

Physics BS: 2018-2019

Definition of Unit

Providing Department:

Physics

Department/Unit Contact:

Steve Robinson

Mission/Vision Statement:

The mission statement for the TTU Department of Physics is to promote the learning of physics through effective teaching, research, and public service. Such learning opportunities are provided to students of all disciplines, in support of the mission of the University.

The department addresses this mission through two programs;

- i) a coherent program of study leading to a B.S. in Physics, and
- ii) a service program that provides courses in physics and astronomy that are requirements for other degree programs or are used by students to fulfill general education science requirements.

Learning Outcome 1 - Student Learning in Introductory Courses

Define Goal:

Students completing calculus-based and algebra-based introductory physics courses will demonstrate increased understanding of foundational basic concepts in mechanics.

Intended Outcomes / Objectives:

Students will achieve an average normalized gain score of at least 45% on a standard diagnostic test. For many years the targeted goal was a gain of 40%, but with recent improved performance, this year the target was raised to 45%. Currently, the minimum acceptable performance for any particular class section is a 30% gain, and any gain greater than 50% is regarded as exemplary.

DRILL DOWN-----
RELATED ITEM LEVEL 1

Learning Outcome 1: Assessment - Force Concept Inventory

Frequency of Assessment:

Beginning and end of each semester

Rationale:

The Force Concept Inventory is a nationally recognized diagnostic test of basic conceptual understanding and is administered to all students at the beginning of both PHYS 2010 and PHYS 2110 courses, and then again after the relevant material has been covered. The normalized gain score, used to judge improvement in understanding, is a measure of the actual improvement in performance after instruction, versus the maximum possible improvement.

RELATED ITEM LEVEL 2

Learning Outcome 1: Results - Force Concept Inventory (FCI)

Results:

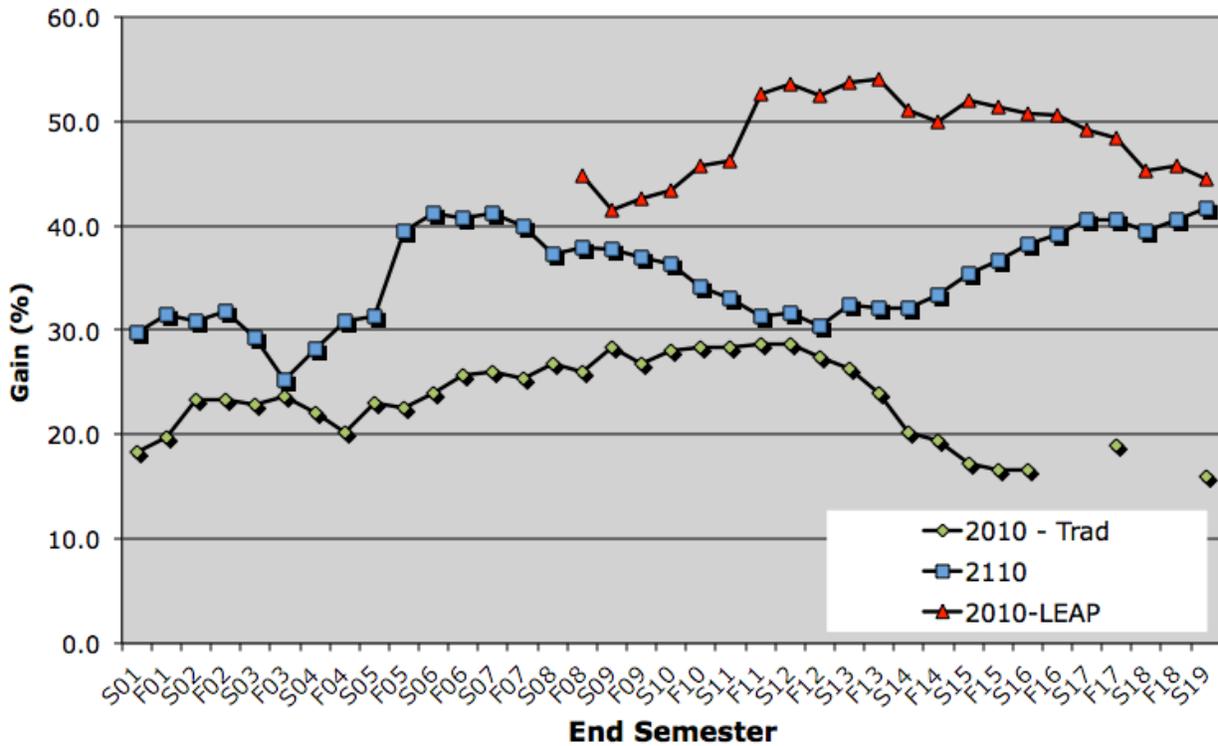
In the 2018/19 academic year 7 of 9 sections of PHYS 2110 achieved the goal of a normalized gain of 40% or more. The average gain of all 9 sections was approximately 44%. At 41.6% the rolling 5-semester average gain is the highest it has been since we have been keeping records!

