Mastery Learning in Engineering: A Case Study in Statics

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Introduction

Mastery learning has been used for decades in education. Two approaches were developed: Bloom's Learning for Mastery and Keller's Personalized System of Instruction [1-3]. The main idea in both approaches is that the course material is divided into basic modules and the students are required to demonstrate their mastery of each module before moving to the next module. The mastery level is assessed by using a set of tests where each test focuses on a specific module.

We have implemented a variation of mastery learning where the course is delivered at an instructor led pace but the students are required to successfully solve a given problem before receiving credit for that problem. This approach entails more exams containing fewer problems where each problem is intended to be focused on a single concept or class of problem (e.g., method of joints for truss analysis). Each exam consists of a first try, a retake, and a final attempt. The retake and final tries consist of new problems designed to test the same idea or problem solving method. The problems are scored such that no points are awarded until a student has successfully solved that problem. The points awarded for a successful solution is reduced on successive retakes.

Compared to conventional teaching and assessment methods, mastery learning provides concrete evidence that students who "pass" the fundamental engineering courses, even with "C" grade, should be able to correctly solve fundamental engineering problems and are prepared to successfully pass the more advanced engineering courses. This approach has been implemented over the past eight years in the School of Engineering at Penn State Erie, the Behrend College (SOE) for key sophomore engineering courses, i.e., Statics, Strength of Materials, and Thermodynamics [4]. These courses are the foundation of many engineering disciplines and passing these courses should mean that the student has the capability to apply concepts from physics and mathematics in an engineering context, and the ability to work through tough problems to get the right answer.

The mastery learning approach has many student-related advantages, such as reducing exam anxiety, emphasizing the value of being "learning-oriented" rather than being "grade-oriented,"

and faculty-related advantages, such as providing an effective way to assess student learning, i.e., it provides a way to measure how many students have passed a specific topic rather than dealing with the average performance score of the class.

In this paper we are evaluating the mastery learning approach as applied specifically to engineering statics by surveying the students. One hypothesis is that students do not appreciate the benefit of mastery learning while they are enrolled in the statics course, but they do realize the benefits of mastery learning for statics after they take later courses which require statics as pre-requisite. To test this hypothesis students who are currently enrolled in statics and who took statics in previous years are surveyed in this study. Our second hypothesis is that mastery learning better motivates students to go back and learn the material when they get a problem incorrect on an exam as compared to the partial credit grading method. The paper also presents valuable qualitative feedback from the students on mastery learning for statics.

Mastery Learning as Applied to Statics

The evaluations are divided into six exams graded on a mastery basis and a comprehensive final exam graded using traditional partial credit. The distribution of the syllabus into modules is listed in Table 1.

Table 1. Breakdown of statics syllabus into 6 modules

Module	Topics	
1	Force Vectors & Equilibrium of Particles	Mastery Exams
2	Force System Resultants & Moment about an axis	
3	Reduction of Distributed Loading & Equilibrium of a Rigid Body 2D	
4	Rigid Body Equilibrium 3D & Method of Joints - Trusses	
5	Method of Sections -Trusses & Frames and Machine	
6	Internal Forces & Friction	
Final	Center of Gravity and Centroid 2D & 3D + **Entire Syllabus**	Partial Credit

Each mastery exam consists of 2-3 problems with one problem per major concept and usually occurs during in a common exam time for all sections. The problems on the exams are intended

to be focused on the ability to solve a particular type of problem. We avoid tricky problems or questions that aim to test multiple concepts at once. In the Fall of 2013 we had 6 sections of statics with a total of 190 students enrolled. For any given exam an initial exam is administered to all students where each problem is graded with one of three possible scores (C, AC, R, or NA) with the definitions and points awarded given in Table 2. The initial exam is graded and returned during the next class period. Since the goal is to encourage the students to solve problems on their own, exam marking is limited to pointing out the error that caused the score of AC or R (if applicable) with only minor comments. Numerical answers are supplied to the students but not problem solutions. It is felt that since the problems on exams are not markedly different from problems the students have already seen on homework and in-class problems it would be counterproductive to give the students yet another solution. Students are encouraged to solve the exam problems they did not solve correctly and to review other class material in order to learn the concept to prepare for the retake on that problem.

Table 2. Score given on the problems in the mastery exams on 1st, 2nd and 3rd attempt

Score		Attempt at Problem		
		1ST	2ND	3RD
Correct {C}	Correctly solved the problem with no mistakes.	100%	85%	70%
Almost Correct {AC}	Satisfactorily solved problem with a minor error.	90%	75%	60%
Retake {R}	Student did not show ability to solve the problem correctly.	0%	0%	0%
Not Attempted {NA}	Either no attempt or essentially no attempt at a solution.	-15%	-10%	-5%

A retake exam is written with similar problems that are designed to test the same concepts as the initial try, often with some complexity removed (e.g. simplified geometry). The exam is administered during the next common exam time (typically once per week). We scheduled the mastery exams on a common evening exam time for all the sections to maintain the same exam for students in each section. After the third week of the course there is an exam almost every week at various levels (initial, retake, final try), which would all be administered in the same exam time block in a given week. The students who did not pass a given problem (got R or NA)

on the 1st attempt are required to solve the similar problem on 2nd attempt, otherwise a NA score is applied. The problems on the retake (2nd and 3rd attempt if needed) are usually allotted less time on the retake. The problems on the retake exam are also graded individually on a mastery basis with reduced points awarded per Table 2. Each instructor grades the exams from his or her own section.

