

A New Perspective on Grading Work in Progress

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Abstract

Instructors strive to achieve fair, valid and equitable grading scales. Determining an appropriate grading methodology in an introductory course that has several components can be difficult. The purpose of this paper is to present a grading system that is simple, flexible, and reflects the quality of students' work, despite the variety of components that comprise the final grades. This grading method takes the process of posting student grades on the web one step further and enables both student and instructor to have a complete picture of students' progress throughout the semester. There is current research that suggests that an up to the minute letter grade evaluation can provide incentive for students to increase learning during the semester.

Keywords: grading method, grading as learning motivation, posting grades on the web

1. BACKGROUND

The only prerequisite for the computer science introductory computer concepts and programming course is intermediate algebra. The one-semester course includes programming in Visual Basic and computer literacy concepts. The course attracts both CS and IT majors and non-majors who have some experience with computing, but little or none with programming. The current required texts are Schneider¹ and Long². The course sections are small, ranging in size from about 13-30 students. Students are in a computer lab for every class meeting. However, the instructor has the option of controlling the student workstations: the instructor can project information from one workstation to all, control the keyboard of a specific workstation, or simply turn off specific workstations. Lecture and lab can be used during any class period. The students final grades are determined by five components: 1. completion of collaborative in-class labs, 2. short objective quizzes, 3. programming assignments, 4. a research paper, and 5. on-line tests that require completion of a program. Grading the variety of assessments and providing quality feedback and grade information to students in this course has been a challenge. For several years, a course grade spreadsheet has been posted on the university network and updated on a weekly basis. Students appreciate the ongoing view of their individual grades, but frequently request an answer to the question, "What is my grade now?" This is encouraged by the university's drop policy, which states that students receive a grade of F if they drop a course after the sixth

week of classes and are not earning a C on the day they submit the drop slip.

2. PROBLEMS WITH WEIGHTED GRADE DETERMINATION

Using a spreadsheet to post grades on the Web is a relatively simple process.³ When grade sheets are posted on the web regularly, students can easily determine what grade they earned on a particular assessment. When a standard percentage weighting scale, such as that in Table 1, is used to calculate a final grade, it is more difficult for students to determine their letter grades on an ongoing basis. Either the students or the instructor must factor in the weights to determine the current grade every time the grade sheet is posted. This is feasible but cumbersome.

I have found that using a weighted grading scale such as that in Table 1 hampers creating new activities during the semester. Weighted grading scales work well when all the assessments are fixed on the first day of the semester. However, students' backgrounds and learning styles in an introductory course vary greatly, and good teaching demands some flexibility in presenting activities and assignments that vary from semester to semester. I have had to entirely re-write in-class activities and labs abruptly, mid-semester, to meet the needs of a group of students. I have also found that when introductory computing course students are required to complete activities during class and submit them immediately, assigning a point value encourages them to participate more attentively. Brookhart's

research supports my observation.⁴ I have found that the pre-determined weighted grade scale hinders creating and adding new materials to satisfy the students' needs as I adapt to the learning styles of my students throughout the semester. A grading model should not prevent an instructor from adding worthwhile assessments during the course, but should enhance students' participation in their own learning.

Labs	5%
Quizzes	15%
Tests	50%
Assignments	25%
Research paper	5%
TOTAL	100%

Table 1. Weights for grading course components

Determining the true value of an assignment, quiz or lab is challenging enough without also taking in to account some weighting factor. For example, an exam that covers exactly three chapters, with precisely the right questions to determine the students' mastery of the material might only provide 80 points. To make it longer might mean adding redundant questions, making some questions worth an inappropriate number of points, or lengthening the exam beyond the class time. On the other hand, a thorough exam covering four chapters might provide 130 points of questions. Preparing a meaningful exam is more important than trying to create an exam constrained to a specific number of points.

