INVESTIGATING THE BENEFITS OF MASTERY LEARNING IN THE HIGH SCHOOL PHYSICS CLASSROOM

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Introduction

Students in general education physics classes often struggle with the material presented. Not all students can be successful in the time frame provided by the curriculum calendar. Last year, we had many students struggling to succeed on the unit tests; we had about a 10% failure rate of students taking physics. The best way was to allow students to move through the curriculum at their own pace and to require mastery of topics within each unit of the curriculum. We decided to utilize the mastery learning approach.

Research Questions

- How implementing mastery framework affected *student performance* in on-level physics classes
- How mastery would *impact student performance on common formative assessments*
- How it impacts *student perceptions* of physics
- How mastery encourages *student motivation*
- How implementing mastery *impacts me*, as an educator

Methodology

Mastery learning was implemented in my classroom through a series of checklists (see Figure 1). When a student started a new unit, they were handed a packet with note guides, labs, worksheets, activities, simulations, etc. Quizzes were administered over the current topic. Students had to earn at least an 80% before they could move on to the next topic.

- Students who failed the mastery check, went back to complete additional activities until they could prove mastery.
- If a student experienced three failed attempts they sat down with a teacher and did a "reteach" session in a small group setting.
- Upon completion of the tutoring, we tried the mastery check one last time.
- Still not passing? Try another practice page (Figure 2)

- This continued until students mastered each topic within a unit.
- Upon completion of all required mastery checks, students tested.
- If they didn't like their test grade, they could retry!

Student Quotes

- Students said they participated more due to the "lack of pressure" they felt
- Many students indicated they "like being self-paced"
- "The teacher doesn't put pressure on anybody unless they are falling behind."
- Not having a "guideline or schedule to follow made it very hard to know what [they] should work on each day."
- "It would be helpful to keep more to a strict schedule so you finish everything and get it done"
- Mastery "stressed them out" because they didn't always know how much work they should have done
- They were "procrastinating a lot" because of the self-paced mastery