Students only need to attempt the problems for which they have not yet received a C or AC score. If a student received all C or AC scores on a given exam attempt they need not attend subsequent exams. The 3rd and last attempt usually occurs concurrently with the next mastery exam. Skipping an exam results in scores of NA on all problems on that exam. It was found necessary to impose this penalty to make sure that students try all problems on an exam, since some students tried a strategy of focusing on one of the two problems on the first try and the other problem on subsequent attempts. The negative scores that result from a NA score are carried forward with future scores on that problem. It has been found that NA scores are rarely necessary.

Example: Let's say that there are 3 problems on the Exam 1 and student gets a C, R, and AC on problems 1, 2, and 3. Student would then need to solve only problem 2 on Exam 1R and their max score for that problem would be 85% if the solution was correct. If problem 2 was still an R or NA then the score would be 0% and problem 2 would need to be solved on the 3rd try. The bookkeeping is handled efficiently with a simple spreadsheet.

This method of conducting a course causes a significant shift in workload. For the instructors, very little time is spent on agonizing over the partial credit to award for an incorrect solution and more time is spent on creating retake problems. Additionally, since detailed comments are not provided on an incorrect solution, the time spent grading is markedly reduced for a given exam. For students who were not able to correctly solve a given problem on an exam, more study time is encouraged by not awarding partial credit and the student is required to spend more time attempting to solve problems during the retake exam. By only noting where the solution became incorrect and not giving detailed comments (or providing solutions) the students are encouraged to solve the problems on their own rather than attempting to memorize the instructor's solutions. Students are told that help will be given relating to the incorrect solutions on an exam problem

only if they re-attempt the problem on a separate sheet of paper to the point where they do not understand and bring this to office hours. Instructors may also direct students to particular sections in the textbook or class notes that cover the topic. One of the key principles of mastery learning that we emphasize is that the students must go back and study the material that they could not solve correctly and practice until they can correctly solve problems on their own.

Research Methods

Study Population

The participants surveyed for this study are undergraduate engineering students from the SOE. The study population included 156 males and 19 females. The group of students currently enrolled in statics are referred here as the 'current' group. The number of sophomores that responded was 122 of the 190 enrolled in statics. Similarly, 53 juniors who took statics in previous semesters are referred as 'previous' students. We expected to survey 73 juniors, but only 53 responded to the survey. The statics course offered at SOE contains many students who are enrolled in majors that do not require the junior level course that we used for the survey of the 'previous' students. For the 'previous' population we focused only on the juniors enrolled in mechanical engineering major, hence the difference in the number of participants in each condition.

The demographics of the sample population surveyed are similar to any engineering classroom in terms of % of women in the class, age group of the students, and year of study. Also, the expected grade for 'current' and the received grade for 'previous' showed that the sample consisted of students from all categories of grade distribution.

Six out of 53 'previous' students who did not study statics with mastery exams, are referred as the 'previous- without mastery' group. This situation occurs since instructors are not compelled to use the mastery method, although the majority of instructors who have tried it do in fact use it again. There is no control group for this study because of the current setup at the SOE where all instructors are currently using mastery exams for the statics course. Ninety-two percent of 'current' students are sophomores from various engineering majors. Eighty-five percent of 'previous' students are Mechanical Engineering juniors at the SOE.

Survey

A survey was developed and conducted to analyze the students' viewpoints on mastery learning in statics. Students were asked to answer a series of questions about mastery learning in statics on a 5-point Likert-scale: *Strongly Disagree – 1, Disagree – 2, Neutral – 3, Agree – 4, Strongly Agree – 5*. The first few questions of the survey collected general demographic information about the students. The later part of the survey questions are included in the Appendix. A few extra questions were added to the 'previous' student surveys that could not be asked of the 'current' group.

The group of students 'previous-without mastery' had to answer only a few general questions but those who completed statics with mastery learning ('previous') completed the entire survey. The survey was conducted in the classrooms before or after the regular lectures. Six sections of statics were surveyed for currently enrolled students and two classes of juniors were surveyed to cover all mechanical engineering juniors who completed statics course as pre-requisite for the junior level course.

Results and Discussion

The results show that the opinions of 'current' and 'previous' students differ on certain questions as shown in the Figure 1. Only those questions on which the opinions of current and previous students differed significantly at $\alpha = 0.01$ are discussed here. A two-tailed *t* test is performed on student agreement about the mastery between the current and previous groups. When asked if they think mastery learning was fair evaluation of their understanding and their abilities to solve problems, the previous students agreed significantly more than the current students. The average responses are represented as Mean ± SEM (standard error mean).

