57% (median 54%).

The distribution was: 49, 51, 51, 54, 54, 57, 66, 74%<br>
The figure below shows the gains in AY 101 over the last 6 years. While the average is fairly constant, the range has narrowed in recent years.

The figure below shows the AY 101 learning gains broken down by learning outcome in 8 sections in 2013-14. The 23 questions of the astronomy diagnostic exam were mapped to the 8 learning gains for the course. Briefly, the learning outcomes are labeled as C – Concepts, H – History, L – Light & Matter, A – Appearance of the sky, P – Planets, S – Stars, G – Galaxies, U – Universe.<br>

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

Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
- Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
- Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
- Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
- Measure: Lab Exam | Outcome/Objective: Astronomy knowledge
- Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Responsible Person/Group: Peer evaluation committee

M 4: Lab Exam
We administer a diagnostic lab exam at the end of the semester (addresses improvement action).

Source of Evidence: Academic direct measure of learning - other
Connected Document
Physics BS Curriculum Maps

Target:
No target established
Students achieved an average learning gain of 58% on the diagnostic lab exam, with individual scores ranging from 23-93%. The exam covered coordinate systems, rising & setting of celestial objects, planetary oppositions, & locating objects with planetarium software & celestial globes. Gains broken down by sub-area include: Parallax and small-angle formula = 54%; magnitude scale and light intensity = 36%; motions in the sky = 40.0%.

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

**Peer evaluation**

Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

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

Relationships (Measure | Outcome/Objective):
- **Measure:** Conceptual Survey in Electricity and Magnetism | **Outcome/Objective:** Basic physics knowledge
- **Measure:** Force Concept Inventory | **Outcome/Objective:** Basic physics knowledge
- **Measure:** Fundamental astronomy questions | **Outcome/Objective:** Astronomy knowledge
- **Measure:** Lab Exam | **Outcome/Objective:** Astronomy knowledge
- **Measure:** Locally Developed Exam Questions | **Outcome/Objective:** Physics knowledge and problem solving

**Responsible Person/Group:** Peer evaluation committee

**SLO 3: Physics knowledge and problem solving**

We expect students who successfully complete our physics curriculum to demonstrate a broad knowledge of physics and demonstrate competency in solving a broad range of physics problems and that they can apply their knowledge to successfully complete physics laboratories.

**Connected Document**  
[Physics BS Curriculum Maps](#)

**Relevant Associations:**

Improvement action: We will continue the development of our common exam questions. The individual faculty will use the results to revise their course content based on the scores obtained regarding specific learning outcomes.

**Related Measures**

**M 5: Physics Major Field Test**

We annually administer the Physics Major Field Test (by ETS – Educational Testing Service) to as many of our Sophomore, Junior, and Senior Physics majors as we can. This is a nationally-normed standardized exam that allows us to compare how well our students are acquiring and applying physics knowledge in the full range of our physics curriculum. We administer the exam near the end of each Spring semester and we will compare the distribution of our students’ results to the national distribution. A significant, well-known issue with such exams is providing sufficient incentives for students to 1) take the exam and 2) take the exam seriously. We experiment with the incentives, as necessary, to increase student participation and performance.

**Source of Evidence:** Standardized test of subject matter knowledge

**Connected Document**  
[Physics BS Curriculum Maps](#)

**Target:**  
Exceed national norm

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

In Spring 2014, we administered the Physics Major Field Test two weeks earlier in the semester than usual, in order to test whether the majors' participation fraction would improve (see related Improvement Action Plan). In Spring 2014, 32 sophomore, junior, & senior physics majors (out of 78) took the Physics Major Field Test. This was 60% more than the 20 (out of 63) SO, JR, & SR majors who took it last year. The fraction of SO, JR, & SR majors taking the test increased from 32% to 41%. Their overall performance this year was similar to last year and significantly better than national norms. We will adopt this earlier administration date in future years.

Following are the percentile scores of our sophomore, junior and senior majors who took the ETS Physics Major Field Test, listed in order of their national percentile ranking among national seniors:<br>
99, 96, 95, 94, 94, 92, 90, 77, 77, 74, 74, 70, 70, 70, 67, 58, 58, 53, 53, 49, 46, 46, 46, 41, 41, 41, 37, 37, 22, 16, 16, 13, 13, 8<br>

Of these, the percentile scores of our seniors who took the exam were: <br>
95, 94, 90, 77, 70, 53, 41, 13 <br>

In the graph below, we plot the factor by which our sophomore, junior, and senior majors exceed the national norms for seniors. The higher the ratio, the more we exceed the national norms. For example, by definition, 10% of national seniors exceed the 90th percentile; this year 21% of our majors' scores exceeded the national 90th percentile, so we exceeded the national norm at 90th percentile by a factor of 2.1. As in prior years, our
majors' performance significantly exceeded the national averages for seniors at the highest percentiles (≥80%) on this exam.

The Physics Major Field Test results can be broken down by subject area. The following table lists the performance (percent correct) of our test takers in five sub-areas of physics:

1) Classical Mechanics and Relativity
2) Electromagnetism
3) Optics, Waves, and Thermal Physics
4) Quantum Mechanics and Atomic Physics
5) Special Topics

The evolution of these sub-area results are plotted below:

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

**Physics Major Field Test administration timing**

We will offer the Physics Major Field Test earlier in the Spring semester to assess whether an earlier administration date leads to an increased participation rate and/or an improvement in average performance.

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

**Relationships (Measure | Outcome/Objective):**
- Measure: Physics Major Field Test
- **Outcome/Objective:** Physics knowledge and problem solving

**Projected Completion Date:** 04/2014
**Implementation Notes:**

**M 6: Locally Developed Exam Questions**

We use a pool of locally developed common exam questions to assess student learning across different sections of the same course for the different learning outcomes of the course (addresses improvement action).

**Source of Evidence:** Academic direct measure of learning - other

**Connected Document**

Physics BS Curriculum Maps

**Target:**
Average score of 80% on common exam questions

**Finding (2013-2014) - Target: Partially Met**

In 2013-14, students scored an average (median) of 61% (59%) on our locally developed exam questions common to all sections of our 1st semester General Physics courses (PH 101, 105, 125).

The distribution was as follows: 45, 52, 53, 54, 54, 57, 57, 58, 59, 59, 63, 65, 66, 68, 69, 73, 90%.

The plot below shows the evolution of our 1st semester common exam questions over time, distinguishing studio courses (blue) from non-studio courses (red).

In our 2nd semester General Physics courses (PH 102, 106, 126) students scored an average (median) of 74% (74%) on common questions in our various sections.

The distribution was as follows: 59, 63, 70, 70, 72, 74, 74, 78, 84, 85, 88%.

The plot below shows the evolution of our 2nd semester common exam questions over time, distinguishing studio courses (blue) from non-studio courses (red).

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

**Continued development of common exam questions**

The result on the common exam questions falls somewhat short of our goal of 80%. The studio sections of our General Physics courses tend to have better results on the common questions than the non-studio sections. While additional data is needed to obtain better statistics, this measure seems to indicate weaknesses for the learning outcome regarding the application of basics laws of physics and strengths for the learning outcome regarding the analysis of electric circuits.

**Established in Cycle:** 2011-2012
**Implementation Status:** In-Progress
SLO 4: Research
We expect our majors to be able to apply their physics knowledge to carry out research with faculty.

Connected Document
Physics BS Curriculum Maps

Relevant Associations:
Improvement action: We will increase the visibility of available undergraduate research projects on our departmental web site.

Related Measures

M 7: Track Number of Majors Involved in Research
We track the number of majors that are involved in research projects with faculty (addresses improvement action).

Source of Evidence: Academic indirect indicator of learning - other

Connected Document
Physics BS Curriculum Maps

Target:
No target established

Finding (2013-2014) - Target: Met
In 2013-14, we had 32 undergraduates (including 25 physics majors) involved in research projects with 12 faculty.

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

Increased visibility of available undergraduate research projects
We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Track Number of Majors Involved in Research | Outcome/Objective: Research

M 8: Research Publications
We track the number of research publications that have our undergraduates as co-authors, as well as the annual number of professional presentations that involve our undergraduate majors (addresses improvement action).

Source of Evidence: Academic indirect indicator of learning - other
Finding (2013-2014) - Target: **Met**
1 major was a co-author on 1 refereed conference abstract with 1 faculty in 2013-14.<br>
1 non-major was co-author on 1 refereed conference abstract with 1 faculty in 2013-14.<br>

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

**Increased visibility of available undergraduate research projects**

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

**Established in Cycle:** 2011-2012  
**Implementation Status:** In-Progress  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**
- **Measure:** Track Number of Majors Involved in Research  
- **Outcome/Objective:** Research

**Implementation Description:** We will increase the visibility of available undergraduate research projects on our departmental web site.

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

**OthOtcm 5: Program Outcome: High Level of Recognized Quality**
The program will improve and sustain a high level of recognized quality.

**Related Measures**

**M 9: Program Strengths**
8-year program review strengths

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

Finding (2013-2014) - Target: **Met**
8-year program review strengths of undergraduate program: The Physics/Astronomy majors currently in the program are a strength. Many of these students are very thoughtful about this program, very concerned about its quality, and want very much to be involved. The increased attention paid to the undergraduate program, has paid dividends in terms of enrollment. This trend should continue provided that activity in this area is maintained. The dual-degree program established with Electrical engineering was visionary, and should be expanded to include other programs; both for the benefit of the department and its graduates.

**M 10: Opportunities for Improvement**
8-year program review opportunities for improvement

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

Finding (2013-2014) - Target: **Met**
8-year review opportunities for improvement of undergraduate program: Keep up the good work. The department is encouraged to pursue additional dual-degree programs with departments in the college of engineering, in particular Metallurgical Engineering and Aerospace and Engineering Mechanics. Considering the success of the Physics-ECE dual-major, the establishment of these additional programs could further boost enrollment, increase the marketability of graduates (to industry or graduate school) and foster more inter-departmental collaborations. The department web site has improved significantly. More information concerning student employment and research activities could be included. This might enhance student interest in getting involved in undergraduate research activities. Once again, collaboration with other programs or colleges that are interested promoting undergraduate research (e.g., engineering) might provide an effective mechanism for increasing involvement without increasing faculty workloads.

**M 33: Post-Graduation Plans**
We track the post-graduate destinations of our recent graduates of our Physics Bachelor program and use exit surveys, advising meetings and email surveys to obtain post-graduation plans of our graduating seniors.

**Source of Evidence:** Alumni survey or tracking of alumni achievements

Finding (2013-2014) - Target: **Met**
Of our 15 graduates, at least 7 will go on to graduate school in physics, engineering, or education (at Princeton, UT Austin, CUNY, Tennessee, UAH, UA). 2 will be High School teachers, 1 is a software developer (Insuresoft, Tuscaloosa), one is doing EMT training in preparation for applying to medical school, one is an academic tutor with UA Athletics; 2 destinations are unknown.<br>

**OthOtcm 6: Program Outcome: Sustain Optimal Level of Enrollment**
The program will build and sustain an optimal level of annual program enrollments and degree completions.
Relevant Associations:
Program Outcome #2 Improvement Action(s) to be advanced. The Department is in the midst of crafting dual-degree programs for engineering branches other than Electrical and Computer Engineering. The ECE program is the most natural dual-major, requiring the fewest additional hours, but we are nonetheless working on other engineering dual-majors, as well. We will continue to recruit physics undergraduates with on-site tours and meetings with faculty, and with outreach activities such as the High School Physics Contest.

