This document is meant to serve as a compliment to the article: “**Grading by Category: A simple method for providing students with meaningful feedback on exams in large courses.”** submitted for publication to The Physics Teacher. A link will be provided to this article once it has been accepted.

In order to provide further support for an instructor who would like to use the Grading By Category method, we present a list of general student solution types that is helpful to consider when determining the numerical value of a certain category. The categories don’t always directly map to these solution types, but UC Davis instructors have found this a useful list to keep in mind when developing the categories:

Type 1: correct

Type 2: almost completely correct with one or two small algebra errors not related to conceptual understanding

Type 3: minor conceptual errors (students add extra incorrect information, or make math error(s) that indicate a conceptual misunderstanding)

Type 4: Major conceptual errors (an example might be violating energy conservation, may also include math error)

Type 5: Some progress made, but many errors

Type 6: Blank or essentially blank

For a given problem there may be more than one major or minor conceptual error, meaning that for any one problem, there may be several categories for solution types 3 and 4 and they all might eventually be given different numeric scores. However, when grading and constructing the categories, it is not necessary to first decide if a certain error is indicative of a major or minor conceptual error, it is only necessary to identify the error and label it with the same symbol as other students who make the same error. Instructors can wait until they have viewed all student solutions before they determine the relative worth of each category.

We advise instructors using the Grading by Category method to give relative high scores to students who make math errors that aren’t indicative of conceptual misunderstanding.

We suggest that each type of error be graded on a 4.0 scale so that students can see how well they did on each problem. It also makes it easier for the instructor assign value to the response. When considering the value, the instructor can determine if the error indicates a “B” or a “C” level of understanding, for example. The following can be considered guidelines, although there can always be exceptions.

4.0 to 4+ (A to A+) for Type 1

3.3 to 4.0 (B+ to A) for Type 2

2.3 to 3.7 (C+ to A-) for Type 3

0.7 to 2.7 (D- to B-) for Type 4

0.0 to 1.7 (F to C-) for Type 5

0.0 (F) for Type 6

A few final things to consider about the Grading By Category Method:

Recall that when using the GBC method, each category is assigned an initially meaningless symbol which is usually a letter to simply grade entry. (See the document “Example Question and Categories” for an example.) Each letter is assigned ONE value. If the grader is unsure if two different errors are similar enough to have the same value or not, the responses can be assigned two different letters and value can be determined after all student responses are viewed.

Try not to have too many categories, you want the categories to be different enough from each other that you can easily put the solution into one of the categories.  Some test items only require three categories, while others may require as many as nine, but if you go over that amount consider if the difference between the student responses is meaningful in some way to you. If not, you can lump some solutions in the same category.

We never write their numerical grades on the students’ exams.  We also don't decide these values until after all the student responses are assigned to categories. We write what the symbols are equivalent to on the website with the categories so students always need to look at the categories in order to determine their scores.

We switch up the letters throughout the quarter so that students don't get used to the system and realize that a ‘Q’ means perfect, and an R is 'good enough.' We want to leave it a little bit of a mystery so that students are encouraged to investigate their errors in order to determine their numerical grade.

If you have further questions about grading by category, or would be interested in attending a future workshop[[1]](#footnote-1) to learn the method, please contact Cassandra Paul at Cassandra.paul@sjsu.edu

1. If there is enough interest, we may organize a workshop in northern California or at one of the national meetings. [↑](#footnote-ref-1)