In PHYS 2010 the 6 sections taught using the guided-inquiry LEAP curriculum had an average gain of 44%. While this surpasses the goal of 40%, this average is the lowest for several years. This relatively disappointing result is mainly due to one of the individual spring sections having an unusually low gain of 25%. The reason for this is not clear.

The one section of PHYS 2010 taught in the more traditional manner again showed a low gain of less than 20%, reconfirming that the LEAP format produces significantly enhanced student learning.

The graph below shows the rolling 5 semester average of FCI gains in relevant courses and a fuller report on a continuing longitudinal study is attached.

Rolling 5-semester average of FCI gain scores



Attachments:

FCI_report_2019.pdf

RELATED ITEM LEVEL 3

Change Related to Learning Outcome 1 and Program Goal 3 - Raising the FCI gain goal

Program Changes and Actions due to Results:

For many years the department goal for the Force Concept Inventory (Tool 6) administered as a pre-/post-test in PHYS 2010 and PHYS 2110 has been to achieve a gain of at least 40%. With the development of the LEAP curriculum for PHYS 2010 and the more widespread adoption of student-centered instructional strategies in PHYS 2110 we have now achieved this goal in both courses (Result 6). Therefore, for the coming year we will raise this goal to a gain of 45%.

Link to Assessment:

Detailed feedback on FCI results (Tool 6, Result 6) has been provided to faculty for several years, and they have been encouraged to focus on employing student-centered strategies in their classes to improve student learning. These strategies have been documented in faculty annual reports (Tool 4, Result 4) and shared with the rest of the department. Also, the department faculty engaged in Physics Education Research (PER) bring interesting developments in the field to the attention of everyone. In this way, more effective strategies have gradually been adopted by most of the department, resulting in a gradual improvement in FCI gain scores to the point that most sections of the relevant courses are now attaining the department goal of 40%.

RELATED ITEM LEVEL 3

Change related to Learning Outcome 1 and Program Goal 3 - Adoption of LEAP Curriculum

Program Changes and Actions due to Results:

We would like to offer all sections of PHYS 2010 and PHYS 2020 using the integrated LEAP curriculum format. However, for now we will continue to offer one section taught in the traditional lecture+lab format.

Link to Assessment:

Students using the LEAP curriculum in the PHYS 2010 course show vastly superior performance on the Force Concept Inventory diagnostic test (Tool 6, Results 6) consistently surpassing the department goal of a gain of 40% (Learning Objective 1), whereas those in traditionally taught sections do not. However, in offering all sections in this format we found that some students could not fit the three 2-hours blocks required into their class schedules. In addition we do not yet have enough instructors who feel comfortable with the LEAP format to implement it in all sections. We continue to brainstorm how we could accommodate all students with the LEAP format, but have so far been unsuccessful. Therefore we will reluctantly continue to offer one section of both PHYS 2010 and PHYS 2020 in the traditional format.

