Non-Major Physics Assessment Report SP15

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**Survey of Physical Science**, PH1125 is a combined lecture and lab course. Formerly two courses (PH1113 Lecture and PH1122 Lab), it is a survey of the physical sciences, designed for the non-science major. Students learn about the scientific method of discovery and its application to the fields of geology, astronomy, chemistry, meteorology, and the environment, as well as classical Newtonian physics and thermodynamics. The prerequisites for Survey are a minimum grade of "C" in MT1303 (Intermediate Algebra) or MT1083 (Applied Algebra & Trig), or appropriate math placement score to enter MT1403 (College Algebra). Upon successful completion of this course, students should be able to:

1. explain how to use the scientific method and how to develop and test hypotheses in order to draw defensible conclusions.
2. evaluate scientific evidence and argument.
3. describe the basic principles of the physical universe.

Survey of Physical Science is currently taught by two full-time instructors at the Union campus, and has previously been taught by an adjunct instructor at the Rolla campus. The course is overseen by the Physics Department and currently requires the use of a departmental syllabus containing a list of required material, as well as requiring a department mandated text, midterm, and final exam. The course is entirely taught in a traditional classroom/laboratory format; online sections are not available.

The success and withdrawal rates for PH1125 (formerly PH1113/1122) are show below, along with enrollment numbers and pre/post test scores on the Force Concept Inventory.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Academic Year | 07/08 | 08/09 | 09/10 | 10/11 | 11/12 | 12/13 | 13/14 | 14/15 |
| Enrollment in Survey | 60 | 62 | 73 | 53 | 30 | 33 | 41 | 24 |

|  |
| --- |
| Survey FCI Scores |
| Sem. | Pre | Post | Δ |
| SP14 | 36% | 43% | 8% |
| FA14 | 34% | 43% | 9% |
| SP15 | 29% | 46% | 17% |

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| --- |
| Survey FCI by Grade |
| Grade | Pre | Post | Δ |
| A | 35% | 55% | 19% |
| B | 34% | 48% | 15% |
| C | 34% | 40% | 6% |
| D | 12% | 30% | 18% |
| F | N/A | N/A | N/A |

**Intro Physics**, PH1104 is a combined lecture and lab course. Formerly two courses (PH1103 Lecture and PH1112 Lab), it is a study of Newtonian physics, mechanics, electricity, and physical properties of matter. Intro Physics is a non-calculus course which features problem-solving and laboratory work, designed for technical majors such as Industrial Engineering Technology or Precision Machining. The prerequisites for Intro Physics are a minimum grade of "C" in MT1083. Upon completion of this course, students should have developed the basic specific technical physics skills necessary to progress in the student’s particular technical disciplines.

Intro Physics is taught by one full-time instructor at the Washington–Four Rivers satellite site. The course is overseen by the Physics Department and requires a departmental syllabus containing a list of required material. The course is taught in a traditional classroom/laboratory format; online sections are not available.

The success and withdrawal rates for PH1104 (formerly PH1103/1112) are show below, along with enrollment numbers and pre/post test scores on the Force Concept Inventory.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Academic Year | 10/11 | 11/12 | 12/13 | 13/14 | 14/15 |
| Enrollment in Intro Physics | 17 | 10 | 8 | 12 | 13 |

|  |
| --- |
| Intro Phys FCI Scores |
| Sem. | Pre | Post | Δ |
| SP14 | 38% | 48% | 11% |
| SP15 | 43% | 53% | 10% |

|  |
| --- |
| Intro Phys FCI by Grade |
| Grade | Pre | Post | Δ |
| A | 49% | 64% | 14% |
| B | 39% | 48% | 10% |
| C | 45% | 50% | 5% |
| D | 30% | 46% | 16% |
| F | N/A | N/A | N/A |

## Interpretation of Results

Success rates in Survey dropped sharply from AY10/11 to AY11/12, but have been steadily increasing since then. Grade records from the individual courses show that all students who failed Survey from FA11 to SP14 failed due to simply not turning in lab reports, rather than poor grades in other areas. The Force Concept Inventory assessment tool shows that despite decreasing pre-test scores, students are consistently leaving the course with a significantly better conceptual understanding of physics. Pre-test scores don’t seem to have much ability to predict student success in the course, except for those with very low scores. Post-test scores correlate well with student grades in the course.

In Intro Physics, low student success rates in 2014 may be partially due to a particularly error-filled textbook which confused the students and decreased their confidence both in the material and in their own abilities, as the answers to homework problems provided in the book were usually incorrect. Examination of grade records from SP14 and SP15 showed that all students failing in SP14 were due to poor exam grades, while the all students failing to complete Intro Physics in SP15 withdrew or failed due to simply not turning in lab reports or other assignments. The Force Concept Inventory assessment tool shows a consistent improvement of student understanding of physics concepts. Pre-test scores don’t seem to have much ability to predict student success in the course, except for those with very low scores. Post-test scores correlate roughly with student grades in the course.

## Assessment Plan

In addition to tracking typical data such as success rates in each course, the Physical Science Program has several ongoing assessment goals.

* Monitor the success rates in degree programs for students successfully completing Intro Physics.
* Analyze final exams in Intro Physics to compare successful versus unsuccessful students to help isolate particular skill and concept areas that separate successful and unsuccessful students.
* Compare pre- and post-test scores in Survey Physical Science and Intro Physics to determine weaknesses in student understanding for those coming into and leaving these courses.
* Develop a plan to increase the completion rate of lab reports, including continuing to inform students of the importance of lab reports.
* Improve enrollment by promoting Survey as a fun lab-based science course for the various majors it serves.
* Evaluate and inventory laboratory equipment in order to update and replace outdated and broken/worn out equipment.