Previous students reported that they would recommend taking statics with mastery learning to their friends more positively than the current students. Current students felt that their grades would have been higher with the partial credit grading method than with mastery exams. Current students reported feeling more stressed on the mastery exams than partial credit as compared to previous students. These results show that the students realize the benefits of mastery exams as they progress further but not while they are enrolled in the course.

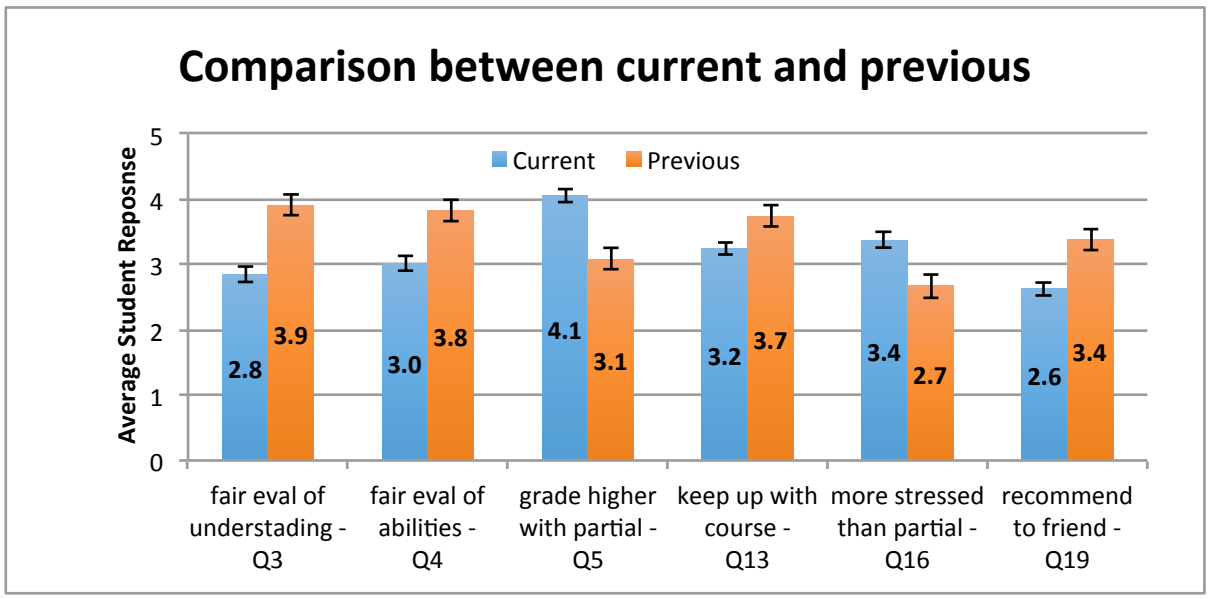

Figure 1. Comparison of average agreement of current and previous students about different aspects of mastery exams in statics course

Previous students reported that the mastery method was beneficial in helping them keep up with the course more so than the current students. This is likely due to more frequent exams in courses using the mastery method. This difference in opinion is perhaps due to the fact that previous students get more exposure to later engineering courses with partial credit grading and they realize how hard it is to keep up with the course. Similar comments are also received in the open-ended questions discussed in next subsection.

In only one out of the six sections of statics did students report that they believe they would have received better grades if the course were being taught with partial credit. But even when this particular section was deleted from the comparison between current and previous, the results reported in Figure 1 showed the same significant trends.

When the students were asked whether "After receiving a graded exam back in a course that is taught with or without mastery exams and there are problems on it which they did not do well on, they read the feedback on the exam and try to solve the problem correctly on their own" – the average response of the students on courses without mastery was significantly lower than the courses with mastery. A similar difference in opinion was observed for both the current and the previous students with a paired *t* test shown as in Figure 2.