RELATED ITEM LEVEL 3

Change related to Learning Outcome 1 and Program Goal 3 - Development of Online Introductory Classes

Program Changes and Actions due to Results:

For the past several years significant numbers of TTU students have chosen to take the online TN eCampus versions of PHYS 2110 and PHYS 2120. While for some this is because of the perceived ease of these classes compared to the on-ground counterparts, for others it is because of the convenience in scheduling that such a class offers. Unfortunately these online classes do not prepare students well, particularly in the area of needed laboratory skills. The TTU physics department has therefore resolved to develop its own online versions of these courses, focusing on maintaining high quality while employing current best practices in online delivery in general and physics content in particular. The working group formed last year has developed what we deem as an acceptable format, and the first version of online PHYS 2110 will be offered in the fall of 2019.

Link to Assessment:

The department will use the established FCI diagnostic test (Tool 4, Result 4) to assess student learning in this new online course compared to current on-ground versions.

Learning Outcome 2 - Learning of Physics Majors

Define Goal:

Students graduating in physics will demonstrate an understanding of the basic principles and foundations of physics.

Intended Outcomes / Objectives:

Graduating seniors will score, on average, at or above the 75th percentile on the ETS Major Field Test in Physics. The threshold of acceptability is to have all seniors score at or above the 50th percentile, thus maintaining a claim that TTU physics graduates are 'above average'.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Learning Outcome 2: Assessment - Major Field Test

Frequency of Assessment:

When necessary for graduating seniors

Rationale:

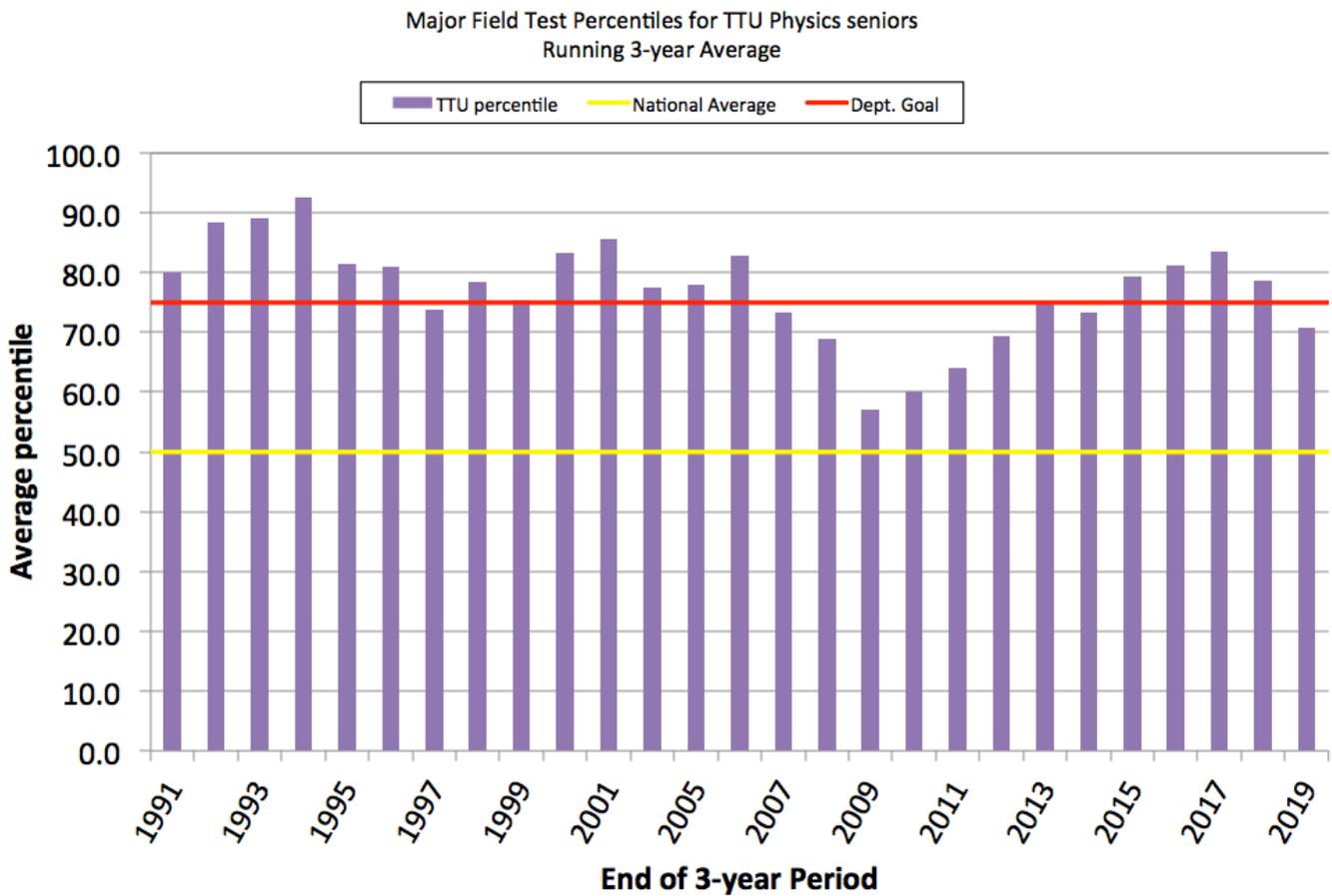
The ETS Major Field Test in Physics is a 70 item multiple-choice test that covers: Classical Mechanics and Relativity; Electromagnetism; Optics and Wave, Thermodynamics and Statistical Mechanics; Quantum Mechanics and Atomic Physics; and other Special Topics. All physics graduates will take the ETS Major Field Test in Physics during their final semester at TTU. Due to a low number of students, only two sub-scores are provided with the Exit exam results.