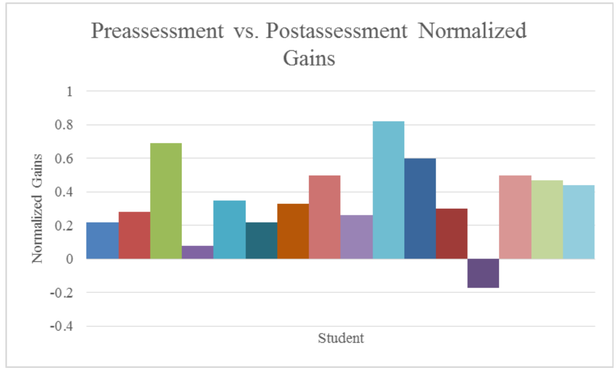


Figure 4

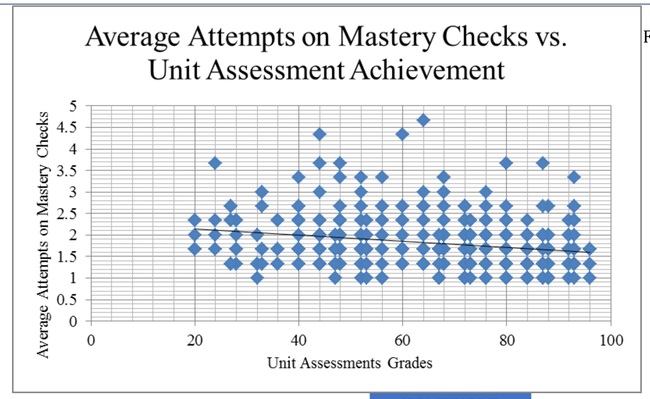


Figure 3

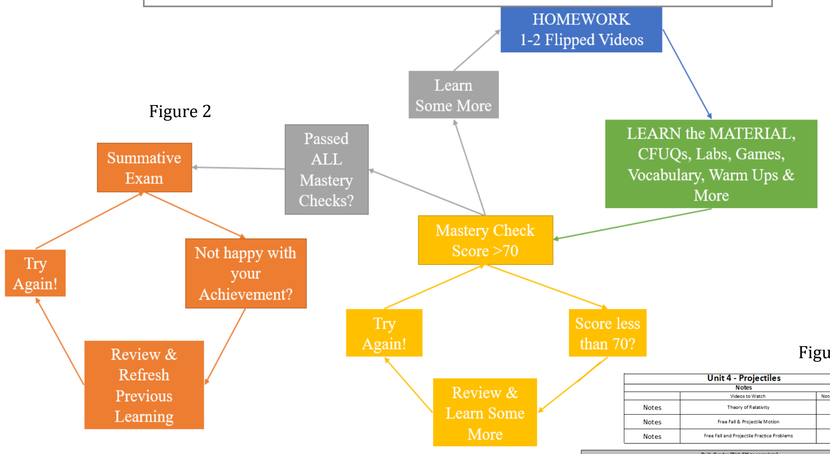
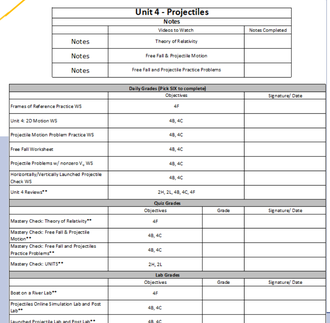


Figure 2

Students pose with their "Electric House" project based learning project



Unit 4 - Projectiles

Notes

	Videos to Watch	Notes Completed
Notes	Theory of Relativity	
Notes	Free Fall & Projectile Motion	
Notes	Free Fall and Projectile Practice Problems	

Daily Grades (Tick SIX to complete)

	Objectives	Signature/ Date
Frames of Reference Practice WS	4F	
Unit 4: 2D Motion WS	4B, 4C	
Projectile Motion Problem Practice WS	4B, 4C	
Free Fall Worksheet	4B, 4C	
Projectile Problems w/ nonzero V_x WS	4B, 4C	
Horizontally/Vertically Launched Projectile Check WS	4B, 4C	
Unit 4 Review**	2H, 2L, 4B, 4C, 4F	

Quiz Grades

	Objectives	Grade	Signature/ Date
Mastery Check: Theory of Relativity**	4F		
Mastery Check: Free Fall & Projectile Motion**	4B, 4C		
Mastery Check: Free Fall and Projectiles Practice Problems**	4B, 4C		
Mastery Check: UNIT 4**	2H, 2L		

Lab Grades

	Objectives	Grade	Signature/ Date
Boat on a River Lab**	4F		
Projectiles Online Simulation Lab and Post Lab**	4B, 4C		
Launched Projectile Lab and Post Lab**	4B, 4C		

Test Grades

	Objectives	Grade	Signature/ Date
Unit 4 Assessment**	2H, 2L, 4B, 4C, 4F		

Figure 1

Results

Figure 3 shows the correlation between the average number of attempts taken and the average on the unit assessment. There was a -0.22 correlation for all the unit tests.

- 47.6% of students state that they do not like watching the lectures on video.
- 53.8% of students 'agree' or 'strongly agree' that learning physics using mastery learning approach made learning physics frustrating.
- 20% of enrolled students did not complete all work for unit five
- 8% of students didn't take the unit five exam
- 9 students saw medium gains, 4 saw low gains, and 2 found high gains (see Figure 4). One student did not gain.

Discussion

The flipped classroom and mastery framework do not show a positive correlation for student motivation and confidence. Overall, the students who required more mastery checks on average, tended to perform worse on the test. Data did not find many positive correlations between mastery and improving student motivation, confidence and achievement.

Conclusions

Overall, I do not believe mastery learning is a successful strategy for general education physics students when it is a required course for high school students. As students required more mastery check attempts, it was detrimental to their overall test average. Students struggled to stay on schedule, and thus, missed valuable "mini-lectures" during the bell work warm ups each class. Students may have been more successful if they had been exposed to mastery for most of their schooling, or if they were not bound by a calendar set by the state.