Related Measures

M 11: Credit Hour Production
Undergraduate semester credit hour production for the last 3 fall semesters

Source of Evidence: Existing data

Target: No target established

Finding (2013-2014) - Target: Met
OIRA data provide total undergraduate credit hour production for the last 3 Fall semesters:
7,334 - Fall 2013
6,279 - Fall 2012
5,272 - Fall 2011

M 12: Number of Courses and Sections Offered
Number of undergraduate courses & sections offered for the last 3 fall semesters

Source of Evidence: Existing data

Target: No target established

Finding (2013-2014) - Target: Met
courses/sections
20 / 64 Fall 2013
17 / 55 Fall 2012
21 / 54 Fall 2011

M 13: Number of Majors
Number of majors for the last 3 fall semesters

Source of Evidence: Existing data

Target: ACHE viability standard of 7.5 BS degrees per year

Finding (2013-2014) - Target: Met
according to OIRA, the numbers of Physics majors in the last 3 Fall semesters are:
Fall 2013: 104
Fall 2012: 89
Fall 2011: 67

M 14: Number of BS Degrees Awarded
Number of BS degrees awarded (Aug-May) for the last 3 years

Source of Evidence: Existing data

Target: ACHE viability threshold of 7.5 BS per year.

Finding (2013-2014) - Target: Met
Departmental and OIRA data provide the following account of BS degrees conferred:
15 – 2013-14
12 – 2012-13
8 – 2011-12

M 15: Compare Number of Degrees Conferred to ACHE Standards
Comparison of number of BS degrees awarded to ACHE viability standards

Source of Evidence: Professional standards

Target: ACHE viability standard of 7.5 BS degrees per year

Finding (2013-2014) - Target: Met
Over the last 5 years we had an average of 12.2 BS degrees per year, which exceeds the ACHE viability threshold of 7.5.

M 21: BS Time-to-Degree
We compare the annual distribution of time-to-degree for our BS recipients to our target of 3.5 years.

Source of Evidence: Existing data

Target:
Finding (2013-2014) - Target: Met
Of the 15 majors receiving their BS degrees, for our regular majors the average time to degree was 3.95 years (median: 3.75 yrs), while for our engineering-physics double majors the average time to degree was 4.01 years (median: 3.75 yrs). The time-to-degree distribution for our 9 regular graduating majors was as follows: 3.00, 3.75, 3.75, 3.75, 3.75, 3.75, 4.33, 5.75 yrs, with 78% within our target of 4 years. The distribution for our 6 engineering-physics double majors was as follows: 2.75, 3.75, 3.75, 3.75, 4.75, 5.33 yrs, with 4 (67%) within our target of 4 years.
A study of the U.S. Department of Education's National Center for Education Statistics (NCES) from 2001 provides a general national baseline for comparison: “Graduates of public, four-year institutions in 1999-2000 completed their bachelor’s degree in 4.8 years on average…”

OthOtcm 7: Program Outcome: Highly Valued by Graduates and Constituencies
The program will be highly valued by its program graduates and other key constituencies it serves.

Related Measures

M 16: Graduating Senior Survey
Results from the Graduating Senior Survey for graduating PH majors
Source of Evidence: Student course evaluations on learning gains made

Target: No target established

M 33: Post-Graduation Plans
We track the post-graduate destinations of our recent graduates of our Physics Bachelor program and use exit surveys, advising meetings and email surveys to obtain post-graduation plans of our graduating seniors.
Source of Evidence: Alumni survey or tracking of alumni achievements

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

Continued development of common exam questions
The result on the common exam questions falls somewhat short of our goal of 80%. The studio sections of our General Physics courses tend to have better results on the common questions than the non-studio sections. While additional data is needed to obtain better statistics, this measure seems to indicate weaknesses for the learning outcome regarding the application of basics laws of physics and strengths for the learning outcome regarding the analysis of electric circuits.
Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Implementation Description: We will continue the development of our common exam questions. The individual faculty will use the results to revise their course content based on the scores obtained regarding specific learning outcomes.

Increased visibility of available undergraduate research projects
We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.
Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Research Publications | Outcome/Objective: Research
Measure: Track Number of Majors Involved in Research | Outcome/Objective: Research

Implementation Description: We will increase the visibility of available undergraduate research projects on our departmental web site.

Professional development
In our 1st semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64). In our 2nd semester general physics courses, the average OSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 40% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd semester general physics courses. One possibility is that the non-calculus course covers more subjects than the calculus-based course.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics
Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge

Implementation Description: We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.

Peer evaluation

Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
- Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
- Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
- Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
- Measure: Lab Exam | Outcome/Objective: Astronomy knowledge
- Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Responsible Person/Group: Peer evaluation committee

Physics Major Field Test administration timing

We will offer the Physics Major Field Test earlier in the Spring semester to assess whether an earlier administration date leads to an increased participation rate and/or an improvement in average performance.

Established in Cycle: 2013-2014
Implementation Status: Finished
Priority: High

Relationships (Measure | Outcome/Objective):
- Measure: Physics Major Field Test | Outcome/Objective: Physics knowledge and problem solving

Projected Completion Date: 04/2014
Implementation Notes:
6/25/2014
Mission / Purpose

The mission of the Department of Physics and Astronomy at the University of Alabama is multi-fold. Through our undergraduate programs, we prepare students for graduate work in physics or astronomy, or for immediate employment in physics-related jobs. We play a vital role in the education of other science and engineering students, and promote the understanding of science through our general studies courses. Our graduate programs prepare students for teaching and/or research positions in colleges and universities, and research positions in government and industrial laboratories. Our research contributes new knowledge in the fields of physics and astronomy. It is part of our mission to secure adequate external funding to support departmental research activities. Through public outreach and involvement within our professions, we serve to improve the public understanding and promote the advancement of science.

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

SLO 1: Basic physics knowledge
We expect students who successfully complete our introductory physics courses will demonstrate adequate knowledge of basic physics to prepare them for more advanced courses in physics.

Connected Document
Physics BS Curriculum Maps

Relevant Associations:
Improvement action: We will continue to implement the following measures to aid faculty in their professional development based on the assessment:

1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty;
2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains;
3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.
4) We will discuss possible causes of the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses during the upcoming Fall semester.

Related Measures

M 1: Force Concept Inventory
In our 1st-semester general physics courses (PH101, PH105, PH125) we use the Force Concept Inventory (FCI), a standardized and nationally adopted exam, which assesses basic knowledge of forces. We use pre- and post-tests to assess learning gains, which are defined as the difference in average scores: (post-test – pretest) divided by the maximum possible gain: (max – pretest). This measure addresses the improvement action.

Source of Evidence: Standardized test of subject matter knowledge

Target: National baseline values

Finding (2012-2013) - Target: Partially Met
In 2012-13, our FCI (Force Concept Inventory) learning gains in our various sections of 1st-semester general physics ranged from 9% to 49%, with an average (median) of 29% (29%). The distribution was as follows: 9,14,21,22,23,24,27,28,29,31,32,33,33,35,38,45,49%. National baseline values for FCI gains are 23% for traditional courses and 48% for courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64).

The graph “2013 BS Yearly average FCI gains” shows our yearly average of FCI gains – no trend is obvious. The graph “2013 BS studio vs non-studio” compares the distribution over time of gains in our studio (integrated lectures & labs) sections since 2005 to gains in our non-studio (separate lectures & labs) sections. The differences in the gains probably reflect faculty differences, rather than format differences, since faculty who have taught in both formats tend to have similar gains in either format. The graph “2013 BS calculus vs non-calculus” compares the distribution over time of gains in our calculus-based versions of these courses (PH 105, 125) to the non-calculus version (PH 101). As in previous years there is not much distinction between the two versions: the average (median) of the calculus-based courses is 29% (28%) compared to 30% (31%) for the non-calculus course.

Connected Documents
2013 BS calculus vs non-calculus
2013 BS studio vs non-studio
2013 BS Yearly average FCI gains

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

Professional development

In our 1st-semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains
exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64). In our 2nd-semester general physics courses, the average CSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 40% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses. One possibility is that the non-calculus course covers more subjects than the calculus-based course.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
  Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
  Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge

Implementation Description: We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.

Peer evaluation

Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
  Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
  Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
  Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
  Measure: Lab Exam | Outcome/Objective: Physics knowledge and problem solving

Responsible Person/Group: Peer evaluation committee

M 2: Conceptual Survey in Electricity and Magnetism
In our 2nd-semester general physics courses (PH102, PH106, PH126) we use the Conceptual Survey in Electricity and Magnetism (CSEM), a standardized exam. We use pre- and post-tests to assess learning gains, which are defined as the difference in average scores: (post-test – pretest) divided by the maximum possible gain: (max – pretest). This measure addresses the improvement action.

Source of Evidence: Standardized test of subject matter knowledge
Connected Document: Physics BS Curriculum Maps

Target: National baseline values

Finding (2012-2013) - Target: Partially Met
Our CSEM (Conceptual Survey of Electricity & Magnetism) learning gains ranged from 25% to 50%, with an average (median) of 36% (34%). The distribution was as follows: 25, 30, 31, 34, 34, 38, 38, 41, 50% National baseline values for CSEM gains are 23% for calculus based and 25% for non-calculus classes (D.P. Maloney et al. 2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). The graph "2013 BS Yearly average CSEM gains" shows our yearly average of CSEM gains – despite fluctuations, there is a generally rising trend in average gains over time.

The graph "2013 BS studio vs non-studio CSEM" compares the distribution over time of gains in our studio (integrated lectures & labs) sections since 2007 to those in our non-studio (separate lectures & labs) sections.

The graph "2013 BS calculus vs non-calculus CSEM" compares the distribution over time of gains in our calculus-based versions of these courses (PH 106, 126) to the non-calculus version (PH 102). It is clear that the calculus-based courses tend to have better gains than the non-calculus courses.

Connected Documents:
2013 BS calculus vs non-calculus CSEM
2013 BS studio vs non-studio CSEM
2013 BS Yearly average CSEM gains

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

In our 1st-semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Heke 1998, Am. J. Phys. 66, 64). In our 2nd-semester general physics courses, the average CSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 40% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
- Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
- Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge

Implementation Description: We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.

Peer evaluation

Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
- Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
- Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
- Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
- Measure: Lab Exam | Outcome/Objective: Astronomy knowledge
- Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Responsible Person/Group: Peer evaluation committee

SLO 2: Astronomy knowledge
We expect students who successfully complete our introductory astronomy courses will demonstrate a broad knowledge of astronomy and that they can apply their knowledge to successfully complete astronomy laboratories.
The figure “2013 BS AY learning outcome gains” shows the AY 101 learning gains broken down by learning outcome in 8 sections in 2012-13. The 22 questions of the astronomy diagnostic exam were mapped to the 8 learning gains for the course. Briefly, the learning outcomes are labeled as C – Concepts, H – History, L – Light & Matter, A – Appearance of the sky, P – Planets, S – Stars, G – Galaxies, U – Universe.

Connected Documents
2013 BS AY gains
2013 BS AY learning outcome gains

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

Peer evaluation

Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):

Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
Measure: Lab Exam | Outcome/Objective: Astronomy knowledge
Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Responsible Person/Group: Peer evaluation committee

M 4: Lab Exam
We administer a diagnostic lab exam at the end of the semester (addresses improvement action).

Source of Evidence: Academic direct measure of learning - other

Connected Document
Physics BS Curriculum Maps

Target: No target established

Finding (2012-2013) - Target: Met
Students achieved an average of 79% on the diagnostic lab exam, with individual scores ranging from 53-95%. The exam covered the Moon, RA and Dec coordinates, operation and set-up of telescopes, determining properties (like magnification) of eyepieces, use of universal time, reading H-R diagrams, using sidereal time, determining the best time to observe a specific object, locating objects on star charts, comparing Dobsonian and equatorial mountings of telescopes, describing what photometry is, and describing what nebular filters do.

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

Peer evaluation

Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):

Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
Measure: Lab Exam | Outcome/Objective: Astronomy knowledge
Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Responsible Person/Group: Peer evaluation committee

SLO 3: Physics knowledge and problem solving
We expect students who successfully complete our physics curriculum to demonstrate a broad knowledge of physics and demonstrate competency in solving a broad range of physics problems and that they can apply their knowledge to successfully complete physics laboratories.
Improvement action: We will continue the development of our common exam questions. The individual faculty will use the results to revise their course content based on the scores obtained regarding specific learning outcomes.