RELATED ITEM LEVEL 2

Learning Outcome 2: Results - Major Field Test

Results:

Five students took the Major Field Test in Physics this year, with an average percentile ranking of 69%. Our three year average percentile now stands at 71%, which has slipped below the department goal of an average of the 75th percentile for the first time in 5 years.



A breakdown of MFT results suggests students are weaker in the areas of Optics/Waves and Thermodynamics. Over the coming year, the department will discuss a course of action to address this weakness.

Attachments:

Learning Outcome 3 - Experimental Skills

Define Goal:

Students graduating in physics will demonstrate the skills and techniques necessary to engage in authentic experimental investigation.

Intended Outcomes / Objectives:

Students will demonstrate their ability to engage in experimental investigations by meeting or exceeding the minimum standards of the capstone Advanced Experimental Physics course (PHYS 4710 or PHYS 4711). The targeted outcome is that at least 75% of students should meet or exceed the minimum standards.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Learning Outcome 3: Assessment - PHYS 4710/4711 Capstone Course

Frequency of Assessment:

When necessary for graduating seniors

Rationale:

All physics majors take a senior lab course, either PHYS 4710 (4 cr) or PHYS 4711 (2 cr). To be successful in this course students must synthesize many skills learned in their academic careers to date. They must engage in scientific investigation by planning and carrying out experiments, and they must use their physics knowledge to guide them and to interpret their results. They must also submit written reports of all their investigations and make a public oral presentation of one project at the end of the semester. Faculty present at these presentations will submit a report on them. A written summary of these reports, together with an assessment as to whether a particular student has met this outcome, will be compiled by the faculty member teaching the course, and placed in the student's file.

RELATED ITEM LEVEL 2

Learning Outcome 3: Results - PHYS 4710/4711 Capstone Course

Results:

Three physics majors took either the PHYS 4710 or 4711 course this year, only two of who met the minimal expectations.

Attachments:

Learning Outcome 4 - Oral Presentation

Define Goal:

Students graduating in physics will demonstrate the ability to communicate their understanding orally in a presentation format.

Intended Outcomes / Objectives:

Students will demonstrate their ability to effectively communicate their capstone Advanced Experimental Physics project (PHYS 4710 or PHYS 4711). The targeted outcome is that at least 75% of students should meet or exceed the minimum communication standards on the project rubric.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Learning Outcome 4: Assessment - PHYS 4710/4711 Capstone Oral Comm.