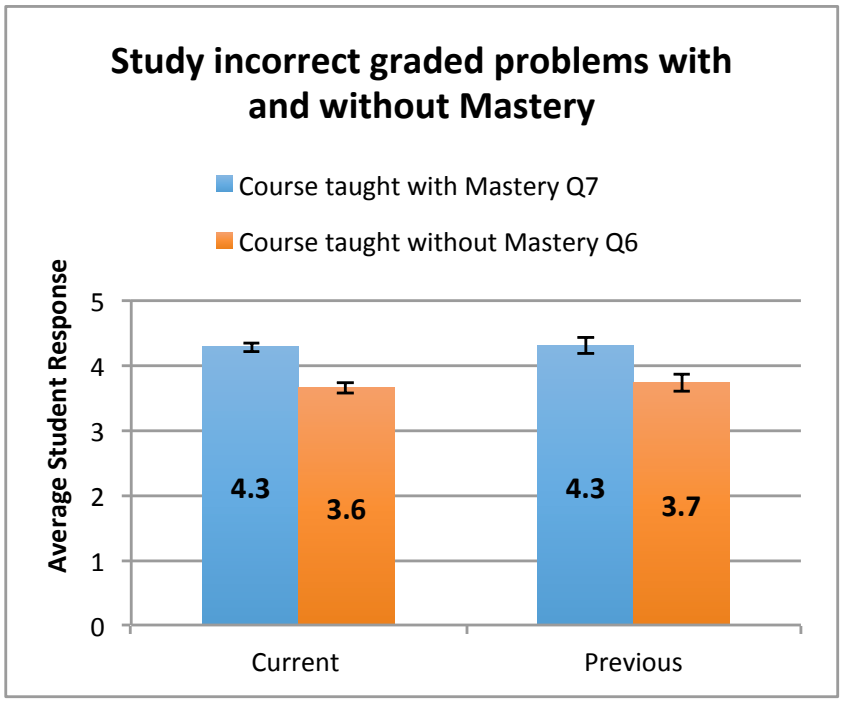

Figure 2. Comparison of average agreement of current and previous students about studying the problems that they get incorrect on exams in courses with and without mastery exams

This result shows that mastery learning does motivate students to go back and look at the problems on which they did not do well. Thus mastery exams do serve the purpose of emphasizing the importance of learning from mistakes or giving students an opportunity to relearn the material if they did not get it right on the first attempt. Thus, there is significant evidence to support the hypothesis that the mastery learning compels students to learn the material even when they get it wrong compared to the partial credit method.

Although we only had a small group of students in this study who did not study statics with mastery, a two- tailed *t* test was performed between the response of previous students with and without mastery as shown in Figure 3. The average response of 'previous students without mastery' was lower, although not significantly so, than 'previous students with mastery' when asked about the importance to get the answers correct. All previous students felt equally prepared by their pre-requisite statics course for the junior level course that they were currently enrolled in.

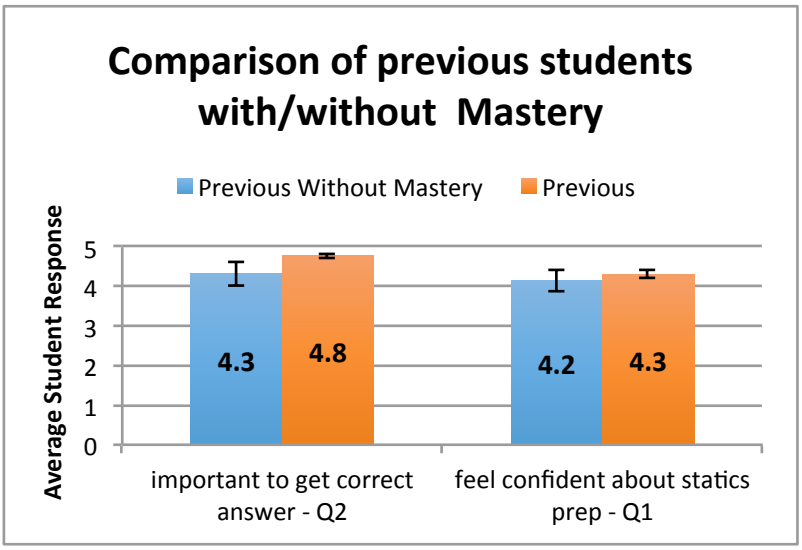

Figure 3. Comparison of average agreement of previous students with and without mastery exams

Responses of some additional questions that were asked only to previous students are reported in Table 3. Of note, 60% of the students agree or strongly agree that as a result of having completed a mastery course, they are more likely to work at getting the right answer in their current courses. Similarly, 61% of the students agree or strongly agree that looking back on the mastery course, they now think it was a good way to learn the statics material. The next subsection discusses the responses of students to the open-ended questions in the survey.

Table 3. Responses of previous students on some reflection type questions

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
More likely to work at getting correct answers on current courses	4%	15%	21%	**45%**	15%
Looking back, mastery is good way to learn statics	6%	6%	26%	**38%**	23%

Open Ended Questions

The survey involved three open-ended questions. These questions were administered to both the current and previous students. The first question asks the participants to identify what they like or dislike about the mastery learning method. The second question asks the participants to recommend any change(s) to the current version of the method. The last question asks the

participants if the mastery learning method had any influence on their studying approach in other courses. Despite the fact that there was some redundancy and overlap between the Likert-type and open-ended questions, this was intended to extract more information and perspective and achieve a greater level of understanding of students' views on the mastery method. The results of this section should help us and interested parties to get insight, improve the method, and remedy any deficiencies that have been identified from the students' perspectives.