**Related Measures**

**M 5: Physics Major Field Test**

We annually administer the Physics Major Field Test (by ETS – Educational Testing Service) to as many of our Sophomore, Junior, and Senior Physics majors as we can. This is a nationally-normed standardized exam that allows us to compare how well our students are acquiring and applying physics knowledge in the full range of our physics curriculum. We administer the exam near the end of each Spring semester and we will compare the distribution of our students’ results to the national distribution. A significant, well-known issue with such exams is providing sufficient incentives for students to 1) take the exam and 2) take the exam seriously. We experiment with the incentives, as necessary, to increase student participation and performance.

**Source of Evidence:** Standardized test of subject matter knowledge

**Target:** Exceed national norm

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

Following are the percentile scores of all of our majors who took the ETS Physics Major Field Test, listed in order of their national percentile ranking among national seniors: 99, 95, 82, 82, 82, 80, 75, 70, 70, 58, 58, 58, 51, 51, 45, 11, 11, 6, 1 Of these, the percentile scores of our seniors who took the exam were: 82, 70, 70, 58, 58, 58, 51, 6

In the graph "2013 MFT percentile", we plot the factor by which our sophomore, junior, and senior majors exceed the national norms for seniors. The higher the ratio, the more we exceed the national norms. For example, by definition, 5% of national seniors exceed the 95th percentile; this year 10% of our majors’ scores exceeded the national 95th percentile, so we exceeded the national norm at 95th percentile by a factor of 2. As in prior years, our majors’ performance significantly exceeded the national averages for seniors at the highest percentiles (≥80%) on this exam.

Sub-area scores are not yet available for the 2013 exam; the MFT Physics exam was substantially revised since last year and not enough national data has accumulated to generate percentile scores.

We also examined what fraction of our majors improve their MFT scores in successive tries. Of the 6 majors who took the exam last year, as well, 100% improved their scores this year.

**M 6: Locally Developed Exam Questions**

We use a pool of locally developed common exam questions to assess student learning across different sections of the same course for the different learning outcomes of the course (addresses improvement action).

**Source of Evidence:** Academic direct measure of learning - other

**Target:** Average score of 80% on common exam questions

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

In 2012-13, students scored an average (median) of 51% (48%) on our locally developed exam questions common to all sections of our 1st semester General Physics courses (PH 101, 105, 125). The distribution was as follows: 35, 41, 43, 45, 47, 48, 48, 48, 50, 54, 59, 59, 60, 61, 64%

The plot "2013 Common questions 101 105 125" shows the evolution of our 1st semester common exam questions over time, distinguishing studio courses (blue) from non-studio courses (red).

In our 2nd semester General Physics courses (PH 102, 106, 126) students scored an average (median) of 69% (67%) on common questions in our various sections. The distribution was as follows: 55, 61, 61, 64, 66, 68, 76, 77, 80, 81%

The plot "2013 Common questions 102 106 126" shows the evolution of our 2nd semester common exam questions over time, distinguishing studio courses (blue) from non-studio courses (red).

The result on the common exam questions falls short of our goal of 80%. The studio sections of our
General Physics courses tend to have slightly better results on the common questions than the non-studio sections. While additional data is needed to obtain better statistics, this measure seems to indicate weaknesses for the learning outcome regarding the application of basics laws of physics and strengths for the learning outcome regarding the analysis of electric circuits.

Connected Documents
2013 Common questions 101 105 125
2013 Common questions 102 106 126

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

Continued development of common exam questions
The result on the common exam questions falls somewhat short of our goal of 80%. The studio sections of our General Physics courses tend to have better results on the common questions than the non-studio sections. While additional data is needed to obtain better statistics, this measure seems to indicate weaknesses for the learning outcome regarding the application of basics laws of physics and strengths for the learning outcome regarding the analysis of electric circuits.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Implementation Description: We will continue the development of our common exam questions. The individual faculty will use the results to revise their course content based on the scores obtained regarding specific learning outcomes.

Peer evaluation
Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

Established in Cycle: 2012-2013
Implementation Status: Planned
Priority: Medium

Relationships (Measure | Outcome/Objective):
Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge
Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge
Measure: Lab Exam | Outcome/Objective: Astronomy knowledge
Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving

Responsible Person/Group: Peer evaluation committee

SLO 4: Research
We expect our majors to be able to apply their physics knowledge to carry out research with faculty.

Connected Document
Physics BS Curriculum Maps

Relevant Associations:
Improvement action: We will increase the visibility of available undergraduate research projects on our departmental web site.

Related Measures

M 7: Track Number of Majors Involved in Research
We track the number of majors that are involved in research projects with faculty (addresses improvement action).

Source of Evidence: Academic indirect indicator of learning - other

Connected Document
Physics BS Curriculum Maps

Target:
No target established

Finding (2012-2013) - Target: Met
In 2012-13, we had 22 undergraduates (including 14 physics majors) involved in 24 separate research projects with 12 faculty.

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have
undergrad projects available; interested majors can review this list to help them shop for potential projects.

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

Increased visibility of available undergraduate research projects

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
- Measure: Research Publications | Outcome/Objective: Research
- Measure: Track Number of Majors Involved in Research | Outcome/Objective: Research

Implementation Description: We will increase the visibility of available undergraduate research projects on our departmental web site.

M 8: Research Publications

We track the number of research publications that have our undergraduates as co-authors, as well as the annual number of professional presentations that involve our undergraduate majors (addresses improvement action).

Source of Evidence: Academic indirect indicator of learning - other

Connected Document
Physics BS Curriculum Maps

Target: No target established

Finding (2012-2013) - Target: Met
1 major was a co-author on 2 refereed publications with 1 faculty in 2012-13.
1 major was co-author on 1 conference presentation with 1 faculty in 2012-13.

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

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

Increased visibility of available undergraduate research projects

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
- Measure: Research Publications | Outcome/Objective: Research
- Measure: Track Number of Majors Involved in Research | Outcome/Objective: Research

Implementation Description: We will increase the visibility of available undergraduate research projects on our departmental web site.

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

OthOtcm 5: Program Outcome: High Level of Recognized Quality
The program will improve and sustain a high level of recognized quality.

Related Measures

M 9: Program Strengths
8-year program review strengths
Source of Evidence: Administrative measure - other

Target: No target established

Finding (2012-2013) - Target: Met
8-year review strengths of undergraduate program: The Physics/Astronomy majors currently in the program are a strength. Many of these students are very thoughtful about this program, very concerned about its quality, and want very much to be involved. The increased attention paid to the undergraduate program, has paid dividends in terms of enrollment. This trend should continue provided that activity in this area is maintained. The dual-degree program established with Electrical engineering was visionary, and should be expanded to include other programs; both for the benefit of the department and its graduates.

M 10: Post-Graduation Plans
We track the post-graduate destinations of our recent graduates of our Physics Bachelor program and use exit surveys, advising meetings and email surveys to obtain post-graduation plans of our graduating seniors.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target: No target established.

Finding (2012-2013) - Target: Met
Of our 11 graduates, at least 5 will go on to graduate school in physics, engineering (Carnegie Mellon, UT Austin, Wisconsin, UNC Charlotte) or law (Cumberland School of Law, Samford Univ.); 4 have joined companies (Schlumberger, Tiffin Motor Homes, Sound Solutions, Club Z! tutoring); 2 destinations are unknown. In summary, our recent BS graduates have successfully competed for placement in quality educational institutions or companies.

M 11: Opportunities for Improvement
8-year program review opportunities for improvement

Source of Evidence: Administrative measure - other

Target: No target established

Finding (2012-2013) - Target: Met
8-year review opportunities for improvement of undergraduate program: Keep up the good work. The department is encouraged to pursue additional dual-degree programs with departments in the college of engineering, in particular Metallurgical Engineering and Aerospace and Engineering Mechanics. Considering the success of the Physics-ECE dual-major, the establishment of these additional programs could further boost enrollment, increase the marketability of graduates (to industry or graduate school) and foster more inter-departmental collaborations. The department web site has improved significantly. More information concerning student employment and research activities could be included. This might enhance student interest in getting involved in undergraduate research activities. Once again, collaboration with other programs or colleges that are interested promoting undergraduate research (e.g., engineering) might provide an effective mechanism for increasing involvement without increasing faculty workloads.

OthOtcm 6: Program Outcome: Sustain Optimal Level of Enrollment
The program will build and sustain an optimal level of annual program enrollments and degree completions.

Relevant Associations:
Program Outcome #2 Improvement Action(s) to be advanced.
The Department is in the midst of crafting dual-degree programs for engineering branches other than Electrical and Computer Engineering. The ECE program is the most natural dual-major, requiring the fewest additional hours, but we are nonetheless working on other engineering dual-majors, as well. We will continue to recruit physics undergraduates with on-site tours and meetings with faculty, and with outreach activities such as the High School Physics Contest.

Related Measures

M 12: Credit Hour Production
Undergraduate semester credit hour production for the last 3 fall semesters

Source of Evidence: Existing data

Target: No target established

Finding (2012-2013) - Target: Met
Table "2013 BS credit hour production" shows that our total credit hour production (15356) increased 13% over last year (13540). The graph below shows our annual credit hour production over the last 12 years. Our current production is 91% greater than in 2004-5.

Connected Documents
2013 BS credit hour production
2013 BS credit hour production graph

M 13: Number of Courses and Sections Offered
Number of undergraduate courses & sections offered for the last 3 fall semesters

Source of Evidence: Existing data

Target: No target established

Finding (2012-2013) - Target: Met
The tables "2013 BS AY enrollment" and "2013 BS PH enrollment" show the number of courses and sections offered together with the enrollment.

Connected Documents
2013 BS AY enrollment
2013 BS PH enrollment

M 14: Number of Majors
Number of majors for the last 3 fall semesters

Source of Evidence: Existing data

Target: ACHE viability standard of 7.5 BS degrees per year
Finding (2012-2013) - Target: Met
In 2012-13 we had 11 majors graduate (Aug-May), which brought our annual production (averaged over 5 years, as per ACHE) to 12 BS degrees/yr, which exceeds the ACHE viability threshold of 7.5 BS/yr.

M 15: Number of BS Degrees Awarded
Number of BS degrees awarded (Aug-May) for the last 3 fall semesters
Source of Evidence: Existing data

Target:
ACHE viability threshold of 7.5 BS per year.

Finding (2012-2013) - Target: Met
In 2012-13 we had 11 majors graduate (Aug-May), which brought our annual production (averaged over 5 years, as per ACHE) to 12 BS degrees/yr, which exceeds the ACHE viability threshold of 7.5 BS/yr.

M 16: Compare Number of Degrees Conferred to ACHE Standards
Comparison of number of BS degrees awarded to ACHE viability standards
Source of Evidence: Professional standards

Target:
ACHE viability standard of 7.5 BS degrees per year

Finding (2012-2013) - Target: Met
In 2012-13 we had 11 majors graduate (Aug-May), which brought our annual production (averaged over 5 years, as per ACHE) to 12 BS degrees/yr, which exceeds the ACHE viability threshold of 7.5 BS/yr.

M 17: BS Time-to-Degree
We compare the annual distribution of time-to-degree for our graduates to our target of 4 years.

Source of Evidence: Existing data

Target:
4 years

Finding (2012-2013) - Target: Partially Met
Of the 11 majors receiving their BS degrees, for our regular majors the average time to degree was 4.75 years (median: 4.25 yrs), while for our engineering-physics double majors the average time to degree was 4.22 years (median: 4.33 yrs). The time-to-degree distribution for our 4 regular graduating majors was as follows: 3.75, 3.75, 4.75, 6.75 yrs, with 50% within our target of 4 years. The distribution for our 7 engineering-physics double majors was as follows: 2.75, 3.75, 3.75, 4.33, 4.33, 5.33, 5.33 yrs, with 3 (43%) within our target of 4 years. A study of the U.S. Department of Education’s National Center for Education Statistics (NCES) from 2001 provides a general national baseline for comparison: “Graduates of public, four-year institutions in 1999-2000 completed their bachelor’s degree in 4.8 years on average…” (Source: http://www.acenet.edu/AM/Template.cfm?Section=Home&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=7328)

OthOtcm 7: Program Outcome: Highly Valued by Graduates and Constituencies
The program will be highly valued by its program graduates and other key constituencies it serves.

