Online Assessment Tracking Database

Sam Houston State University (SHSU)
2014 - 2015

Physics BS

Goal

Provide The Necessary Basic Skills For Beginning Students In Physics, The Physics/engineering Dual Degree And Pre Engineering Programs

The Department of Physics provides discipline-specific offerings for beginning students in physics, the dual degree in physics/engineering and pre engineering

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Objective (L)

Apply Foundational Concepts

Students who complete the second course in calculus based Physics will be able to apply foundational concepts, particularly in the areas of (1) proofs and derivations, and (2) translation of written problems into mathematical equations.

Indicator

Comprehensive Exam

Students will complete a faculty-developed comprehensive exam in Physics 1411 assessing the common foundational concepts in Physics.

Criterion

80% Score 70% Or Higher

Eighty percent of students completing the exam will score 70% or higher on the comprehensive exam.

Finding

Results Of Physics 1411 Testing

This report documents the global gains in pre/post examination performance of 34 students enrolled in Physics 1411 during the Spring of 2015. It additionally compares the differential gains made by two sub-populations, consisting of 11 students (group A, primarily physics and pre-engineering majors), who had previously completed the new “Physics Bootcamp” (PHYS 1401), and 23 students (group B, about half math with the remainder phys, pre-eng, other) who had not. The bootcamp functions largely as a quantitative leveling and preparatory agent.

Both groups had approximately the same academic age. Respective classification indices for groups A, B were 2.6, 2.4 (with Freshman = 1, Soph. = 2, etc).

Group B was more experienced in formal mathematics, with 1.3 average semesters of calculus completed, as opposed to 0.6 for group A.

Group A had a slight advantage (0.7,0.4) with regard to previously completed semesters of physics education, awarding a half point for high-school credit, general science exposure, and incomplete college terms.

The exam consisted of 20 multiple choice physics questions appropriate to the study of introductory classical mechanics at the university level. A quarter point deduction was made for incorrect answers in order to subtract out statistical background noise associated with guessing, and negative values were zeroed out. Absolute scores were converted to percentile form. Normalized results will be reported in units of the inclusive (all students) standard deviation of 12 percentile points associated with adjusted scores on the pre-test.

Both groups fared poorly, but similarly, on the pre-test of physics concepts, with adjusted normalized scores of 0.6, and 0.9 (0.8 for class overall).

Both groups improved similarly, and significantly, in their post-test scores, with normalized marks of 1.8 and 2.3 (2.1 overall), representing a percent improvement of 190%, 150% (160% overall).

Conclusions: All students made significant gains in physics knowledge, but the two sub-populations could not be significantly discriminated in terms of initial or final performance. Participants in the “Physics Bootcamp” fared comparably to classmates with more formal math training, suggesting that this experience is providing a benefit approximately commensurate to one semester of calculus. The results presented are preliminary and additional statistical support is required. No effort has been made to calibrate against standardized college entry scores.

Action **Continue To Collect More Data.**

Although the results are enocuraging, the numbers are small. We will continue to collect more data.

Action **Collect More Data**

We will continue to collect more data. The results are encouraging but there are a number of confounding factors and more data is needed to obtain a scientifically meaningful result.

Goal **Competence For Bachelor Of Science**

Seniors studying Physics will demonstrate competence to graduate with a Bachelor of Science in Physics

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Objective (L) **Mastery Of Fundamental Principles In Physics**

Students preparing to graduate with a BS in Physics will demonstrate comprehension of fundamental principles and the ability to apply these principles in solving problems.

Indicator **Previous GRE Subject Test In Physics**

Students will complete a common earlier version of the Graduate Record Subject Exam in Physics related to PHY 4370 (Classical Mechanics) under GRE standardized conditions. Faculty will have classified the questions into domains specific to the major principles in this area.

Criterion **Above 50th Percentile**

Students will score above the 50th percentile determined as a result of the graduating seniors' scores from the common exam. A raw score of 50% is in the 74th percentile for the Physics GRE with a ¼ penalty for wrong answers.

Finding **Results Of Physics 4370 Testing**

On the first day of class, 11 students scored an average of 1.7. On the last day of class, 7 students scored an average of 2.8.

Action **Collect More Data For 4370**

We will continue to study the effect of working harder problems and teaching the students when to use Lagrangian methods.

Previous Cycle's "Plan for Continuous Improvement"

The “Physics Bootcamp”, which functions largely as a quantitative leveling and preparatory agent, has successfully compensated for a full semester deficit of formal training in calculus, when gauged by final outcome. The results presented are preliminary and additional statistical support is required.

The emphasis in physics 4370 on when to use the Lagrangian and when to use Newton's laws directly has appeared to improve performance on the GRE.
Again, the sample size is small and additional statistical support is needed.

Please detail the elements of your previous "Plan for Continuous Improvement" that were implemented. If elements were not implemented please explain why, along with any contextual challenges you may have faced that prevented their implementation.

Pevious elements were implemented.

Plan for Continuous Improvement - Please detail your plan for improvement that you have developed based on what you learned from your 2014 - 2015 Cycle Findings.

More data collection is necessary before any meaningful conclusion can be reached.