As mentioned in the study population discussion, we had data from six current sections and two previous sections of statics. Therefore, it is expected to have more responses from the current sections. Moreover, we believe that the current students are more motivated to provide comments. To analyze the responses, we read all the participants' responses, and grouped and counted these responses as shown in Table 4. We identified 23, 11, and 10 categorized responses for the first, second, and third questions, respectively. We calculated the percentages by taking the ratio of the response count of each item to the total responses obtained for that particular question as shown in Table 5. Of note, the like and dislike category of the first question are separated as shown in Table 4. The percentages of the dislike items were more than the percentages of the like items for both the current (62.42%) and the previous (72.90%) groups. Figure 4a and 4b, show the results of Table 5 graphically. Both the graphs in Figure 4a and 4b show a similar trend for responses from current and previous groups.

Table 4. Survey open-ended questions and the categorized participants' responses

Item	1. What do you like or dislike about mastery learning method?	Response Count	
	Like	**Current**	**Previous**
1.1	I can retake/multiple tries	25	7
1.2	I can solve the problems correctly from the first time	11	1
1.3	I feel I learn more in the class and better understand and even after the fact	1	1
1.4	Shorter exams	1	3
1.5	The method sets a good base	3	2
1.6	Less material to study for each exam	7	4
1.7	Keep me up to date with the material	4	5
1.8	Less stress especially on the first try	3	0
1.9	Opportunity to improve the grade	3	0
1.10	It provides challenge	1	0
1.11	I work more on problems that I do not understand	1	0
1.12	I pay more attention to details	2	0
Question 1 Like Total		**62**	**23**
	Dislike		
1.13	One little error can result in the whole problem being wrong	51	13
1.14	Tests every week/frequency of the exams	5	3
1.15	Tests outside the class/waste of time	8	9
1.16	Major grading differences between professors/ between R and AC/between A and AC/No standard rubric	22	9
1.17	More stressed in the tests	4	3
1.18	No partial credits	5	1
1.19	I know if I take R, I would take a much easier version of the problem on the retake	2	1
1.20	No feedback when I get R/no answers on ANGEL (ANGEL is a course management system)	1	0
1.21	Tough to get A	1	0
1.22	There is no enough time during the exam	2	0
1.23	Frustration to get R	2	0
Question 1 Dislike Total		**103**	**62**
Item	**2. What change(s) do you recommend to mastery learning method?**	**Current**	**Previous**
2.1	Be more lenient for AC/more chance for AC's	22	9
2.2	Stop doing it/use traditional grading	5	3
2.3	Keep the first or two trials as they are but change the final retake to partial credit/use combination of mastery and traditional	22	7
2.4	Nothing/keep it this way	12	4
2.5	Take tests during the class time	7	2
2.6	Feedback instead of R	2	2
2.7	Fair grading/standard way to grade/rubric	22	5
2.8	Longer exam time	2	0
2.9	Should be used in other courses	1	1
2.10	Less number of tests	0	1
2.11	Provide the solution for the exam problems	3	0
Question 2 Total		**98**	**34**
Item	**3. What, if anything, did you change in your studying approach for other courses as a result of your experience with mastery method?**	**Current**	**Previous**
3.1	Try to finish problems correctly/question my approach	5	3
3.2	No change	62	15
3.3	More attention to details	4	1
3.4	Practiced more problems	9	3
3.5	Less stressed	0	2
3.6	Go back and find my mistakes after the exam	4	1
3.7	Easier to study	1	0
3.8	Study less knowing that I have another chance/or know the question type	6	0
3.9	Stop studying the material when I get 100%	1	0
3.10	Study longer and harder/more often for retakes	7	5
Question 3 Total		**99**	**34**

Table 5. First question percentages per each category (like and dislike) and item

	Like			Dislike	
Item	**Current**	**Previous**	**Item**	**Current**	**Previous**
1.1	40%	30%	**1.13**	50%	33%
1.2	18%	4%	**1.14**	5%	8%
1.3	2%	4%	**1.15**	8%	23%
1.4	2%	13%	**1.16**	21%	23%
1.5	5%	9%	**1.17**	4%	8%
1.6	11%	17%	**1.18**	5%	3%
1.7	6%	22%	**1.19**	2%	3%
1.8	5%	0%	**1.20**	1%	0%
1.9	5%	0%	**1.21**	1%	0%
1.10	2%	0%	**1.22**	2%	0%
1.11	2%	0%	**1.23**	2%	0%
1.12	3%	0%	**--**	--	--

In Figure 4a, we noticed that the previous students appreciate the method more not only because they have more than one exam trial but also because of other factors like the length of exams, less material to study each time, shorter exams, and good method to study. Particular items that have tended to have higher percentage of positive responses from previous students are 1.3 (I feel I learn more in the class and better understand and even after the fact), 1.4 (shorter exams), 1.5 (the method sets a good base), 1.6 (less material to study for each exam), and 1.7 (keep me up to date with the material). It is worth noting that the previous students appreciate that the method keeps them up to date with the material more than the current students (item 1.7).

