

Assessing the Impact of Ungrading in a First-Year Mechanics Course at a Japanese Engineering College

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Abstract. The effect of not giving grades for assignments was investigated in calculus-based introductory mechanics courses at a Japanese engineering college. In the class that was treated as a control group, assignments were graded. In the experimental group class, assignments were given submission points regardless of content, and only feedback was provided. Final exam scores were higher in the experimental group where assignments were not graded. Significant differences were found, especially in the group of students who had lower scores on the pretest.

Introduction

The learner's attitude toward learning and motivation significantly impacts their understanding of physics. One critical factor influencing learning attitude is grading. While grading acts as extrinsic motivation, it can also detract from course content comprehension by shifting focus solely to grades, fostering a fear of mistakes, promoting shallow memorization, and discouraging deep learning. Additionally, grades induce anxiety, hindering effective learning. In recent years, alternative grading, sometimes referred to as *ungrading* as an umbrella term, has garnered attention. This approach advocates for a learning environment where students progress at their own pace, embracing mistakes without the constraints of traditional grading. It prioritizes feedback for formative assessment over final grades for summative evaluation. Furthermore, *ungrading* promotes intrinsic motivation, independence, deep understanding, practical skills, and sustained learning. Although discussions on educational evaluation are longstanding, recent reports highlight diverse practices across specialized fields [1,2,3].

The research question for the present study is whether reducing anxiety about grades promotes learning in physics. This paper reports on an attempt to investigate the effectiveness of an *ungrading* method in a mechanics course for first-year university students. The results of the final exam were compared between a class in which no grades were given for assignments and mid-term examinations and a class in which grades were given in a traditional way.

Methods and findings

The practice was conducted in 2023 for first-year students at a Japanese engineering college. Classroom practice was conducted in two classes of the same major, each with approximately 50 students. The two classes were designated as an experimental and control group. The content of the classes was calculus-based introductory mechanics. Both classes were taught in a traditional lecture style. A pretest was administered at the beginning of the course to assess the students' readiness to learn. The test content was basic mechanics and math up to high school.

In the experimental group, submitted assignments were accepted regardless of the content of the answers and were given a submission point. No grades, such as A, B, or C, were assigned to the answers, and only feedback comments were given to the students. Students were encouraged to revise their answers based on the comments. Students who found it difficult to revise on their own were strongly encouraged to seek guidance at the Center for Supporting Teaching and

Learning (CSTL) in the college, but not forced to do so, nor was this a factor in the evaluation. In submitting the assignment, we especially emphasized to the students that they should write their own ideas without worrying about the grade, because making mistakes is an inevitable and inherent part of learning and incorrect answers will not affect the grade. In other words, we told the students that they did not need to copy the textbook or other students' answers to submit their assignments, but to write the best answer they could at the moment. In the control group, submitted assignments were graded and returned with comments for errors. If the evaluation did not meet the criteria, the student had to be supervised at the CSTL and resubmit a signed answer sheet certifying that they had received instruction. If they followed this procedure, they received points for submitting their answers. This was done with the expectation of extrinsic motivation, that if they received instruction there, they would receive points for their submissions.

The midterm test was administered in the ninth class of a total of 14 classes. In the control group, the test was not scored, but a list of items to be achieved was presented to the students. For each item, students were individually informed by the LMS (Moodle) whether they "got it" or "didn't get it yet. For items that were not yet understood, students were given specific instructions on what they needed to review, including the number of previous assignments, the corresponding textbook page, and examples. This is because it is important to give students specific instructions on what to do in response to their feedback. In the control group, students were individually informed of their exam scores, and those with particularly low scores were encouraged to do their best for the final exam.

In FY2023, there were 51 students in each class who took both the pretest and the final exam. The pretest results showed no significant difference in the mean scores of the two classes, confirming that the students in both classes could be considered the same group. The final exam scores (mean \pm standard error) are 72.9 ± 2.8 and 67.4 ± 3.3 for the experimental and control groups, respectively. Although the mean score of the experimental group is higher, the difference was not significant. When compared only with students who scored less than 50% on the pretest (twenty-two students in both classes fell into this category), the mean scores for the final exam were 62.3 and 49.5 for the experimental and the control groups, respectively. The mean score for the experimental group was significantly higher at the 5% level, with a moderate effect size of 0.30.

Conclusion

The study showed that teaching methods that reduce grade anxiety and provide feedback are effective, especially for groups with low pretest grades. In other words, the reduction of grade anxiety is expected to contribute to the achievement of course goals for a diverse student population, regardless of their history or proficiency in physics courses. It remains to be seen how the students' anxiety about learning physics has changed as a result of this approach. Another future task is to examine the effect of *ungrading* separately from the feedback of the achievement of each item in the mid-term examination.

References

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