

The Beat of Your Own Drum: A comparison of self-paced mastery learning and traditional lecture models

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What Is Self-Paced Mastery?

Self-paced mastery is a model of instruction that allows students to pace themselves through a series of “bite-sized”, self-guided units. To proceed from one unit to the next, a unit test needs to be completed with a score of close to 100%. There is no penalty for failure; if this score is not met, the student will receive additional assistance and be allowed to retake the exam in this fashion until the unit is passed.

The Experiment

This study hypothesized that by mixing two pedagogical models, self-paced learning¹ and mastery², a large enrollment introductory physics course could be designed that would allow students to gain a more thorough understanding of the course material.

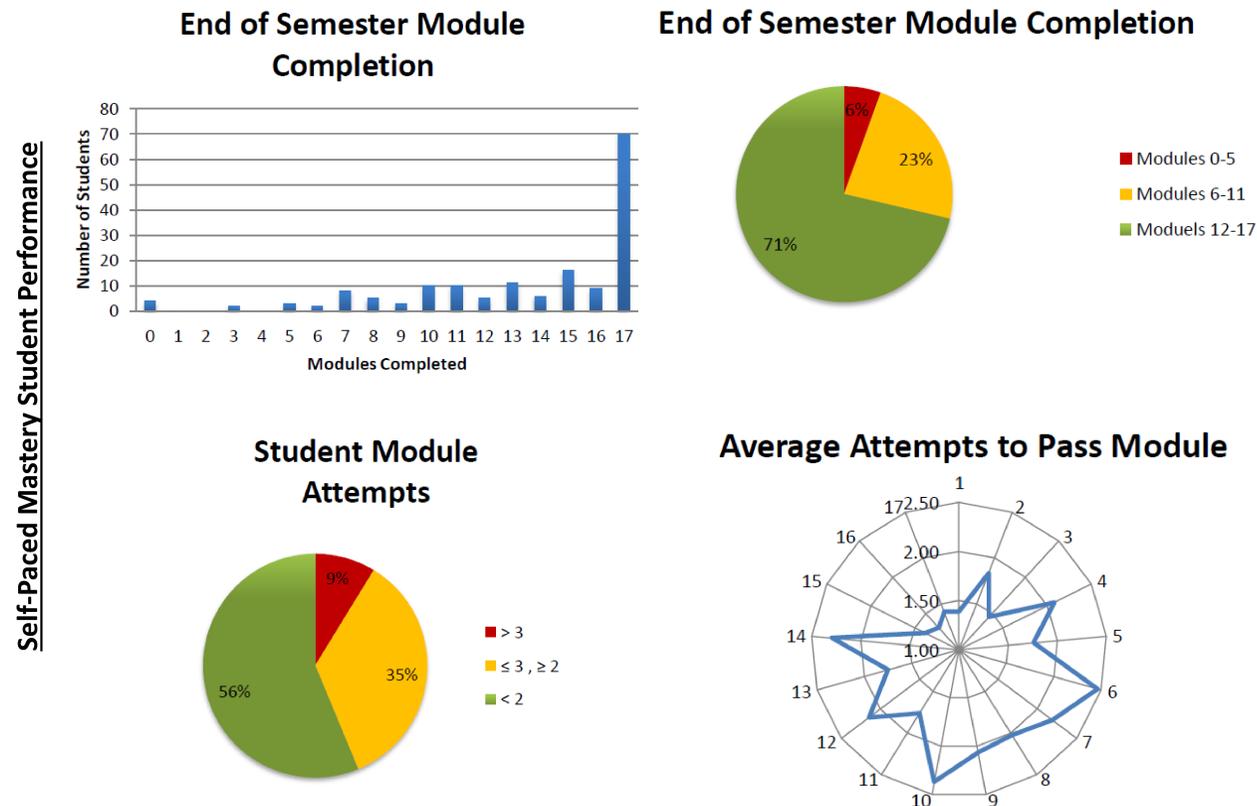
To test this hypothesis, two introductory undergraduate mechanics physics courses were offered in tandem: the experimental self-paced mastery course, and a traditional lecture-exam course.

In the experimental course, students guided their own instruction and were required to pass each of 17 module exams with a score of 90%. In the traditional course, students were given lectures three hours a week, workshops two hours a week, and were required to take three mid-term exams.

To compare the two courses, three main methods were used: A common final exam, self-paced module test attempts and completion rates, and online surveys.

95% of the 311 students enrolled in the two courses were engineering majors. 151 students enrolled in the self-paced course and 160 in the traditional course.

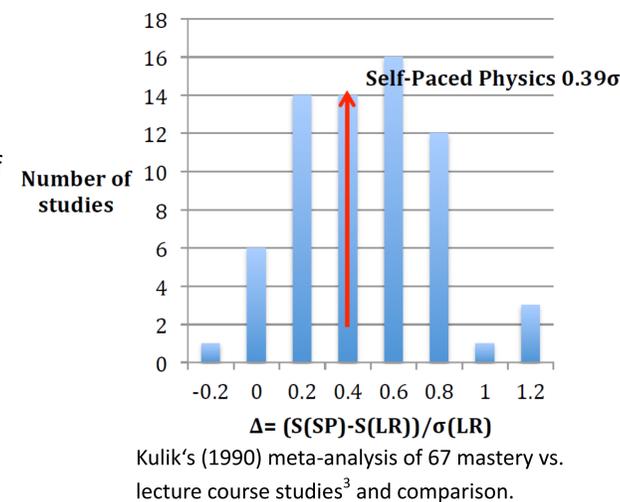
Results



Final Exam Comparison

Mastery learning raised physics final exam scores by delta (Δ) standard deviations (σ), where $S(SP)$ and $S(LR)$ are the mean scores of the self-paced and traditional lecture groups, respectively, and $\sigma(LR)$ is the traditional lecture exam score standard deviation.

$$\Delta = (S(SP) - S(LR)) / \sigma(LR) = 0.39\sigma$$



Student Survey

Mastery of Physics Concepts	Self-Paced Response Percent, N=52	Traditional Response Percent, N=43
Not mastered	10%	16%
Moderately mastered	29%	48%
Strongly mastered	61%	36%

Question from post-course student survey.

Conclusions

Concerning the self-paced mastery students: most students completed anywhere between 12-17 of the total 17 modules, thus mastering 70% or more of the total course content. Overall, the average student passed each of the module exams in just under 2 tries per module. There were a number of modules, namely #6, #10, and #14, that had a higher than average exam attempt rate (more than 2.3 attempts). Reevaluating these three “problem” modules should allow a greater number of students to reach course completion.

When comparing self-paced mastery final exam scores to the standard lecture course scores, it is evident that the self-paced students greatly outperformed their counterparts, which is in agreement with previous instances of similar studies.

Not only did self-paced mastery students outperform their lecture course counterparts on paper, they also self-identified as having a better grasp of the physics content they were required to learn.

References

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