3. FINDING ANOTHER GRADING METHOD

Valvoord and Anderson maintain that there is no perfect grading system, but grading "can be a powerful tool for learning."⁵ They present several grading models for consideration, two of which are the Accumulated Points model and the Curve model⁶. For this introductory computer course, a Curve model does not work well. The course sections are small, and require a specific minimum level of proficiency to pass.

Table 2. Syllabus text and minimum percentage of total points required to earn a specific grade

Grades will be based on total points accumulated in the course. The adjacent table shows the minimum percentage of total points that are required to earn a specific grade.

I will post a spreadsheet on the network with each student's grades on it every Monday. I assign each student a number. The number has no connection to your student ID. Please check the spreadsheet periodically for any errors or omissions, and notify me as soon as possible if there are any errors. You must keep the returned assessment (lab, quiz, paper, etc.) and present it to me in order to have the master grade sheet corrected.

Furthermore, research suggests that post-secondary students respond well to criterion-referenced grading and learn more in courses where their "work [would] be compared with a standard of quality rather than with the work of their fellow students."⁷ An Accumulated Points model provides greater flexibility and adaptability to course goals, particularly to the students' requests to monitor their grades throughout the semester. Brookhart proposes that providing the students with a better picture of current performance can motivate them to work harder.⁸

Before adapting a grading scheme, department guidelines must be considered. For programming courses in this department, the guidelines strongly suggest that no less than 50% of final grades in an introductory course are based on independent exams and quizzes. The department also requires the instructor to announce the grading scale on the first day of class, and to adhere to it throughout the semester.

4. AN ACCUMULATED POINTS GRADING METHOD FOR POSTING ON THE WEB

An effective grading method for the introductory computer course should

1. Be flexible enough to accommodate heterogeneous assessments and variations in the number and point value of each assessment.
2. Encourage students to learn more and increase their effort.
3. Increase the accuracy of final grades.
4. Simplify maintaining a web based grade sheet.
5. Fit into departmental guidelines.

This straightforward method for calculating final grades is based on the Accumulated Points method described by Valvoord and Anderson⁵. In this variation, the actual total number of possible points is not announced at the beginning of the course, but the evaluation mechanisms for each component are. **Tables 2 and 3** include sample text from the syllabus, which is distributed on the first day of class.

Grade Desired	Percentage
A+	96%
A	93%
A-	90%
B+	87%
B	83%
B-	80%
C+	77%
C	73%
C-	70%
D+	67%
D	63%
F	less than 60%

Table 3. Syllabus text and an example of student earned points and possible points

For example, if the possible points and points earned by a student are those in the adjacent table, the grade earned is a B because 384/455 is 84%. Note that the total points possible in this course is likely to be different than 455.

Component	Possible Points	Earned Points
Hour Exams	160	125
Programs	80	72
Quizzes	60	53
Written Paper	20	19
Labs	50	45
Final exam	80	70
TOTAL	455	384

	Lab 1	Lab 2	Quiz L1	Assign 1	Assign 2		Test 1	Point Total	% so far
Possible Points	5	5	7	10	10	...	95	159	
2246	5	4	5.5	9	4	...	58	107	67%
2781	5	5	6	8	10	...	84	141	89%
5772	5	5	6	8	10	...	81	140	88%
5926	5	5	7	6	10	...	49	91	57%
4694	5	5	4	8	8	...	77	131	82%
1288	5	5	7	8	9	...	82	142.5	90%
7082	5	5	6	9	10	...	82	142.5	90%
...
Average Score	4.9	5.0	6.1	8.3	9.2		76.0	131.6	83%
Average Percentage	98%	99%	87%	83%	92%		80%	83%	

Table 4. A portion of a spreadsheet posted after the first exam. For brevity, some columns have been omitted.

5. CREATING THE SPREADSHEET

An Excel spreadsheet is used to total the students' grades and calculate their cumulative percentage grades each week. The first column contains the students name, the second contains the randomly generated **Assigned Id** number, and the remaining columns contain the scores for each lab, quiz, exam, assignment, and paper as they are graded, recorded and returned to students. The top row of the numeric data shows the possible points. **Table** is a sample of a spreadsheet posted on the Web after the first exam, around the seventh week of the semester.