Related Measures

M 18: Post-Graduation Placement
We track the post-graduate destinations of our recent graduates of our Physics Bachelor program and use exit surveys, advising meetings and email surveys to obtain post-graduation placement of our graduating seniors.

Source of Evidence: Alumni survey or tracking of alumni achievements

Target:
No target established.

Finding (2012-2013) - Target: Met
Of our 11 graduates, at least 4 will go on to graduate school in physics, engineering (Carnegie Mellon, UT Austin, Wisconsin) or law (Cumberland School of Law, Samford Univ.). 7 destinations are unknown. In summary, our recent BS graduates have successfully competed for placement in quality educational institutions.

M 19: Graduating Senior Survey
Results from the Graduating Senior Survey for graduating PH majors

Source of Evidence: Student course evaluations on learning gains made

Target:
No target established

Finding (2012-2013) - Target: Met
The results of the graduating senior survey are in the pdf file.

Connected Document
Graduating Senior Survey

M 20: NSSE Results
Results from the most recent NSSE for PH senior majors

Source of Evidence: Academic indirect indicator of learning - other

Target:
No target established

Finding (2012-2013) - Target: Not Reported This Cycle
To few responses to report.
**M 21: Exit Surveys**
Results from departmental exit survey for graduating PH majors

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

**Target:**
No target established

**Finding (2012-2013) - Target: Not Reported This Cycle**
To few responses to report.

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

#### Continued development of common exam questions
The result on the common exam questions falls somewhat short of our goal of 80%. The studio sections of our General Physics courses tend to have better results on the common questions than the non-studio sections. While additional data is needed to obtain better statistics, this measure seems to indicate weaknesses for the learning outcome regarding the application of basics laws of physics and strengths for the learning outcome regarding the analysis of electric circuits.

**Established in Cycle:** 2011-2012  
**Implementation Status:** In-Progress  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**  
**Measure:** Locally Developed Exam Questions  
**Outcome/Objective:** Physics knowledge and problem solving

**Implementation Description:** We will continue the development of our common exam questions. The individual faculty will use the results to revise their course content based on the scores obtained regarding specific learning outcomes.

#### Increased visibility of available undergraduate research projects
We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

**Established in Cycle:** 2011-2012  
**Implementation Status:** In-Progress  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**  
**Measure:** Research Publications  
**Outcome/Objective:** Research  
**Measure:** Track Number of Majors Involved in Research  
**Outcome/Objective:** Research

**Implementation Description:** We will increase the visibility of available undergraduate research projects on our departmental web site.

#### Professional development
In our 1st-semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64). In our 2nd-semester general physics courses, the average CSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 46% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses. One possibility is that the non-calculus course covers more subjects than the calculus-based course.

**Established in Cycle:** 2011-2012  
**Implementation Status:** In-Progress  
**Priority:** High

**Relationships (Measure | Outcome/Objective):**  
**Measure:** Conceptual Survey in Electricity and Magnetism  
**Outcome/Objective:** Basic physics knowledge  
**Measure:** Force Concept Inventory  
**Outcome/Objective:** Basic physics knowledge

**Implementation Description:** We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.

#### Peer evaluation
Our peer evaluation committee has recently finished the development of guidelines and a rubric for peer evaluation of teaching, which have been reviewed and endorsed by all faculty. We expect these guidelines to have a positive impact on the evaluation process and the quality of the feedback faculty will receive regarding their teaching. The individual faculty are expected to use the results of the peer review to revise their teaching, which in turn is expected to affect a number of student learning outcomes.

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

**Relationships (Measure | Outcome/Objective):**  
**Measure:** Conceptual Survey in Electricity and Magnetism  
**Outcome/Objective:** Basic physics knowledge
| Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge |
| Measure: Fundamental astronomy questions | Outcome/Objective: Astronomy knowledge |
| Measure: Lab Exam | Outcome/Objective: Astronomy knowledge |
| Measure: Locally Developed Exam Questions | Outcome/Objective: Physics knowledge and problem solving |

**Responsible Person/Group:** Peer evaluation committee
Mission / Purpose

The mission of the Department of Physics and Astronomy at the University of Alabama is multi-fold. Through our undergraduate programs, we prepare students for graduate work in physics or astronomy, or for immediate employment in physics-related jobs. We play a vital role in the education of other science and engineering students, and promote the understanding of science through our general studies courses. Our graduate programs prepare students for teaching and/or research positions in colleges and universities, and research positions in government and industrial laboratories. Our research contributes new knowledge in the fields of physics and astronomy. It is part of our mission to secure adequate external funding to support departmental research activities. Through public outreach and involvement within our professions, we serve to improve the public understanding and promote the advancement of science.

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

SLO 1: Basic physics knowledge
We expect students who successfully complete our introductory physics courses will demonstrate adequate knowledge of basic physics to prepare them for more advanced courses in physics.

Relevant Associations:
Improvement action: We will continue to implement the following measures to aid faculty in their professional development based on the assessment:
1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty;
2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains;
3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.
4) We will discuss possible causes of the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses during the upcoming Fall semester.

Related Measures

M 1: Force Concept Inventory
In our 1st-semester general physics courses (PH101, PH105, PH125) we use the Force Concept Inventory (FCI), a standardized and nationally adopted exam, which assesses basic knowledge of forces. We use pre- and post-tests to assess learning gains, which are defined as the difference in average scores: (post-test – pretest) divided by the maximum possible gain: (max – pretest). This measure addresses the improvement action.

Source of Evidence: Standardized test of subject matter knowledge

Finding (2011-2012) - Target: Partially Met
In 2011-12, our FCI (Force Concept Inventory) learning gains in our various sections of 1st-semester general physics ranged from 28% to 53%, with an average (median) of 36% (34%). The distribution was as follows: 28, 29, 31, 32, 33, 34, 34, 34, 34, 34, 35, 41, 43, 46, 53%. National baseline values for FCI gains are 23% for traditional courses and 48% for courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64).

The graph “2012 BS Yearly average FCI gains” shows our yearly average of FCI gains – no trend is obvious.

The graph “2012 BS studio vs non-studio” compares the distribution over time of gains in our studio (integrated lectures & labs) sections since 2001 to gains in our non-studio (separate lectures & labs) sections.

The graph “2012 BS studio vs non-studio cumulative” compares the cumulative distribution of the same data: gains in our studio (integrated lectures & labs) sections are compared to gains in our non-studio (separate lectures & labs) sections. The vertical axis shows the fraction of sections with gains greater than particular values along the horizontal axis. Studio sections (in blue) have somewhat better gains than non-studio sections (in red) at the low-gain end of the distributions. The average (median) gain in all studio sections is 30% (31%), compared to 26% (27%) for non-studio sections. This probably reflects faculty differences, rather than format differences, since faculty who have taught in both formats tend to have similar gains in either format.

The graph “2012 BS calculus vs non-calculus” compares the distribution over time of gains in our calculus-based versions of these courses (PH 105, 125) to the non-calculus version (PH 101).

The graph “2012 BS calculus vs non-calculus cumulative” compares the cumulative distribution of gains
in our calculus-based versions of these courses (PH 105, 125) to the non-calculus version (PH 101). There is not much distinction between the two versions: the average (median) of the calculus-based courses is 29% (31%) compared to 29% (30%) for the non-calculus course.

As shown in figure “2012 BS FCI concept gains” we have started to disaggregate the scores for the FCI according to the six conceptual dimensions of this standardized test. This data will be provided to the faculty to enable them to adjust their teaching approach.

Connected Documents
- 2012 BS calculus vs non-calculus
- 2012 BS calculus vs non-calculus cumulative
- 2012 BS FCI concept gains
- 2012 BS studio vs non-studio
- 2012 BS studio vs non-studio cumulative
- 2012 BS Yearly average FCI gains

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

Professional Development
In our 1st-semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64). In our 2nd-semester general physics courses, the average CSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 40% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses. One possibility is that the non-calculus course covers more subjects than the calculus-based course.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
- Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
- Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge

Implementation Description: We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.

M 2: Conceptual Survey in Electricity and Magnetism
In our 2nd-semester general physics courses (PH102, PH106, PH126) we use the Conceptual Survey in Electricity and Magnetism (CSEM), a standardized exam. We use pre- and post-tests to assess learning gains, which are defined as the difference in average scores: (post-test – pre-test) divided by the maximum possible gain: (max – pretest). This measure addresses the improvement action.

Source of Evidence: Standardized test of subject matter knowledge

Connected Document
- Physics BS Curriculum Maps

Target:
National baseline values

Finding (2011-2012) - Target: Partially Met

Our CSEM (Conceptual Survey of Electricity & Magnetism) learning gains ranged from 12% to 38%, with an average (median) of 24% (22%).

The graph “2012 BS Yearly average CSEM gains” shows our yearly average of CSEM gains – no trend is obvious.

The graph “2012 BS studio vs non-studio CSEM” compares the distribution over time of gains in our studio (integrated lectures & labs) sections since 2007 to those in our non-studio (separate lectures & labs) sections. The highest gains in our studio (integrated lectures & labs) sections are compared to those in our non-studio (separate lectures & labs) sections. There is little difference between the two distributions, except that the highest gains are achieved in studio sections (blue). The average (median) gain in studio sections is 23% (21%), compared to 24% (20%) for non-studio sections. Faculty who have taught in both formats tend to have similar gains in either format.

The graph “2012 BS studio vs non-studio CSEM cumulative” compares the cumulative distribution of the same data: gains in our calculus-based versions of these courses (PH 106, 126) to the non-calculus version (PH 102). It is clear that the calculus-based courses tend to have better gains than the non-calculus course.

The graph “2012 BS calculus vs non-calculus CSEM cumulative” compares the cumulative distribution of the same data: gains in our calculus-based versions of these courses (PH 106, 126) are compared to those in the non-calculus version (PH 102). There is a large difference between the two versions: the average
As shown in figure “2012 BS CSEM concepts post-test” we have started to disaggregate the scores for the CSEM according to the eleven conceptual dimensions of this standardized test:

I. Charge distribution on conductors/insulators
II. Coulomb's law
III. Electric force and field superposition
IV. Force caused by an electric field
V. Force, electric potential, field and force
VI. Induced charge and electric field
VII. Magnetic force
VIII. Magnetic field caused by a current
IX. Magnetic field superposition
X. Faraday's law
XI. Newton's third law

This data will be provided to the faculty to enable them to adjust their teaching approach.

Connected Documents
- 2012 BS calculus vs non-calculus CSEM
- 2012 BS calculus vs non-calculus CSEM cumulative
- 2012 BS CSEM concepts post-test
- 2012 BS studio vs non-studio CSEM
- 2012 BS studio vs non-studio CSEM cumulative
- 2012 BS Yearly average CSEM gains

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

Professional development

In our 1st-semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64). In our 2nd-semester general physics courses, the average CSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 40% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
- Measure: Conceptual Survey in Electricity and Magnetism | Outcome/Objective: Basic physics knowledge
- Measure: Force Concept Inventory | Outcome/Objective: Basic physics knowledge

Implementation Description: We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.

SLO 2: Astronomy knowledge

We expect students who successfully complete our introductory astronomy courses will demonstrate a broad knowledge of astronomy and that they can apply their knowledge to successfully complete astronomy laboratories.

Connected Document
- Physics BS Curriculum Maps

Relevant Associations:
- Improvement action: We will continue to refine the diagnostic lab exam in the coming year.

Related Measures

M 3: Fundamental astronomy questions

In our introductory astronomy classes (AY101, AY204, AY206) we use pre- and post-tests to assess learning gains. These tests are composed of 20 fundamental questions covering the full range of topics covered in these survey courses: the appearance of celestial objects in the sky; the history of astronomy; the nature of planetary systems, stars, galaxies, and the universe.
Target: Learning gains of at least 30%

Finding (2011-2012) - Target: Met

In 2011-12, our learning gains in our various sections of introductory astronomy ranged from 50% to 76%, with an average of 60% (median: 57%). The distribution was: 50, 55, 56, 57, 61, 65, 66, 76%

The figure “2012 BS AY gains” shows the gains in AY 101 over the last 4 years, distinguishing sections which used clickers (blue) from those that did not (red). The classes using clickers tend to have larger learning gains than classes that do not use clickers.