On the other hand, Figure 4b shows that most of the students in both groups dislike the fact that a "small error" would lead to a retake of the problem or getting "R" on the problem (item 1.13). In addition, they agreed that there is an inconsistency in grading between the instructors (item 1.16), such that one instructor might give an AC for a sign mistake, while the other instructor would give R for the same mistake. The grading inconsistency, if any, is between AC and R but not between C and R; which is not actually an issue as long as the instructor can ensure that students get the grades that they deserve on the third try.

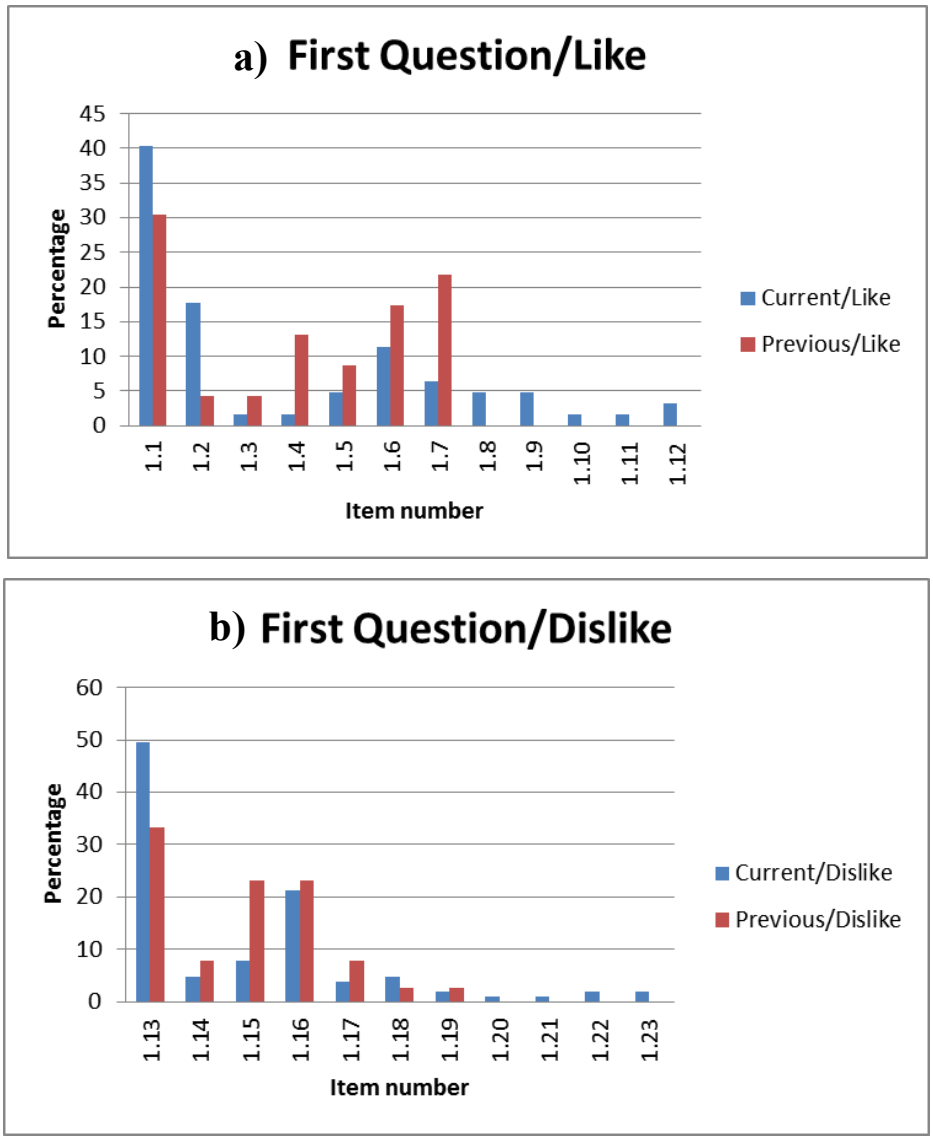

Figure 4. Percentages of a) like items, and b) dislike items for the first question

Another item that the students notably disliked was taking the exams outside the class time (item 1.15). Note that this would occur whether or not the mastery exam method were used due to the multiple sections involved although it would be likely that fewer evening exams would take place in a partial credit setting. Students did get 4 to 6 class periods off to compensate for evening exam time, which the students don't seem to appreciate. It is interesting to note the responses in item 3.8, 3.9, and 3.10, which indicate that, students did not read the questions correctly; they are expressing the attributes of mastery learning when asked about their method to study for other courses.

