

## Effect of Letting Students Choose the Weight of Each Assessment Category for the Semester Grade

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### Abstract

To increase inclusivity and equity, higher education instructors are adopting the universal design for learning (UDL) approach in their classrooms. While the principles of UDL are evidence-based, they additionally allow flexibility in meeting the needs of our students. One of the three principles of UDL is action and expression, that is, how can an instructor provide alternative options to students to demonstrate what they know. This paper concentrates on an instance of this principle in action and its effect in a Numerical Methods course at the University of South Florida. The author has many means of assessments in the course that count toward the final grade, and to give students some ownership of learning, the students could choose a specific percentage weight for each assessment category of the course. About 16% of the students received a higher grade than they would have otherwise got.

### Keywords

Variable grading, Universal Design for Learning, UDL.

### Introduction

Universal design for learning (UDL) “is a framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn.” [1]. The UDL has three overarching principles. Each of these principles has guidelines and are categorized under “access, build and internalize” [2] for each of them. The three principles are

1. Provide multiple means of engagement: This principle is based on the “why” of learning and hence influences the affective network. An example includes using personal response systems for think-pair-share exercises in a lecture class.
2. Provide multiple means of representation: This principle is based on the “what” of learning and hence affects the recognition networks. An example includes having not only textbook readings but also online digital audiovisual lectures as well.
3. Provide multiple means of action and expression: This principle is based on the “how” of learning” and hence impacts the strategic networks. An example includes going beyond a couple of midterms tests and a final exam as assessments and extend the grading system to include projects, online quizzes, frequent testing, adaptive learning lessons, etc.

In this paper, we concentrate on how we are using the third principle in a course to optimize and encourage learning. A typical grading policy witnessed across many syllabi in STEM courses includes two to three mid-term tests and a final examination [3, 4]. With the proliferation of

solutions manuals, some low-stakes homework assignments may also be included. However, several instructors provide even more forms of expression for our students such as projects, short quizzes, online homework, handwritten homework, metacognition exercises, essays, poems, memes, etc. Some instructors also give choices in how students want to express themselves, especially for summative assessments. One example of such a choice would be to either submit a final project or take a final examination. The author offers such a choice in a technical elective course he teaches in the field of composite materials. Although only 25% or so of the students make the choice of a project, as it involves rigorous theoretical as well as experimental work, it is still appreciated by students who are up to the challenge.

In this paper, for a course in Numerical Methods in Spring 2019, we let students choose the weight of each assessment category in the overall grade. The inspiration for replicating this idea came from the Lang’s article “How Much Do You Want Your Final to Count?” [5]. In this article, Lang discussed the variable weights the students chose for a colleague’s Economics course. For a survey question “I appreciate being able to choose the weighting for each assessment toward my semester grade” for the Economics course [5], the average response of the students was a 4.7 on a 5-point scale.

## Method

In a Numerical Methods course at the University of South Florida, the grading policy includes three tests, two computer projects, 15 online quizzes via the learning management system (LMS), 17 adaptive platform lessons [6], special assignments, a concept inventory test [7], and a final examination. The intervals of weights for these assessments are given in Table 1. Students could choose any integer percentage weight totaling 100%. The final exam grade weight was kept fixed though as we were using the results from it to determine cognitive learning gains for another part of the study.

**Table 1.** Weightage spread for each assessment

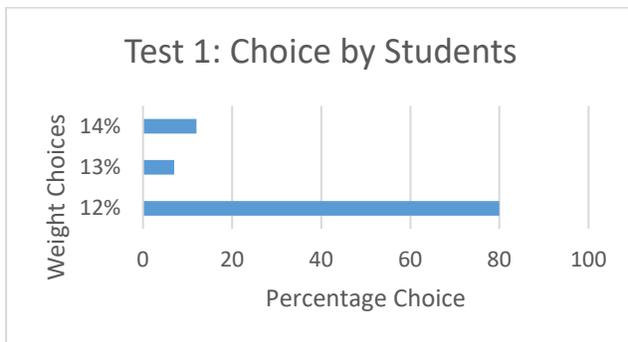
Category	Weightage
Test#1	12% to 14%
Test#2	12% to 14%
Test#3	12% to 14%
Computer Projects	8% to 10%
CANVAS Quizzes	5% to 9%
Online Adaptive Lessons	6% to 10%
Special Assignments	6% to 8%
Concept Test	4% to 6%
Final Exam	25% to 25%