The figure “2012 BS AY learning outcome gains” shows the AY 101 learning gains broken down by learning outcome in 3 sections in Spring 2012. The 22 questions of the astronomy diagnostic exam were mapped to the 8 learning gains for the course. Briefly, the learning outcomes are labeled as C – Concepts, H – History, L – Light & Matter, A – Appearance of the sky, P – Planets, S – Stars, G – Galaxies, U – Universe. The Light & Matter outcome has the smallest gain, which we attribute to a particular question that probably needs to be stated more clearly. We will revised that question in the coming semester.

Connected Documents
2012 BS AY gains
2012 BS AY learning outcome gains

M 4: Lab Exam

We administer a diagnostic lab exam at the end of the semester (addresses improvement action).

Source of Evidence: Academic direct measure of learning - other

Connected Document
Physics BS Curriculum Maps

Target: No target established

Finding (2011-2012) - Target: Met

Students achieved an average of 73% on the diagnostic lab exam, with individual scores ranging from 47-94%. The exam covered coordinate systems, rising & setting of celestial objects, planetary oppositions, & locating objects with planetarium software & celestial globes.

All 9 of our introductory astronomy courses had learning gains exceeding our goal of at least 30%. Sections which used clickers tended to have better gains than sections which did not.

SLO 3: Physics knowledge and problem solving

We expect students who successfully complete our physics curriculum to demonstrate a broad knowledge of physics and demonstrate competency in solving a broad range of physics problems and that they can apply their knowledge to successfully complete physics laboratories.

Connected Document
Physics BS Curriculum Maps

Relevant Associations:

Improvement action: We will continue the development of our common exam questions. The individual faculty will use the results to revise their course content based on the scores obtained regarding specific learning outcomes.

Related Measures

M 5: Physics Major Field Test

We annually administer the Physics Major Field Test (by ETS – Educational Testing Service) to as many of our Sophomore, Junior, and Senior Physics majors as we can. This is a nationally-normed standardized exam that allows us to compare how well our students are acquiring and applying physics knowledge in the full range of our physics curriculum. We administer the exam near the end of each Spring semester and we will compare the distribution of our students’ results to the national distribution. A significant, well-known issue with such exams is providing sufficient incentives for students to 1) take the exam and 2) take the exam seriously. We experiment with the incentives, as necessary, to increase student participation and performance.

Source of Evidence: Standardized test of subject matter knowledge

Connected Document
Physics BS Curriculum Maps

Target: Exceed national norm

Finding (2011-2012) - Target: Met

Following are the percentile scores of all of our majors who took the ETS Physics Major Field Test, listed in order of their national percentile ranking among national seniors: 97, 93, 80, 80, 78, 73, 64, 58, 55, 52, 46, 46, 38, 38, 35, 27, 24, 16, 13

Of these, the percentile scores of our seniors who took the exam were: 93, 80, 73, 64, 38, 35, 16, 13

In the graph “2012 BS MFT seniors”, we plot the factor by which our seniors exceed the national norms for seniors for the last several years. The higher the ratio, the more we exceed the national norms (indicated by the black horizontal line at 1). For example, by definition, 10% of national seniors exceed the
90th percentile; if 20% of our seniors’ scores exceed the national 90th percentile, then we exceed the national norm at 90th percentile by a factor of 2. This year (green line) our seniors were close to the national norm except at the highest percentiles, where we significantly exceed the national norm. We typically have 2-5 times as many seniors above the 95th percentile compared to the national norm.

In the graph “2012 BS MFT So Jr Se”, we plot the factor by which our sophomore, junior, and senior majors exceed the national norms for seniors. Our most recent results (2012) are indicated in green.

The Physics Major Field Test results can be broken down by subject area. The table “2012 BS MFT table” lists the performance (percent correct) of our test takers in five sub-areas of physics:
1) Classical Mechanics and Relativity
2) Electromagnetism
3) Optics, Waves, and Thermal Physics
4) Quantum Mechanics and Atomic Physics
5) Special Topics

These results are also shown in the graph “2012 BS MFT sub areas”.

We also examined what fraction of our majors improve their MFT scores in successive tries. The figure “2012 BS MFT changes” shows the cumulative distribution of changes in individual majors’ MFT scores. 70% of our majors improved their scores, while 30% did not improve their scores on successive exams.

The distribution of Physics Major Field Test scores is significantly better than the national distribution on the high end of performance; our seniors exceed national norms for seniors by a factors of 2 above the 95th percentile.

M 6: Locally Developed Exam Questions
We use a pool of locally developed common exam questions to assess student learning across different sections of the same course for the different learning outcomes of the course (addresses improvement action).

Source of Evidence: Academic direct measure of learning - other

Connected Document
Physics BS Curriculum Maps

Target:
Average score of 80% on common exam questions

Finding (2011-2012) - Target: Partially Met
In 2011–12, students scored an average (median) of 61% (60%) on our locally developed exam questions common to all sections of our 1st semester General Physics courses (PH 101, 105, 125). The distribution was as follows: 47, 51, 52, 57, 57, 58, 60, 60, 60, 62, 64, 65, 70, 75, 78%

The plot “2012 BS Common questions” shows the evolution of our 1st semester common exam questions over time, distinguishing studio courses (blue) from non-studio courses (red).

In our 2nd semester General Physics courses (PH 102, 106, 126) students scored an average (median) of 70.5% (72%) on common questions in our various sections. The distribution was as follows: 47, 64, 68, 71, 73, 74, 79, 88%

The plot “2012 BS Common questions 2nd semester” shows the evolution of our 2nd semester common exam questions over time, distinguishing studio courses (blue) from non-studio courses (red).

The result on the common exam questions falls somewhat short of our goal of 80%. The studio sections of our General Physics courses tend to have better results on the common questions than the non-studio sections. While additional data is needed to obtain better statistics, this measure seems to indicate weaknesses for the learning outcome regarding the application of basics laws of physics and strengths for the learning outcome regarding the analysis of electric circuits.

Related Action Plans (by Established cycle, then alpha):
Continued development of common exam questions
The result on the common exam questions falls somewhat short of our goal of 80%. The studio sections of our General Physics courses tend to have better results on the common questions than the non-studio sections. While additional data is needed to obtain better statistics, this measure seems to indicate weaknesses for the learning outcome regarding the application of basics laws of physics and strengths for the learning outcome regarding the analysis of electric circuits.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High
SLO 4: Research
We expect our majors to be able to apply their physics knowledge to carry out research with faculty.

Connected Document
Physics BS Curriculum Maps

Relevant Associations:
We will increase the visibility of available undergraduate research projects on our departmental web site.

Related Measures

M 7: Track Number of Majors Involved in Research
We track the number of majors that are involved in research projects with faculty (addresses improvement action).

Source of Evidence: Academic indirect indicator of learning - other

Connected Document
Physics BS Curriculum Maps

Target: No target established
Finding (2011-2012) - Target: Met
In 2011-12, we had 26 undergraduates (including 16 physics majors) involved in 25 separate research projects with 12 faculty.

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

Related Action Plans (by Established cycle, then alpha):
Increased visibility of available undergraduate research projects

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Research Publications | Outcome/Objective: Research

M 8: Research Publications
We track the number of research publications that have our undergraduates as co-authors, as well as the annual number of professional presentations that involve our undergraduate majors (addresses improvement action).

Source of Evidence: Academic indirect indicator of learning - other

Connected Document
Physics BS Curriculum Maps

Target: No target established
Finding (2011-2012) - Target: Met
1 major was a co-author on 3 refereed publications with 1 faculty in 2011-12.
2 majors were co-authors on 2 conference presentations with 2 faculty in 2011-12.

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

Related Action Plans (by Established cycle, then alpha):
Increased visibility of available undergraduate research projects
We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
Measure: Research Publications | Outcome/Objective: Research
Measure: Track Number of Majors Involved in Research | Outcome/Objective: Research

Implementation Description: We will increase the visibility of available undergraduate research projects on our departmental web site.

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

OthOtm 5: Program Outcome: High Level of Recognized Quality
The program will improve and sustain a high level of recognized quality.

Related Measures
M 9: Program Strengths
8-year program review strengths
Source of Evidence: Administrative measure - other
Target: No target established
Finding (2011-2012) - Target: Met
8-year review strengths of undergraduate program:
The Physics/Astronomy majors currently in the program are a strength. Many of these students are very thoughtful about this program, very concerned about its quality, and want very much to be involved. The increased attention paid to the undergraduate program, has paid dividends in terms of enrollment. This trend should continue provided that activity in this area is maintained. The dual-degree program established with Electrical engineering was visionary, and should be expanded to include other programs; both for the benefit of the department and its graduates.

M 10: Opportunities for Improvement
8-year program review opportunities for improvement
Source of Evidence: Administrative measure - other
Target: No target established
Finding (2011-2012) - Target: Met
8-year review opportunities for improvement of undergraduate program:
Keep up the good work. The department is encouraged to pursue additional dual-degree programs with departments in the college of engineering, in particular Metallurgical Engineering and Aerospace and Engineering Mechanics. Considering the success of the Physics-ECE dual-major, the establishment of these additional programs could further boost enrollment, increase the marketability of graduates (to industry or graduate school) and foster more inter-departmental collaborations. The department web site has improved significantly. More information concerning student employment and research activities could be included. This might enhance student interest in getting involved in undergraduate research activities. Once again, collaboration with other programs or colleges that are interested promoting undergraduate research (e.g., engineering) might provide an effective mechanism for increasing involvement without increasing faculty workloads.

OthOtm 6: Program Outcome: Sustain Optimal Level of Enrollment
The program will build and sustain an optimal level of annual program enrollments and degree completions.

Related Measures
M 11: Credit Hour Production
Undergraduate semester credit hour production for the last 3 fall semesters
Source of Evidence: Existing data
Target: No target established
Finding (2011-2012) - Target: Met
The table "2012 BS credit hour production" shows that our total credit hour production (13493) increased 5% over last year (12813). Gains in physics credit hour production more than compensated for losses in astronomy credit hour production (see enrollment trends above). The graph below shows our annual
credit hour production over the last 10 years. Our current production is 68% greater than in 2004-5.

Connected Document
2012 BS credit hour production

M 12: Number of Courses and Sections Offered
Number of undergraduate courses & sections offered for the last 3 fall semesters

Source of Evidence: Existing data
Target:
No target established
Finding (2011-2012) - Target: Met
The tables “2012 BS AY enrollment” and “2012 BS PH enrollment” show the number of courses and sections offered together with the enrollment.

Connected Documents
2012 BS AY enrollment
2012 BS PH enrollment

M 13: Number of Majors
Number of majors for the last 3 fall semesters

Source of Evidence: Existing data
Target:
ACHE viability standard of 7.5 BS degrees per year
Finding (2011-2012) - Target: Met
In 2011-12 we had 87 majors and awarded 9 BS degrees (Aug-May). Over the last 5 years we had an average of 10.4 BS degrees per year, which exceeds the ACHE viability threshold of 7.5.

M 14: Number of BS Degrees Awarded
Number of BS degrees awarded (Aug-May) for the last 3 fall semesters

Source of Evidence: Existing data
Target:
ACHE viability threshold of 7.5 BS per year.
Finding (2011-2012) - Target: Met
In 2011-12 we had 87 majors and awarded 9 BS degrees (Aug-May). Over the last 5 years we had an average of 10.4 BS degrees per year, which exceeds the ACHE viability threshold of 7.5.

M 15: Compare Number of Degrees Conferred to ACHE Standards
Comparison of number of BS degrees awarded to ACHE viability standards

Source of Evidence: Professional standards
Target:
ACHE viability standard of 7.5 BS degrees per year
Finding (2011-2012) - Target: Met
In 2011-12 we had 87 majors and awarded 9 BS degrees (Aug-May). Over the last 5 years we had an average of 10.4 BS degrees per year, which exceeds the ACHE viability threshold of 7.5.