Frequency of Assessment:

When necessary for graduating seniors

Rationale:

All physics majors take a senior lab course, either PHYS 4710 (4 cr) or PHYS 4711 (2 cr). To be successful in this course students must synthesize many skills learned in their academic careers

to date. They must engage in scientific investigation by planning and carrying out experiments, and they must use their physics knowledge to guide them and to interpret their results. They must also submit written reports of all their investigations and make a public oral presentation of one project at the end of the semester. Faculty present at these presentations will submit a report on them. A written summary of these reports, together with an assessment as to whether a particular student has met this outcome, will be compiled by the faculty member teaching the course, and placed in the student's file.

RELATED ITEM LEVEL 2

Learning Outcome 4: Results - PHYS 4710/4711 Capstone Oral Comm.

Results:

Three physics majors took either the PHYS 4710 or 4711 course this year, all three were judged by the faculty to have made acceptable oral presentations.

Attachments:

Learning Outcome 5 - Technological Tools

Define Goal:

Students graduating in physics will have received an introduction to a range of common technological tools appropriate to physics and related disciplines.

Intended Outcomes / Objectives:

All graduating physics majors and alumni report being adequately prepared to use technological tools appropriate to physics and related disciplines in their employment or graduate studies.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Learning Outcome 5: Assessment - Technological Tools

Frequency of Assessment:

As necessary for graduating seniors; Approximately every five years

Rationale:

Exit Interview with students who are getting ready to graduate from the program. While these students do not have the benefit of post-program experience, they do have a fresher recollection of their TTU experiences and so can provide valuable feedback on some elements of the program. The department chair already conducts a confidential exit interview with each graduating physics major. These interviews explicitly address how well prepared each student feels for their next career step, including their preparation in the use of technological tools and development of research skills.

Because of the low number of physics graduates, the alumni surveys are administered to department alumni on an approximate 5-year cycle. Among the questions asked are how well graduates felt the TTU physics program prepared them for their chosen career path, and how effectively they were introduced to appropriate technological tools. (The most recent results available are from the survey conducted in Fall 2014 in conjunction with the department's scheduled academic audit.)

RELATED ITEM LEVEL 2**Learning Outcome 5: Result - Technological Tools****Results:****Exit Interviews:**

In exit interviews conducted just before graduation four seniors expressed general satisfaction with their preparation at TTU. Addressing the department goal of giving students a good grounding in computational techniques, all said their exposure was valuable, though two would have liked more practice in the use of commercial software packages.

Alumni Survey:

Due to the low numbers of graduates we only conduct this survey every 5 years. The most recent survey was conducted this year in conjunction with our program review. A full report is attached, but significant results are:

- TTU physics students continue to be highly satisfied with the program and the level of preparation they receive for their future careers.

Attachments:

alum_survey_report_2019.pdf

Learning Outcome 6 - Career Preparation**Define Goal:**

The TTU physics program will give students sufficient preparation in content and skills/techniques to continue to graduate school or obtain suitable employment.

Intended Outcomes / Objectives:

All graduating seniors and alumni will report being well prepared to continue on to graduate school in physics (or a closely related discipline) or to enter immediate employment, whichever is relevant to their particular situation.

DRILL DOWN-----**RELATED ITEM LEVEL 1****Learning Outcome 6: Assessment - Career Preparation****Frequency of Assessment:**

As necessary for graduating seniors; Approximately every five years

Rationale:

Exit Interview with students who are getting ready to graduate from the program. While these students do not have the benefit of post-program experience, they do have a fresher recollection of their TTU experiences and so can provide valuable feedback on some elements of the program. The department chair already conducts a confidential exit interview with each graduating physics major. These interviews explicitly address how well prepared each student feels for their next career step, including their preparation in the use of technological tools and development of research skills.

Because of the low number of physics graduates, the alumni surveys are administered to department alumni on an approximate 5-year cycle. Among the questions asked are how well graduates felt the TTU physics program prepared them for their chosen career path, and how effectively they were introduced to appropriate technological tools. (The most recent results available are from the survey conducted in Fall 2014 in conjunction with the department's scheduled academic audit.)