## Results and Discussion

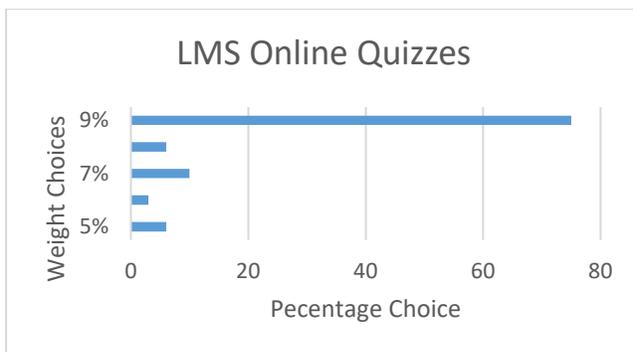
The students made their choice of weights through a CANVAS survey soon after when the first test was returned in the fourth week of classes. This timing was chosen so that students have a good idea of how well they were doing in each type of assessment, and hence be able to make a

reasonable choice of the weights. All 92 students in the class were given the choice of choosing the weights of the assessment categories as announced in the syllabus but since only 74 chose to take part in the overall study of which this intervention was part of, we are only reporting the results from these 74 participants. Out of the 74 participants, 71 students chose the weights while the weights chosen by 1 student added to be more than 100%. The other two did not make a choice before the deadline. For these three students, the default of the midpoint of each interval in Table 1 was used. Reminders were sent via email and announced in class as well, but only could be made to the whole class.

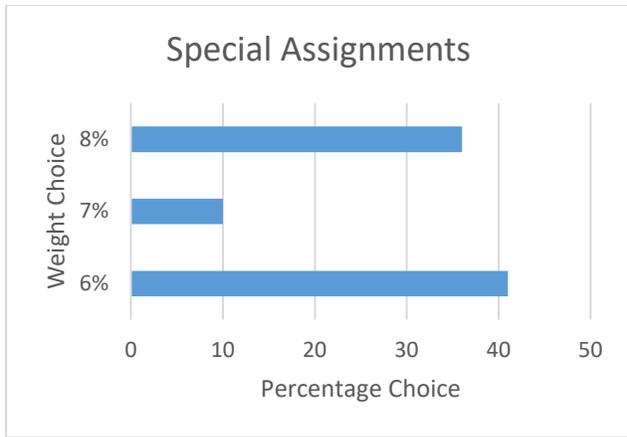
Figures 1-3 show the choices students made for certain categories. Most students chose the lowest weights for tests and the highest weights for LMS online quizzes and adaptive platform lessons. This was expected as the scores in the latter can be improved with several retakes (three for online quizzes and unlimited for adaptive lessons) until they are due. Most questions in the online quizzes and adaptive lessons are algorithmic in nature, and hence cannot be guessed or obtained easily from a peer. It was for the special assignments (ill-posed real-life problems with incomplete data, poems, memes, etc.) that we saw a similar number of students choosing between lowest and highest weights as these included exercises that needed higher-order thinking as well as good skills in written communication.