OthOtcm 7: Program Outcome: Highly Valued by Graduates and Constituencies
The program will be highly valued by its program graduates and other key constituencies it serves.

Related Measures

M 16: Graduating Senior Survey
Results from the Graduating Senior Survey for graduating PH majors

Source of Evidence: Student course evaluations on learning gains made

M 17: NSSE Results
Results from the most recent NSSE for PH senior majors

Source of Evidence: Academic indirect indicator of learning - other

M 18: Exit Surveys
Results from departmental exit survey for graduating PH majors

Source of Evidence: Academic indirect indicator of learning - other

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

Continued development of common exam questions
The result on the common exam questions falls somewhat short of our goal of 80%. The studio sections of our General Physics courses tend to have better results on the common questions than the non-studio sections. While additional data is needed to obtain better statistics, this measure seems to indicate weaknesses for the learning outcome regarding the application of basics laws of physics and strengths for the learning outcome regarding the analysis of electric circuits.

Established in Cycle: 2011-2012
Implementation Status: In-Progress
Priority: High

Relationships (Measure | Outcome/Objective):
**Measure**: Locally Developed Exam Questions | **Outcome/Objective**: Physics knowledge and problem solving

**Implementation Description**: We will continue the development of our common exam questions. The individual faculty will use the results to revise their course content based on the scores obtained regarding specific learning outcomes.

**Increased visibility of available undergraduate research projects**

We believe we are achieving a satisfactory level of undergraduate involvement in our research. On our departmental web site we list past and present undergrad research projects, along with faculty who have undergrad projects available; interested majors can review this list to help them shop for potential projects.

**Established in Cycle**: 2011-2012  
**Implementation Status**: In-Progress  
**Priority**: High  
**Relationships (Measure | Outcome/Objective)**:  
**Measure**: Research Publications | **Outcome/Objective**: Research  
**Measure**: Track Number of Majors Involved in Research | **Outcome/Objective**: Research

**Implementation Description**: We will increase the visibility of available undergraduate research projects on our departmental web site.

**Professional development**

In our 1st-semester general physics courses, the average FCI learning gains meet our goal of at least 30% gains. However, 25% of the courses have learning gains below our goal. Our FCI learning gains exceeded the national baseline for learning gains typically achieved in traditional courses but are somewhat short of those achieved in courses with interactive engagement (R.R. Hake 1998, Am. J. Phys. 66, 64). In our 2nd-semester general physics courses, the average CSEM learning gains are somewhat short of our goal of at least 30% gains, with 70% of the course sections below our goal. 40% of the course sections had gains exceeding the 25% baseline published by D.P. Maloney et al. (2001, Phys. Educ. Res., Am. J. Phys. Suppl. 69, 12). We do not yet understand the large difference between non-calculus and calculus-based versions of our 2nd-semester general physics courses. One possibility is that the non-calculus course covers more subjects than the calculus-based course.

**Established in Cycle**: 2011-2012  
**Implementation Status**: In-Progress  
**Priority**: High  
**Relationships (Measure | Outcome/Objective)**:  
**Measure**: Conceptual Survey in Electricity and Magnetism | **Outcome/Objective**: Basic physics knowledge  
**Measure**: Force Concept Inventory | **Outcome/Objective**: Basic physics knowledge

**Implementation Description**: We will continue to implement the following measures to aid faculty in their professional development based on the assessment: 1) Faculty with relatively high gains are encouraged by the chair to share their techniques with other faculty; 2) Faculty with relatively low gains are encouraged by the chair to have their class presentations be evaluated by peer faculty with the highest gains; 3) The chair meets with faculty with relatively low gains in order to help determine contributing factors.
## Curriculum Map I (Student Learning Outcomes)

<table>
<thead>
<tr>
<th>Course</th>
<th>Student Learning Outcome 1</th>
<th>Student Learning Outcome 2</th>
<th>Student Learning Outcome 3</th>
<th>Student Learning Outcome 4</th>
<th>Student Learning Outcome 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic physics knowledge</td>
<td>Astronomy knowledge</td>
<td>Physics knowledge</td>
<td>Research</td>
<td></td>
</tr>
<tr>
<td>PH105/PH125</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH106/PH126</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH253/PH255</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH301/PH302</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH331/PH332</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH354</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH411</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH441/PH442</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH471</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH491</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH493/495/496</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY203</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY204</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY206</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Curriculum Map II (Assessment Measures)

<table>
<thead>
<tr>
<th>Course</th>
<th>Student Learning Outcome 1</th>
<th>Student Learning Outcome 2</th>
<th>Student Learning Outcome 3</th>
<th>Student Learning Outcome 4</th>
<th>Student Learning Outcome 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic physics knowledge</td>
<td>Astronomy knowledge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH105/PH125 Measure 1.1: course embedded assessment; standardized, nationally adopted test (Force concept inventory), administered at the beginning and end of the semester.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH106/PH126 Measure 1.2: course embedded assessment; standardized test (Conceptual Survey in Electricity and Magnetism), administered at the beginning and end of the semester. Measure 3.2: course embedded assessment; common exam questions throughout the semester.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH253/PH255 Measure 3.1 Summative assessment; Physics Major Field Test (Educational Testing Service), administered each Spring semester.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH301/PH302 Measure 3.1 Summative assessment; Physics Major Field Test (Educational Testing Service), administered each Spring semester.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 5</td>
<td>PH331/PH332</td>
<td>Measure 3.1 Summative assessment; Physics Major Field Test (Educational Testing Service), administered each Spring semester.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 6</td>
<td>PH354</td>
<td>Measure 3.1 Summative assessment; Physics Major Field Test (Educational Testing Service), administered each Spring semester.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 7</td>
<td>PH411</td>
<td>Measure 3.1 Summative assessment; Physics Major Field Test (Educational Testing Service).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 8</td>
<td>PH441/PH442</td>
<td>Measure 3.1 Summative assessment; Physics Major Field Test (Educational Testing Service), administered each Spring semester.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 9</td>
<td>PH471</td>
<td>Measure 3.1 Summative assessment; Physics Major Field Test (Educational Testing Service), administered each Spring semester.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 10</td>
<td>PH491</td>
<td>Measure 3.1 Summative assessment; Physics Major Field Test (Educational Testing Service), administered each Spring semester.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 11</td>
<td>PH493/495/496</td>
<td>Measure 4.1: Research projects with faculty. Measure 4.2: Research publications.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 12</td>
<td>AY203</td>
<td>Measure 2.2: course embedded assessment; diagnostic lab exam at the end of the semester.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 13</td>
<td>AY204</td>
<td>Measure 2.1: course embedded assessment; 20 question test developed at UA, administered at the beginning of the semester (pre-test) and by the end of the semester (post-test).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course 14</td>
<td>AY206</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Graduating Senior Survey
Department of Physics & Astronomy
The University of ALABAMA

Report Compiled by
Jon Charles Acker, Ph.D.

Office of Institutional Research and Assessment
Respondent Characteristics

Fourteen graduates from the Department of Physics completed the instrument between Fall 2009 and Spring 2013. Ten of the respondents were male and four were female. Twelve respondents were White, one was African-American and one was a Native-American. Six respondents graduated during the spring 2010 term, one in fall 2010, three in spring 2011, three in spring 2012 and one in spring 2013.

The survey is reproduced in the results. The number of respondents (N) for each structured item is given with the percentages of structured responses reported in the given tables. Open-ended responses are highlighted in red italic text and assigned an ID for comparison across questions.
**Question 2: General Knowledge, Skills, Personal Development**

To what extent do you think your education at UA contributed to your knowledge, skills, and/or personal development in each of the following areas?

<table>
<thead>
<tr>
<th>Area</th>
<th>N</th>
<th>Very Much</th>
<th>Somewhat</th>
<th>Very Little</th>
<th>Not at All</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing skills</td>
<td>14</td>
<td>42.9</td>
<td>35.7</td>
<td>7.1</td>
<td>14.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Listening skills</td>
<td>14</td>
<td>14.3</td>
<td>57.1</td>
<td>14.3</td>
<td>7.1</td>
<td>7.1</td>
</tr>
<tr>
<td>Comprehension skills (written information)</td>
<td>14</td>
<td>35.7</td>
<td>28.6</td>
<td>28.6</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td>Mathematical skills</td>
<td>14</td>
<td>78.6</td>
<td>14.3</td>
<td>7.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Scientific methods of inquiry</td>
<td>14</td>
<td>78.6</td>
<td>21.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Analytic skills</td>
<td>14</td>
<td>78.6</td>
<td>14.3</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td>Computer skills</td>
<td>14</td>
<td>42.9</td>
<td>21.4</td>
<td>14.3</td>
<td>14.3</td>
<td>7.1</td>
</tr>
<tr>
<td>Public speaking skills</td>
<td>14</td>
<td>28.6</td>
<td>28.6</td>
<td>28.6</td>
<td>14.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Information gathering skills</td>
<td>14</td>
<td>57.1</td>
<td>21.4</td>
<td>14.3</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td>Function as part of a team</td>
<td>14</td>
<td>28.6</td>
<td>28.6</td>
<td>28.6</td>
<td>14.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>
**Question 3: Department and Department Faculty**

Please assess your department and its faculty members for each of the following:

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Frequently</th>
<th>Occasionally</th>
<th>Seldom</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you conduct or assist in a research project in your major?</td>
<td>14</td>
<td>42.9</td>
<td>42.9</td>
<td>0.0</td>
<td>14.3</td>
</tr>
<tr>
<td>Did at least one faculty member in your major express a special interest in your academic progress?</td>
<td>14</td>
<td>35.7</td>
<td>42.9</td>
<td>21.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Did at least one faculty member in your major express a special interest in your career development?</td>
<td>14</td>
<td>28.6</td>
<td>42.9</td>
<td>28.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Were you unable to enroll in a required course in your major because all sections were filled?</td>
<td>14</td>
<td>0.0</td>
<td>0.0</td>
<td>28.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Did faculty in your major encourage you to be an actively involved learner?</td>
<td>14</td>
<td>28.6</td>
<td>35.7</td>
<td>35.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Did faculty in your major give you prompt feedback?</td>
<td>14</td>
<td>50.0</td>
<td>28.6</td>
<td>21.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Did faculty in your major care about your academic success?</td>
<td>14</td>
<td>35.7</td>
<td>57.1</td>
<td>7.1</td>
<td>0.0</td>
</tr>
</tbody>
</table>
**Question 4: Major Courses, Faculty, Instruction, Advising**

How would you evaluate the courses, faculty, instruction, and advising in your major?

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction in 100 and 200 level courses in your major was</td>
<td>14</td>
<td>21.4</td>
<td>57.1</td>
<td>21.4</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Instruction in 300 level and above courses in your major was</td>
<td>14</td>
<td>14.3</td>
<td>50.0</td>
<td>21.4</td>
<td>14.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Instruction provided by departmental graduate teaching assistants (GTAs) in your major was</td>
<td>14</td>
<td>14.3</td>
<td>28.6</td>
<td>7.1</td>
<td>21.4</td>
<td>28.6</td>
</tr>
<tr>
<td>The overall quality of your major was</td>
<td>14</td>
<td>21.4</td>
<td>42.9</td>
<td>28.6</td>
<td>7.1</td>
<td>0.0</td>
</tr>
<tr>
<td>The quality of courses as preparation for employment after graduation in your major was</td>
<td>14</td>
<td>0.0</td>
<td>42.9</td>
<td>28.6</td>
<td>14.3</td>
<td>14.3</td>
</tr>
<tr>
<td>The quality of courses as preparation for graduate or professional school in your major was</td>
<td>14</td>
<td>14.3</td>
<td>71.4</td>
<td>7.1</td>
<td>7.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Advising in your major was</td>
<td>14</td>
<td>50.0</td>
<td>42.9</td>
<td>7.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Question 5: Department Facilities**

How would you evaluate your department's facilities?