The **Assigned Id** numbers are generated using Excel's random number function. Excel's RAND function generates a number between 0 and 1. The Excel formula to generate a number between 1000 and 9999 is =INT((RAND()*9000)+1000). Since Excel's RAND function result is volatile, once the Assigned Id column is generated, the cells must be copied to the clipboard and pasted to a new column. Using the Excel *Edit* pull-down menu, selecting *Paste Special* and the *Values* option produces the 4-digit nonvolatile numbers in the new column. The original column that contains the formula can then be erased, deleted or hidden.

Insert columns for each graded item that is returned to the students. By creating the **Point Total** column as

soon as there are two columns to add up, each new column between those two will be included in the total. However, if the range in a sum stored in column 6 is column 3 through column 5, a new column inserted to the left of column 6 is not included in the sum, which has now moved to column 7. This is easily remedied by adding the column for the final Exam score immediately to the left of the total, with no possible points specified.

To make the posting version of the spreadsheet, *select* the range of cells in the master spreadsheet, skipping the student names, copy and paste them to a new spreadsheet. In Excel, using the *Edit* pull-down menu and selecting the *Paste Special* option allows only the *values* (and not the *formulas*) to be pasted. This ensures that the posting spreadsheet will have no references to the master spreadsheet and no null references. Using the *Edit Paste Special* sequence a second time, with the *formats* option, pastes the formatting style to the cells in the posting spreadsheet. The column widths may need adjustment, but generally, it only takes five minutes to make sure that the cells are correct and readable for students. The posting spreadsheet is saved and copied to the course network handout directory in which students have *read* and *copy* access only.

To distribute the Assigned Id to each student, print the name and Assigned Id columns of the spreadsheet.

Cut them up and hand them out in class in place of taking attendance. Spend a minute or two reviewing how to access the course network directory, and how they can locate the grade sheet.

6. ADVANTAGES

The total points grading method is flexible. In a semester in which a class requires more hands on supervised lab time, it is easy to add a lab or two to the grade sheet. In some semesters, students are better suited to small assignments, perhaps only 10 points in value, and a single 15-point assignment. Other semesters, classes are more amenable to incorporating a larger project worth 20 or 25 points, and fewer 10-point assignments. Point values are appropriate to the assessment, and are criterion-based. This adaptability to the assessments encourages the instructor to adjust to students learning styles, with the result that more students achieve the course objectives. Student comments from course evaluations over several semesters indicate that they like the grading scheme, particularly:

- the availability of their grades on the network
- the many components that add to their final grades
- the ability to figure out what they need to get a higher grade
- the request to other instructors to provide similar grade data

Since students check the grade sheet and report any missing or erroneous scores, final grades are extremely accurate. Students have access to the spreadsheet while logged in to the university network, and can copy the data to answer any "what if" questions about their course grades using Excel.

The grade sheet maintenance requires minimal effort for the instructor, and in fact, saves time overall by providing students with desired information. Office visits can be used for more meaningful student contact.

Each semester, this method has stayed within the department guidelines. **Table 5** summarizes the final weights of the course components for the most recent semester, fall 2001. The exams + quizzes comprise more than 66% of the final grade. It has turned out to be surprisingly similar to the weighted grade method demonstrated in Table 1.

Table 5. A Summary of the weights of the course components

	Lab	Quiz	Exam	Assign	Project
Possible points	35	67	257	115	20
% of total points	7.2%	13.7%	52.6%	23.5%	4.1%

7. CONCLUSION

This paper is intended to offer a view of grading in an introductory course that can provide information to students that encourages them to learn, while providing instructors the flexibility to use

pertinent assessments throughout the semester. It is my opinion that creating an effective yet flexible grading method can contribute to higher quality teaching and improved student learning. Further study, such as administering a survey and analyzing the data collected could give more insight into how much a grading method can contribute to student motivation and learning.

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