RELATED ITEM LEVEL 2

Learning Outcome 6: Results - Career Preparation

Results:

Exit Interviews:

In exit interviews conducted just before graduation four seniors expressed general satisfaction with their preparation at TTU. Addressing the department goal of giving students a good grounding in computational techniques, all said their exposure was valuable, though two would have liked more practice in the use of commercial software packages. Addressing the department goal of developing students' research skills, all reported that their experiences within the department had been invaluable in this area, but one expressed a desire for more mentoring in the skills needed.

Alumni Surveys:

Due to the low numbers of graduates we only conduct this survey every 5 years. The most recent survey was conducted this year in conjunction with our program review. A full report is attached, but significant results are:

- TTU physics students continue to be highly satisfied with the program and the level of preparation they receive for their future careers.

Attachments:

alum_survey_report_2019.pdf

Learning Outcome 7 - Development of Research Skills

Define Goal:

Students graduating in physics will demonstrate the skills and techniques needed to engage in planning and carrying out basic or applied research.

Intended Outcomes / Objectives:

Students will demonstrate competency by completing a research project in PHYS 4730 (Research Planning) and PHYS 4740 (Research) courses taken as seniors. Students will meet or

exceed the minimum standards of the research course (PHYS 4730 or PHYS 47140). The targeted outcome is that at least 75% of students should meet or exceed the minimum standards.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Learning Outcome 7: Assessment - Research Involvement and Skills Development

Frequency of Assessment:

End of each academic year

Rationale:

PHYS 4730 (Research Planning) and PHYS 4740 (Research) Capstone

All physics majors must take these two senior level research courses. To be successful in these courses students must create a detailed research plan and present it both in written and oral formats (PHYS 4730). They must then conduct the planned research and again present the results in written and oral formats (PHYS 4740). Each year the department will judge students' competence in planning and conducting research and communication.

Student Research Involvement

The department will keep a record of student participation in the research of department faculty members and in specialized summer research programs for undergraduates at other institutions. (Note: since almost all such experiences must necessarily take place during the summer it is impossible to ensure that all students will take advantage of such opportunities. However, the department will encourage such participation as actively as possible.)

Exit Interviews

The department chair already conducts a confidential exit interview with each graduating physics major. These interviews explicitly address how well prepared each student feels for their next career step, including their preparation in the use of technological tools and development of research skills.

RELATED ITEM LEVEL 2

Learning Outcome 7: Results - Research Involvement and Skills Development

Results:

PHYS 4730 (Research Planning) and PHYS 4740 (Research) Capstone

In their second implementation, three students completed these course. All met the minimal standards for success thus demonstrating their attainment of the required skills and in planning and carrying out research.

Student Research Involvement

During this year a total of twenty individual undergraduate students participated in research activities of various types with department faculty members. In addition one graduate student in the College of Education was mentored by two physics faculty members.

Exit Interviews

In interviews conducted just before graduation four seniors expressed general satisfaction with their preparation at TTU. Addressing the department goal of developing students' research skills, all reported that their experiences within the department had been invaluable in this area, but one expressed a desire for more mentoring in the skills needed.

Attachments:

Program Goal 1 - Number of Physics Majors

Define Goal:

The Department will recruit and retain sufficient majors for a thriving educational program.

Intended Outcomes / Objectives:

Increase majors at least one per year. Having sustained an average of at least 30 majors for several years, the current minimum acceptable threshold is that the average number of majors should not drop below 30.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Program Goal 1: Assessment - Number of Physics Majors

Frequency of Assessment:

Beginning of every fall semester

Rationale:

At the beginning of each fall semester a count is made of the number of the total number of enrolled students who have Physics declared as a major. Because of the small numbers involved, trends are tracked using an average of the current year plus the previous four years.

RELATED ITEM LEVEL 2

Program Goal 1: Results 2 - Number of Physics Majors

Results:

The number of declared physics majors at the start of the Fall 2017 semester was 30, which is a slight increase from the previous year. However, we still have a long way to go to reach our goal of a five-year average 50 majors.

Attachments:

Program Goal 2 - STEM Center Involvement

Define Goal:

The Physics Department will contribute to the mission of the Millard Oakley Center for Teaching and Learning in Science, Technology, Engineering, and Mathematics (STEM).