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>The classroom facilities in your department were</td>
<td>14</td>
<td>14.3</td>
<td>50.0</td>
<td>7.1</td>
<td>28.6</td>
<td>0.0</td>
</tr>
<tr>
<td>The non-computer laboratory facilities for courses in your major were</td>
<td>14</td>
<td>21.4</td>
<td>21.4</td>
<td>28.6</td>
<td>28.6</td>
<td>0.0</td>
</tr>
<tr>
<td>The departmental computer facilities for courses in your major were</td>
<td>14</td>
<td>14.3</td>
<td>35.7</td>
<td>0.0</td>
<td>14.3</td>
<td>35.7</td>
</tr>
</tbody>
</table>
**Question 6: Core Courses, Faculty, Instruction**

How would you evaluate the courses, faculty, and instruction in your core curriculum/general education classes?

<table>
<thead>
<tr>
<th>Instruction provided by graduate teaching assistants (GTAs) in core courses was good.</th>
<th>N</th>
<th>Frequently</th>
<th>Occasionally</th>
<th>Seldom</th>
<th>Never</th>
<th>Took core Elsewhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>28.6</td>
<td>28.6</td>
<td>21.4</td>
<td>0.0</td>
<td>21.4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Were you unable to enroll in a core course because all sections were filled?</th>
<th>N</th>
<th>Frequently</th>
<th>Occasionally</th>
<th>Seldom</th>
<th>Never</th>
<th>Took core Elsewhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>0.0</td>
<td>7.1</td>
<td>14.3</td>
<td>71.4</td>
<td>7.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did faculty in your core courses encourage you to be an actively involved learner?</th>
<th>N</th>
<th>Frequently</th>
<th>Occasionally</th>
<th>Seldom</th>
<th>Never</th>
<th>Took core Elsewhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>42.9</td>
<td>14.3</td>
<td>28.6</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did faculty in your core courses give you prompt feedback?</th>
<th>N</th>
<th>Frequently</th>
<th>Occasionally</th>
<th>Seldom</th>
<th>Never</th>
<th>Took core Elsewhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>21.4</td>
<td>57.1</td>
<td>7.1</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did faculty in your core courses care about your academic success?</th>
<th>N</th>
<th>Frequently</th>
<th>Occasionally</th>
<th>Seldom</th>
<th>Never</th>
<th>Took core Elsewhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>28.6</td>
<td>42.9</td>
<td>21.4</td>
<td>0.0</td>
<td>7.1</td>
<td></td>
</tr>
</tbody>
</table>

**Additional comments on the above core curriculum courses, faculty, and instruction.** N = 3

2 My experience with core classes (the introductory courses) was varied. The UH and advanced courses were great because of the small class size, students that actually wanted to learn, and excited professors that enjoyed teaching students who want to learn. My language (French) and computer science classes were also great. English and writing fell under the UH/advanced category, and mathematics, physics, and psychology came easily to me to begin with. My problems were the history and chemistry classes. Because of the large size, there were many students who really didn't want to be there. Also, professors usually taught from powerpoint slides that they did not put together themselves. I have the most complaints about the chemistry classes, where the professors actually tell you that only 1/3 of the original (101) class will make it to the 102 class. I had to take 102 my senior year because it never fit into my schedule. This course consists of a 50 minute lecture three times a week, an 80 minute recitation one

6 The core curriculum desperately needs to be reduced. I was unable to take many upper-level classes because of the core requirements, and am now at a significant disadvantage as an entering graduate student.

9 Excellent.
### Question 7: Campus Offices, Services, Opportunities

How would you evaluate these offices, services, and opportunities?

<table>
<thead>
<tr>
<th>Service Description</th>
<th>N</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration process</td>
<td>14</td>
<td>21.4</td>
<td>42.9</td>
<td>28.6</td>
<td>7.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Financial aid services</td>
<td>14</td>
<td>35.7</td>
<td>35.7</td>
<td>21.4</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td>Campus food services</td>
<td>14</td>
<td>7.1</td>
<td>57.1</td>
<td>14.3</td>
<td>21.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Supply store services</td>
<td>14</td>
<td>7.1</td>
<td>64.3</td>
<td>21.4</td>
<td>7.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Campus health services</td>
<td>13</td>
<td>30.8</td>
<td>30.8</td>
<td>7.7</td>
<td>0.0</td>
<td>30.8</td>
</tr>
<tr>
<td>Campus counseling (not career) services</td>
<td>14</td>
<td>7.1</td>
<td>14.3</td>
<td>0.0</td>
<td>7.1</td>
<td>71.4</td>
</tr>
<tr>
<td>Business services/cashier/student accounts</td>
<td>14</td>
<td>7.1</td>
<td>35.7</td>
<td>35.7</td>
<td>7.1</td>
<td>14.3</td>
</tr>
<tr>
<td>University Career Center</td>
<td>14</td>
<td>0.0</td>
<td>7.1</td>
<td>0.0</td>
<td>0.0</td>
<td>92.9</td>
</tr>
<tr>
<td>Campus residence life programs for those in University-owned housing</td>
<td>14</td>
<td>7.1</td>
<td>14.3</td>
<td>7.1</td>
<td>7.1</td>
<td>64.3</td>
</tr>
<tr>
<td>Opportunities to participate in campus recreational activities</td>
<td>14</td>
<td>57.1</td>
<td>35.7</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td>Opportunities to participate in other extra-curricular activities</td>
<td>14</td>
<td>57.1</td>
<td>28.6</td>
<td>14.3</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Opportunities to participate in community service projects</td>
<td>14</td>
<td>28.6</td>
<td>28.6</td>
<td>14.3</td>
<td>7.1</td>
<td>21.4</td>
</tr>
</tbody>
</table>

Additional comments on the offices, services, and opportunities.  \( N = 4 \)

1. **Campus food quality is excellent, but limitations on meal plan options in Ferg are disappointing, and food is not reasonably priced.** $8 lunch combos seem to exploit student accounts too much.
2. **The only request from this section would be more healthy options in the food court. I don’t want to pay $9 for lunch to get something healthy from Fresh Food.**
3. **Student accounts service was completely convoluted.** There has to be a simpler way. I also felt unprepared for my entrance to the job market.
4. **Many people in the above areas seemed 'stand-offish' toward the common student.** Patience was typically very thin as well. Maintaining an overall attitude of professionalism would go a long way.
**Question 8: Professional Growth from Field Experience**

How would you evaluate your experience with a co-op, internship, practicum, student teaching, or other field experience in terms of its contribution to your personal and professional growth?  N = 14

<table>
<thead>
<tr>
<th>Percent</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>64.3</td>
<td>Excellent</td>
</tr>
<tr>
<td>7.1</td>
<td>Good</td>
</tr>
<tr>
<td>0.0</td>
<td>Fair</td>
</tr>
<tr>
<td>0.0</td>
<td>Poor</td>
</tr>
<tr>
<td>28.6</td>
<td>I did not participate in any of those activities</td>
</tr>
</tbody>
</table>

**Question 9: Person who made Most Significant Positive Contribution**

Identify the person at UA who made the most significant positive contribution to your education:  N = 14

Sarah Barry
Emily Conner
Ronald Dulek
Jimmy Irwin
William Keel
Patrick LeClair (5)

George McClure
Robert Moore
Andreas Piepke
Shane Sharpe

(Note: number in parentheses indicates number of references. One respondent listed three names)
**Question 10: Overall UA Intellectual Environment**

All things considered, how would you characterize the intellectual environment at UA?  \( N = 14 \)

<table>
<thead>
<tr>
<th>Percent</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.3</td>
<td>Very strong</td>
</tr>
<tr>
<td>50.0</td>
<td>Strong</td>
</tr>
<tr>
<td>28.6</td>
<td>Average</td>
</tr>
<tr>
<td>7.1</td>
<td>Weak</td>
</tr>
<tr>
<td>0.0</td>
<td>Very Weak</td>
</tr>
</tbody>
</table>

Please explain your reason(s) for your answer.  \( N = 13 \)

1. I am from a very rural Midwestern area; in light of my background, UA is the most diverse atmosphere I have been a part of. However, intellectual environment is not ‘very strong’ because I don't think UA is as inclusive or open-minded as it could be. This will continue to be the case with the prominence of Greek life, although the growth of the Honors College and the expanded enrollment of out-of-state students will continue to improve the overall atmosphere.

2. The Honors program is very beneficial and intellectually challenging. Also, the astronomy department has some very interesting research opportunities.

3. A true intellectual environment is not the study of business, philosophy or any such bullshit course. It is the study of science and mathematics. And there are very few real intellectuals on this campus.

4. They are smart people.

5. It is very strong among the math and science people I am around frequently. Collaboration and team work occurs frequently. Outside of my academic niche, there are numerous people I have developed relationships with that have enriched my intellect. I'd say it's a great environment, for those willing to get involved with it.

6. Though CBH and the Honors College provide a lively intellectual sub-system, and there are many specific excellent professors, there is not on the whole a very good attitude toward thought and scholarship among the general campus population.

7. I felt within my department almost everyone helped contribute to the intellectual atmosphere I felt. Outside of my department I still found widespread ignorance and arrogance to be the driving force behind any conversations or debates.

8. Because the university make sure you strive to do your best at whatever you do.

9. Sometimes it seems like academics in general take a backseat to sports events (on weekends of football games, it can be impossible to do anything on campus except for drink and watch football.)

10. UA has a wide range of intellect. The strong are very strong, but there are others who are average or below. Overall I would say students and teachers are average. However, there are many excellent faculty members at UA.

12. An air of supremacy over students was prevalent especially with the higher level class professors in my field. Encountering this on a day by day basis proves to wear on one after awhile. Little to no advice was given as to how to correct the problem, merely a proverbial slap in the face explaining how ignorant one was. This lack of enthusiasm for learning is a detriment to intellectual growth for the department.

13. There are a lot of intelligent students and excellent academic departments on campus. However, I personally felt like the university was focused more on football and other sports than on education.
Not enough core classes were offered. This was due to the university not making the physics department a priority or giving them enough money to get all they need. The physics department has some really fantastic professors, and they've greatly improved in my time, but they need to hire more faculty and obtain more equipment in order to have students become more involved with research. Core classes the UA makes you take for arts and sciences are a joke and a waste of time. I should have spent more time focusing on physics and math courses. That was not possible with the asinine core classes that are required.
Question 11: Overall UA Education Received

All things considered, how would you evaluate the overall education that you received at UA?  N = 14

<table>
<thead>
<tr>
<th>Percent</th>
<th>Excellent</th>
<th>14.3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good</td>
<td>64.3</td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>Poor</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Please explain your reason(s) for your answer.  N = 12

2   My answer to this question is really focused on my departments, which are physics and math. The answer would probably be “good” or even “excellent” if one thing were altered in the programs. The 100/200 level courses are great, but there seems to be a lar

3   The physics department needs a complete overhaul. It needs to require more mathematics. There should also be a 1 hour long math methods class taught every semester to keep you fresh on mathematic tricks.

4   I enjoyed my major and had a spectrum of classes in Arts and Science that contributed to my overall knowledge.

5   The educators and services provided by UA are excellent. Once again, it is up to the individual to make the most of them.

6   It could have been much improved if I had had the opportunity to take more high-level courses.

8   I learn alot of valuable information whereas I knew a lot of information already that I had learn from my community school.

9   I think I would have given an excellent rating if I felt more prepared to find a job. I think the physics major as it is now is a little too geared for graduate school and not enough for the possibility of entering the workforce.

10  I did not feel as if it was the best education I could have received, but it got the job done.

11  I consider the overall amount and quality of my education at UA worthwhile and substantive. What regrets I have about my academic choices are really attributable to the “luck of the draw,” as in deciding which semester to take a given class and finding out later that it had not been taught well, or to my own stubbornness, as when I overloaded a number of semesters and sacrificed health and happiness to complete all the requirements. Even so, I believe that I am as well-prepared for graduate school as a realist could demand (albeit not as prepared as the perfectionist in me would have liked), and various awards and recognition throughout my career have seemed to affirm such a judgment.