The students suggested many changes to improve the mastery learning experience; these are shown in Table 4 under the second question. As shown in Table 6 and Figure 5, three items got a high percentage, items 2.1 (Be more lenient for AC/more chance for AC's), 2.3 (Keep the first or two trials as they are but change the final retake to partial credit/use combination of mastery and traditional), and 2.7 (Fair grading/standard way to grade/rubric). These items suggest changes on the grading approach and we believe that having a rubric or grading guidelines would solve the issues related to these items. We also believe that grading the final attempt for a given problem using partial credit is not warranted as it represents a way out of learning how to solve the problem correctly and would be a prohibitive increase in workload to the instructor. Awarding partial credit for a solution that has a significant error even after two previous attempts to solve a similar problem is not in the best interest of the student's preparation of statics. Also, we believe many students would not take the first 2 attempts seriously and rely solely on the partial credit of the third attempt to pass the course. Thus, awarding partial credit on the final attempt would have negative consequences and would not serve the purpose of mastery learning.

Table 6. Second question percentages for each item

Item	Current	Previous
2.1	22%	26%
2.2	5%	9%
2.3	22%	21%
2.4	12%	12%
2.5	7%	6%
2.6	2%	6%
2.7	22%	15%
2.8	2%	0%
2.9	1%	3%
2.10	0%	3%
2.11	3%	0%

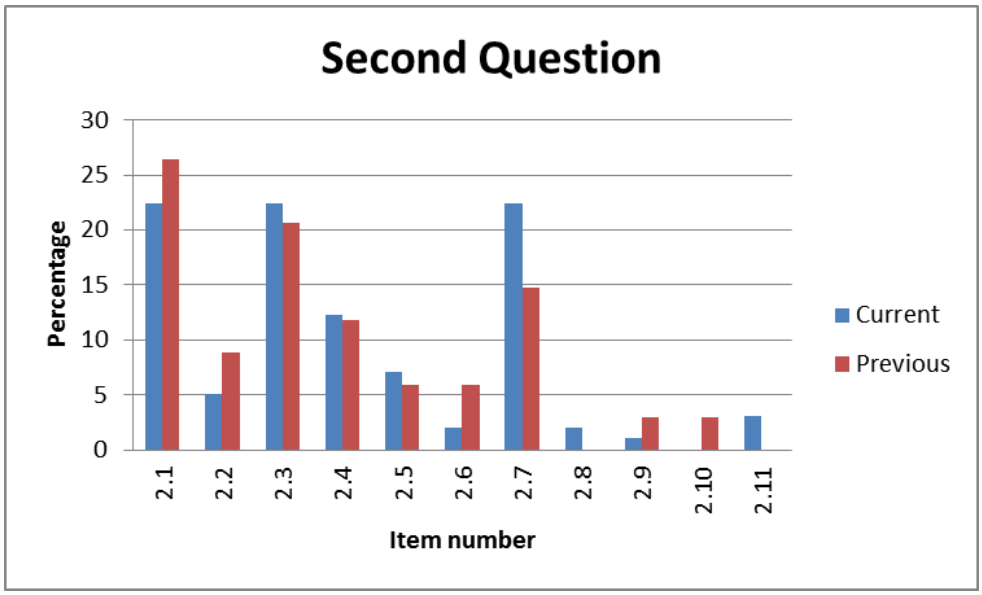

Figure 5. Percentages of the second question items

Table 7 and Figure 6 show that item 3.2 got a very high percentage. Students responded that the mastery learning method did not change their studying approach in their other courses. This does not have to be a negative consequence; nevertheless, other items showed higher percentages for previous students compared to current students, i.e., items 3.1 (try to finish problems correctly/question my approach), 3.10 (study longer and harder/more often for retakes), and 3.5(less stressed) with these percentages (previous vs. current) 10% vs. 5.05%, 16.67% vs. 7.07%, and 6.67% vs. 0%, respectively.

Table 7. Third Question Percentages for Each Item

Item	Current	Previous
3.1	5%	10%
3.2	63%	50%
3.3	4%	3%
3.4	9%	10%
3.5	0%	7%
3.6	4%	3%
3.7	1%	0%
3.8	6%	0%
3.9	1%	0%
3.10	7%	17%