Intended Outcomes / Objectives:

1. The majority of faculty in the department will support the center by teaching at least one class using its facilities and/or facilitating activities in center outreach events.
2. Physics students will engage in at least three center outreach activities per year.

The minimum acceptable threshold is to maintain involvement via at least one faculty member and student engagement in at least one outreach event.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Program Goals 2: Assessment - STEM Center Involvement

Frequency of Assessment:

End of each academic year

Rationale:

At the end of each academic year, a count is made of the number of actual or proposed projects, programs, and outreach events in which members of the Physics faculty and physics undergraduates were jointly involved with the Millard Oakley Center for Teaching and Learning in Science, Technology, Engineering, and Mathematics (STEM).

RELATED ITEM LEVEL 2

Program Goal 2: Results - STEM Center Involvement

Results:

Physics faculty involvement in projects and programs associated with the Millard Oakley STEM Center (MOSC) has continued at a high level. Again, one faculty member taught a complete course using the MOSC facilities. Four faculty members were also engaged with the Center in other ways. Two were PIs on separate grants administered by MOSC and three physics faculty and approximately ten students were involved in several different public outreach events offered by MOSC.

Attachments:

Program Goal 3 - Improving Instruction

Define Goal:

Ensure the use of effective and innovative pedagogical methods within the classroom.

Intended Outcomes / Objectives:

All faculty will report on changes/innovation in instruction in their annual reports, reflecting on their utility with regard to student learning and attitudes. Changes that result in improved student

performance are expected to be adopted and will be shared with the department as a whole. As a minimum, faculty are expected to report on one such strategy per year.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Program Goal 3: Assessment - Teaching Developments

Frequency of Assessment:

End of each academic year

Rationale:

In their annual reports faculty members will be asked to comment on their awareness of new pedagogical developments and whether they have tried to implement them in their own teaching.

Once each academic year, every faculty member is video-taped teaching a class. The chair uses these video-tapes to assess a faculty member's teaching in terms of the implementation of effective pedagogy. The tapes are also made available to the faculty members concerned to facilitate reflection on their own teaching.

RELATED ITEM LEVEL 2

Program Goal 3: Results - Teaching Developments

Results:

During this year several developments in instruction occurred in the department:

- Materials for the LEAP format of the PHYS 2020 course were finalized.
- Two faculty members continued developing a 'flipped' class format for the PHYS 2120 class.
- An online version of PHYS 2110 was planned and developed, to be delivered for the first time in Fall 2019.
- The Frontiers of Physics freshman seminar class (PHYS 1173) was taught for the first time.
- A new Observational Astronomy (ASTR 3100) was proposed and will be delivered for the first time in Fall 2019.
- A program for a minor in Astronomy was approved by the University.

No classroom video was recorded again this year because of time pressure imposed by various administrative functions. Since we have another tool that addresses Program Goal 4, we are considering abandoning this particular measure.

Attachments:

RELATED ITEM LEVEL 3

Change Related to Learning Outcome 1 and Program Goal 3 - Raising the FCI gain goal**Program Changes and Actions due to Results:**

For many years the department goal for the Force Concept Inventory (Tool 6) administered as a pre-/post-test in PHYS 2010 and PHYS 2110 has been to achieve a gain of at least 40%. With the development of the LEAP curriculum for PHYS 2010 and the more widespread adoption of student-centered instructional strategies in PHYS 2110 we have now achieved this goal in both courses (Result 6). Therefore, for the coming year we will raise this goal to a gain of 45%.

Link to Assessment:

Detailed feedback on FCI results (Tool 6, Result 6) has been provided to faculty for several years, and they have been encouraged to focus on employing student-centered strategies in their classes to improve student learning. These strategies have been documented in faculty annual reports (Tool 4, Result 4) and shared with the rest of the department. Also, the department faculty engaged in Physics Education Research (PER) bring interesting developments in the field to the attention of everyone. In this way, more effective strategies have gradually been adopted by most of the department, resulting in a gradual improvement in FCI gain scores to the point that most sections of the relevant courses are now attaining the department goal of 40%.