**Figure 1.** Student Choice of Weights for Test#1



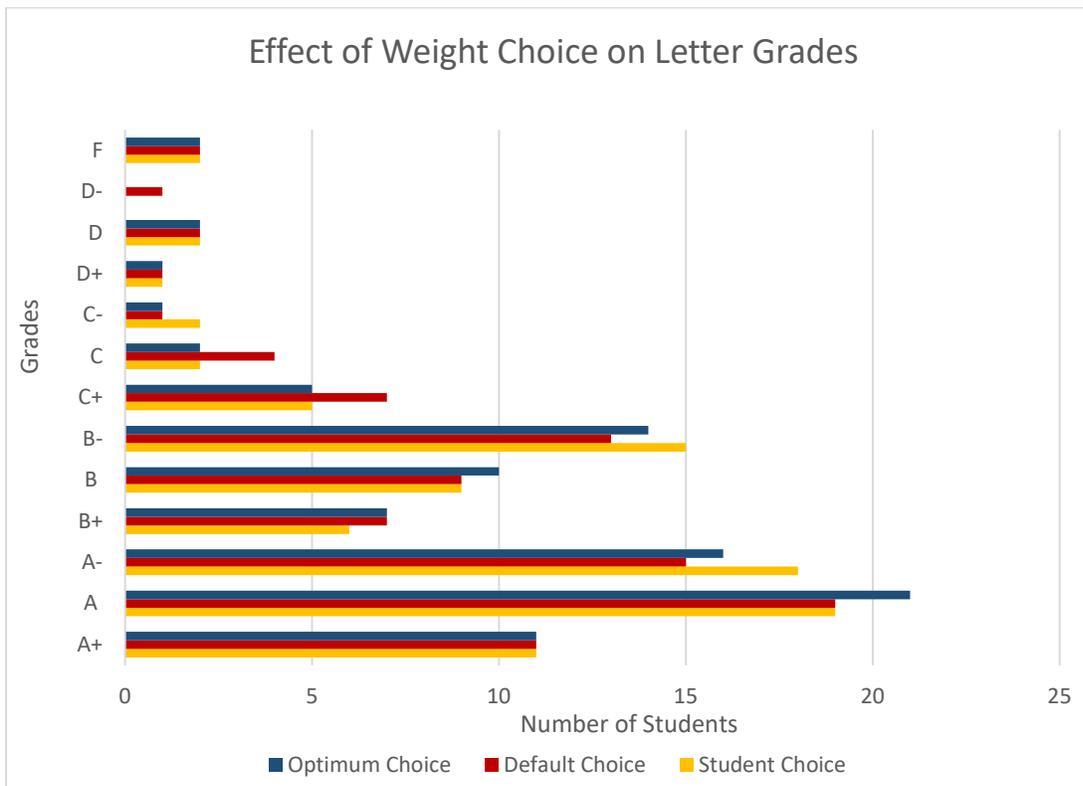
**Figure 2.** Student Choice of Weights for LMS Online Quizzes



**Figure 3.** Student Choice of Weights for Special Assignments

A VBA code written for Microsoft Excel worksheet was used to determine the grades based on student choices of weights. Using a Monte Carlo method with a uniform random number generator, a grade with optimum weights was also calculated. Anyone interested in these VBA modules can contact the author.

Shown in Figure 4, only 17% of the grades were affected because of the student choices of weights.



**Figure 4.** Effect of Weight Choices on Letter Grades of Students.

The author expected more students to be affected, especially when the university uses a plus-minus grading system and a letter grade varies every 3 to 4 percentage points. The effect was most pronounced for the middle grades, while the lowest and highest letter grades were least affected. As a side note, as part of their grade, students were also asked to write a general computer program to find the optimum combination of weights. However, their decisions were based on the end of 4<sup>th</sup>-week grades.

No student was adversely affected by choosing the weights of their grades when compared to the default combination. The number of student grades affected would increase to 24% if the optimum combination of weights were chosen for the students at the end of the semester. These combinations were used anyway by the instructor for every student in the course to assign their letter grades for this semester as it was the first application of such a policy.

The paper demonstrates that some effective teaching tools that are based on evidence can be implemented without major investment from the instructor. To give students a choice in their grading can be a powerful motivator; it also gives a voice to how students want to express their cognitive learning of the course.

### Acknowledgements

The author would like to thank two anonymous reviewers for their comments which improved the quality of the paper. One reviewer suggested the use of Excel Solver over the Monte Carlo method for calculating the optimum weights. By rewriting the VBA program through use of all combinations of weights, no differences were found in the assigned grades.

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Autar Kaw is a professor of mechanical engineering at the University of South Florida. His main scholarly interests are in education research methods, open courseware development, flipped and adaptive learning, bascule bridge design, fracture mechanics, composite materials, and the state and future of higher education. He led the development of the Numerical Methods courseware that annually receives 1,000,000+ page views, 2,000,000+ views of the YouTube lectures, and 90,000+ visitors to the "numerical methods guy" blog. He has written more than 100 refereed papers, and his opinion editorials have appeared in the Tampa Bay Times, Tampa Tribune, and Chronicle Vitae.