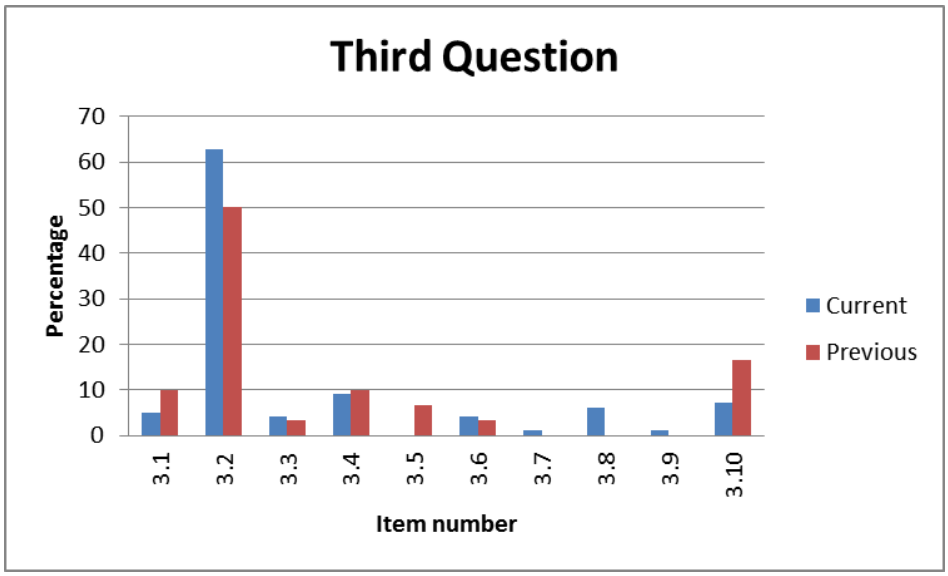

Figure 6. Percentages of the Third Question Items

Summary

In this paper, a survey was developed and conducted to analyze student's viewpoint on mastery learning in statics course. The paper explains the mastery learning approach as applied to engineering statics at the SOE. The results of the study show that students do not appreciate the benefits of mastery learning for statics while they are enrolled in the course, but they realize the benefits after they take future engineering courses. Additionally, the results show that mastery learning does motivate students to go back and look at the problems on which they did not do well. Mastery learning helps to cultivate a habit of learning from mistakes and gives students an opportunity to learn the material compared to partial credit grading.

The paper also presents valuable qualitative feedback from the students from the open-ended questions in the survey, which should help the interested parties to get insight, improve the method, and remedy any deficiencies that have been identified from the students' perspective. Grading inconsistencies between professors could possibly affect the students' opinion about mastery learning, but the issue could be fixed in future semesters by creating a more consistent grading rubric. For example, a sign error in interpreting a moment due to a force "is" an error that justifies an R score but judgment is required when deciding how to score an algebraic sign error.

Mastery method is used for thermodynamics, strength of materials and statics at the SOE, so students may be subjected to the mastery method more than once. It is likely that the juniors have seen mastery in more than one setting so they might perceive it differently compared to the current students. For current students, statics is usually their first exposure to mastery learning as well as their first exposure to engineering courses. Of note, in this study data is gathered only over one semester and a longitudinal study remains as future work.

With the mastery approach we could gather rich data on proportions of students who pass each concept since scores are necessarily tracked on a problem basis rather than summary exam scores. The passing rate of each concept could be a valuable indicator for assessment of ABET student outcomes. For instance, the fact that 80% of students can solve 2D rigid body equilibrium problems helps the instructor to evaluate a specific course outcome, which is on-going work leading to a future publication. Also, based on the passing rate from previous semesters we can predict the concepts that are difficult for most of the students and better plan for instruction in future offerings of the course.

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Appendix: Survey Questions

1. I feel confident in taking future courses that require E MCH 211 as a pre-requisite.
2. I think it is important to be able to solve problems correctly
3. I feel that the grades I received in E MCH 211 with mastery exams was a fair evaluation of my understanding of that subject
4. I feel that the grades I received in E MCH 211 with mastery exams was a fair evaluation of my abilities to solve problems in that subject

5. I feel that my expected course grade would be higher if E MCH 211 was taught with partial credit exams
6. When I receive a graded exam back in a course that is not taught with mastery exams and there are problems on which I did not do well, I read the feedback on the exam and try to solve the problem correctly on my own
7. When I receive a graded exam back in a course that is taught with mastery exams and I did not successfully pass a problem, I try to solve the problem correctly on my own to prepare for the retake
8. When I receive a score of C or AC on a problem (even on a retake) I feel satisfaction that I know how to solve the problem
9. If I needed to schedule another course that was offered as one section being taught with mastery and another using traditional partial credit I would choose the mastery course
10. I feel more confident in my abilities to solve problems due to having taken a course using the mastery method
11. I worked harder in E MCH 211 course as a result of it being taught with mastery
12. I learned more in E MCH 211 course as a result of it being taught with mastery
13. I feel that the mastery exams made me keep up with the course better that traditional exams
14. I feel that the time I spent preparing for retake exams was time well spent
15. I spend more time studying for the first try on a mastery exam than I would if it were a partial credit exam
16. I felt more stressed on the first try of a mastery exam compared to a partial credit exam
17. I changed the way in which I currently study due to having taken a course taught with mastery
18. If I needed to schedule another course that was offered with one section being taught with mastery and another using traditional partial credit I think that the mastery course would better prepare me for subsequent courses
19. If a friend needed to schedule this course and it was offered with one section being taught with mastery and another using traditional partial credit, I would suggest that they take the mastery course

Open Ended Questions

1. What do you like or dislike about mastery learning method?
2. What change/s do you recommend to mastery learning method?
3. What, if anything, did you change in your studying approach for other courses as a result of your experience with mastery method?

Additional Questions for Previous Students

1. As a result of having completed a mastery course, I am more likely to work at getting the right answer in my current courses
2. Looking back on the mastery course, I now think it was a good way to learn the statics material
3. I changed the way in which I currently study due to having taken a course taught with mastery