12  The few good professors fortunately corrected the damage done by poor ones. As a result I am relatively pleased with the quality of education I have received. I can see much room for improvement, however overall I am pleased.

13  I feel like most of the physics professors do not explain and teach material very well. For a lot of my classes, I frequently had to teach myself the material outside of class.

14  The physics department does not have enough resources, so I could have gotten a better education elsewhere.
Question 12: Attend UA Again

If you had to start over again, would you still choose to attend UA?  N = 14

<table>
<thead>
<tr>
<th>Percent</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.0</td>
<td>Definitely</td>
</tr>
<tr>
<td>28.6</td>
<td>Probably</td>
</tr>
<tr>
<td>21.4</td>
<td>Probably not</td>
</tr>
<tr>
<td>0.0</td>
<td>Definitely not</td>
</tr>
</tbody>
</table>

Please explain your reason(s) for your answer.  N = 12

1. I love the University of Alabama. I wouldn’t trade four years here to be anywhere else. No other university I visited had an atmosphere that was comparable, or takes care of its students so well.
2. Despite my long winded complaints, I did receive a well-rounded education and great life experiences.
3. The AFROTC program is stellar. It is where the majority of my friendships were made.
4. I enjoyed my time at UA for the aforementioned responses.
5. See above.
6. I have done very well at UA and achieved all my goals in terms of getting into graduate schools. Knowing this, I would not risk changing my mind.
7. For my major I did not realize how small and underfunded the physics department was. At least it seemed this way to me after comparing with friends at other state universities.
8. It's a good university and the education is great but its too close to home.
9. Scholarships
10. While appealing at first, the product did NOT meet the expectations given by the publicity department. The administration was lacking in professionalism, the classes were either incredibly simple or unnecessarily complicated, and the sheer cost of everything on campus from a simple piece of plastic to park to food was outrageous. Once again, the few excellent professors saved the day.
11. I would have preferred a school that was more focused on academics than the are on winning the next sporting event. While sports activities are fun and important, they should not be the central focus of a university.
12. There's a chance I would have chosen electrical engineering instead. This is not based upon university equipment, etc.
Question 13: Choose Major Again

If you had to start over again, would you still choose this major?  N = 14

<table>
<thead>
<tr>
<th>Percent</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.0</td>
<td>Definitely</td>
</tr>
<tr>
<td>28.6</td>
<td>Probably</td>
</tr>
<tr>
<td>14.3</td>
<td>Probably not</td>
</tr>
<tr>
<td>7.1</td>
<td>Definitely not</td>
</tr>
</tbody>
</table>

Please explain your reason(s) for your answer.  N = 13

1. Sometimes a more interdisciplinary track intrigues me, such as a New College option. But my major is in line with many of my interests, and is broadly applicable for graduate school, so I would probably choose again.
2. I chose to be a physics major because I loved the AP physics class I had in high school and dreamed of working for NASA. I didn't realize until this year how much I dislike the theory aspect of it. Most of the professors in the department are theoretical.
3. I enjoy the intellectual challenge.
4. Same as above.
5. I would have chosen to major in Mathematics and minor in Physics instead of the other way around.
6. Physics and Math are the most interesting things in the world for me. I would not be happy doing anything else.
7. My interests changed over the course of my collegiate career and I felt it was too late to change my major as it would postpone my graduation by a year at the least.
8. Because if I would have chosen this major from the start I could have been graduated and in graduate school or in the workforce.
9. I would probably choose a double major with Physics and an engineering discipline of some kind.
10. I love physics and dance.
11. My mind was already made up before I even enrolled at UA. There was no way a few setbacks or inconveniences from uncaring professors were going to derail my plans.
12. Although I do not feel like I am well-suited for a career in physics, I really enjoy astronomy.
13. Scholarships and not needing to actually pay for school is why I came here.
Question 14: Reason for Attending UA

What is the primary reason you chose to attend UA?  \( N = 14 \)

<table>
<thead>
<tr>
<th>Percent</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Academic Reputation</td>
</tr>
<tr>
<td>7.1</td>
<td>Cost</td>
</tr>
<tr>
<td>0.0</td>
<td>Family</td>
</tr>
<tr>
<td>0.0</td>
<td>Friends came here</td>
</tr>
<tr>
<td>14.3</td>
<td>Major/Field of Study</td>
</tr>
<tr>
<td>21.4</td>
<td>Location</td>
</tr>
<tr>
<td>35.7</td>
<td>Scholarship/Financial Aid</td>
</tr>
<tr>
<td>0.0</td>
<td>Social Life</td>
</tr>
<tr>
<td>0.0</td>
<td>Athletics</td>
</tr>
<tr>
<td>21.4</td>
<td>Other: Please list (see comment below)</td>
</tr>
</tbody>
</table>

The following is the list of comments from the “Other” category.  \( N = 3 \)

1. no primary reason; a balance of factors
2. Million Dollar Band Colorguard
3. AFROTC
**Question 15: Participation in Clubs and Organizations**

Check all of the clubs or organizations that you participated in actively while in graduate school at UA.  \( N = 14 \)

<table>
<thead>
<tr>
<th>Percent</th>
<th>Club/Organization</th>
<th>Percent</th>
<th>Club/Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Student government</td>
<td>7.1</td>
<td>Intercollegiate athletics</td>
</tr>
<tr>
<td>14.3</td>
<td>Volunteer service</td>
<td>35.7</td>
<td>Independent study/research</td>
</tr>
<tr>
<td>35.7</td>
<td>Academic clubs</td>
<td>14.3</td>
<td>Study abroad or overseas program</td>
</tr>
<tr>
<td>64.3</td>
<td>Political clubs</td>
<td>14.3</td>
<td>Social fraternity or sorority</td>
</tr>
<tr>
<td>50.0</td>
<td>Cultural clubs</td>
<td>64.3</td>
<td>Religious services/clubs</td>
</tr>
<tr>
<td>14.3</td>
<td>Honor societies</td>
<td>7.1</td>
<td>Student newspaper/Corolla</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.3</td>
<td>Million Dollar Band</td>
</tr>
</tbody>
</table>

Did you hold an office in any of the above organizations? Yes: \( N = 8 \)

The following are the offices and remarks listed by the respondents.

2  **Corresponding Secretary of Sigma Alpha Iota (women's music fraternity)**

3  **Held several positions inside Arnold Air Society over the course of my time here. Ranging from Operations to Command.**

7  **Founding Officer and Treasurer for 2 years of the Society of Physics Students**

8  **On the independent study I was the main team leader or manager where I taught different areas of subjects to high school students.**

9  **I was the President of the Society of Physics Students.**

10 **Vice-President in Society of Physics Students, Principal dancer In MDBCG, CCHS chair in Alpha Lambda Delta Honor Society**

12 **Baptist Campus Ministry Leadership Team**

14 **Secretary and president of the Society of Physics Students**

---

**Question 16: Work Status Throughout College**

Generally, what was your work status throughout college?

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>On-Campus Full-Time</th>
<th>On-Campus Part-Time</th>
<th>Off-Campus Full-Time</th>
<th>Off-Campus Part-Time</th>
<th>Did Not Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>13</td>
<td>7.7</td>
<td>23.1</td>
<td>0.0</td>
<td>23.1</td>
<td>46.2</td>
</tr>
<tr>
<td>Sophomore</td>
<td>13</td>
<td>7.7</td>
<td>38.5</td>
<td>0.0</td>
<td>30.8</td>
<td>23.1</td>
</tr>
<tr>
<td>Junior</td>
<td>14</td>
<td>21.4</td>
<td>50.0</td>
<td>0.0</td>
<td>7.1</td>
<td>21.4</td>
</tr>
<tr>
<td>Senior</td>
<td>14</td>
<td>14.3</td>
<td>57.1</td>
<td>7.1</td>
<td>14.3</td>
<td>7.1</td>
</tr>
</tbody>
</table>
Question 17: Plans Following Graduation.

Indicate the ONE best description of your plans following graduation.  N = 14

Percent
7.1  I do not know yet
0.0  I have accepted a job related to my field of study
7.1  I have accepted a job not related to my field of study
0.0  I plan to continue in my current position
42.9 I will be going to a graduate or professional school full-time next year: What school?  (see comments below)
0.0  I will be going to a graduate or professional school part-time next year and working part-time: What school?  (see comments below)
0.0  I will take more undergraduate courses
14.3 I am still seeking employment
7.1  I am not currently seeking employment and do not plan to attend school next year
7.1  I am entering military service
14.3 Other  (see comments below)

The following is the list of comments from the above questions.

I will be going to a graduate or professional school full-time next year:
What school?

4  Beeson Divinity School
5  University of Alabama
6  MIT, UMD, Stanford, or Duke
10  UAB
12  UA
14  University of Texas at Austin

I will be going to a graduate or professional school part-time next year and working part-time: What school?

Other

2  I applied for my dream job (NASA) and if I don't get it this round I will go to graduate school at UAH and try again after I get my Masters.
7  Peace Corps
Question 18: Additional Comments

Additional comments: Elaborate on anything covered or not covered in the survey.  N = 4

2  My dream since I was young was to work for NASA. When I came here, it turned into a concrete plan. I had three internships at Marshall Space Flight Center that I absolutely loved and my classes were great, for the most part. This past year things went dow

6  The A&S core curriculum must be reduced!!!!!!!!!!!!!

11  The numbering on the “please explain your reasoning” questions is wrong!

12  Make this school match was the ads say. Work on compassion and a better attitude toward others who may not hold the same views as yourself (especially religious views). There were many times I was personally attacked by the Atheists and Agnostics of America because of my convictions, and they were attacked by others as well. Freedom to express ones beliefs without persecution is still a freedom we Americans hold.
<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CM &amp; Relativity</td>
<td>57</td>
<td>55</td>
<td>51</td>
<td>49</td>
<td>42</td>
<td>52</td>
<td></td>
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<tr>
<td>E&amp;M</td>
<td>51</td>
<td>53</td>
<td>48</td>
<td>45</td>
<td>46</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Optics/Waves &amp; Thermo</td>
<td>54</td>
<td>52</td>
<td>41</td>
<td>38</td>
<td>33</td>
<td>45</td>
<td></td>
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<tr>
<td>QM &amp; Atomic</td>
<td>52</td>
<td>55</td>
<td>50</td>
<td>45</td>
<td>41</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Special Topics</td>
<td>43</td>
<td>46</td>
<td>37</td>
<td>39</td>
<td>33</td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

| N majors | 11  | 18  | 19  | 30  | 20  | 20  |
| N non-majors | 3  | 15  | 19  |     |     |     |

|          | 156 | 156 | 151 | 154 | 151 | 152 |          |
|          | 144 | 133 | 134 |     |     |     |          |
|          | 120 | 147 | 143 |     |     |     |          |

majors' avg
non-majors avg
all avg
<table>
<thead>
<tr>
<th></th>
<th>Sum 2011</th>
<th>Fall 2011</th>
<th>Spring 2012</th>
<th>Total</th>
<th>Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sec</td>
<td>Enroll</td>
<td>Sec</td>
<td>Enroll</td>
<td>Sec</td>
<td>Enroll</td>
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<td>Lower UG</td>
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<td>5</td>
<td>403</td>
<td>5</td>
<td>528</td>
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<td>102</td>
<td>3</td>
<td>39</td>
<td>16</td>
<td>348</td>
<td>17</td>
<td>430</td>
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<td>203</td>
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<td>2</td>
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<td>9</td>
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<td>LUG Totals</td>
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<td>24</td>
<td>779</td>
<td>23</td>
<td>967</td>
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<td>Upper UG</td>
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AY 101 Gains vs time

AY gain

AY 200800 200900 201000 201100 201200 201300
calculus (PH 105+125) vs non (PH 101)

FCI gain

20050 20060 20070 20080 20090 20100 20110 20120 20130
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Physics MFT Percentile Ratio
UA (So Jr Sr) factor > national Seniors
Yearly Avg FCI Gains - PH 101, 105+125

Avg FCI Gain


101
105+125