RELATED ITEM LEVEL 3

Change related to Learning Outcome 1 and Program Goal 3 - Adoption of LEAP Curriculum**Program Changes and Actions due to Results:**

We would like to offer all sections of PHYS 2010 and PHYS 2020 using the integrated LEAP curriculum format. However, for now we will continue to offer one section taught in the traditional lecture+lab format.

Link to Assessment:

Students using the LEAP curriculum in the PHYS 2010 course show vastly superior performance on the Force Concept Inventory diagnostic test (Tool 6, Results 6) consistently surpassing the department goal of a gain of 40% (Learning Objective 1), whereas those in traditionally taught sections do not. However, in offering all sections in this format we found that some students could not fit the three 2-hours blocks required into their class schedules. In addition we do not yet have enough instructors who feel comfortable with the LEAP format to implement it in all sections. We continue to brainstorm how we could accommodate all students with the LEAP format, but have so far been unsuccessful. Therefore we will reluctantly continue to offer one section of both PHYS 2010 and PHYS 2020 in the traditional format.

RELATED ITEM LEVEL 3

Change related to Learning Outcome 1 and Program Goal 3 - Development of Online Introductory Classes

Program Changes and Actions due to Results:

For the past several years significant numbers of TTU students have chosen to take the online TN eCampus versions of PHYS 2110 and PHYS 2120. While for some this is because of the perceived ease of these classes compared to the on-ground counterparts, for others it is because of the convenience in scheduling that such a class offers. Unfortunately these online classes do not prepare students well, particularly in the area of needed laboratory skills. The TTU physics department has therefore resolved to develop its own online versions of these courses, focusing on maintaining high quality while employing current best practices in online delivery in general and physics content in particular. The working group formed last year has developed what we deem as an acceptable format, and the first version of online PHYS 2110 will be offered in the fall of 2019.

Link to Assessment:

The department will use the established FCI diagnostic test (Tool 4, Result 4) to assess student learning in this new online course compared to current on-ground versions.

RELATED ITEM LEVEL 3

Change related to Program Goal 3 - Video of classes

Program Changes and Actions due to Results:

In the past, reviewing video of classes (Tool 5) being taught has given valuable feedback to faculty on their teaching (Program Goal 3). However, with the adoption of more student-centered

strategies the focus of classroom activity has moved from the instructor to several groups of students working together in different parts of the room. This is more difficult to capture using a simple video camera. It is also extremely time consuming to review, to the extent that for the last few years we have not recorded any video in classes that were not being studied for education research purposes associated with externally funded grants (Result 5). For these reasons we have decided to abandon the tool of video recording classes by all faculty.

Link to Assessment:

Program Goal 3 is still addressed by Tools 4, 6, & 10, and these have been the primary drivers of recent improvements in instruction reflected in Results 4 & 6. Since the videoing of classes (Tool 5) has not played a role in these improvements, and is labor intensive, its abandonment should not adversely affect the ongoing improvement.

Program Goal 4 - Undergraduate Research Opportunities

Define Goal:

Provide opportunities for all physics majors to gain experience in authentic basic or applied research.

Intended Outcomes / Objectives:

All faculty engaged in research in suitable fields will seek support to engage interested physics majors in their work. Opportunities at other institutions and in other fields will also be made known to physics majors. The targeted outcome is that all physics majors will have the opportunity to engage in such opportunities as many times as they wish during their TTU career. At a minimum, any interested student should engage in at least one such opportunity.

DRILL DOWN-----

RELATED ITEM LEVEL 1

Program Goal 4: Assessment - Undergraduate Research Experience

Frequency of Assessment:

End of each academic year

Rationale:

The department will keep a record of student participation in the research of department faculty members and in specialized summer research programs for undergraduates at other institutions. (Note: since almost all such experiences must necessarily take place during the summer it is impossible to ensure that all students will take advantage of such opportunities. However, the department will encourage such participation as actively as possible.)

RELATED ITEM LEVEL 2

Program Goal 4: Results - Undergraduate Research Involvement**Results:**

During this year a total of twenty individual undergraduate students participated in research activities of various types with department faculty members. In addition one graduate student in the College of Education was mentored by two physics faculty members.

Attachments: