

Standards-based Grading in Introductory Physics: An Example

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My course

- Two-semester calculus-light intro course for construction, packaging, engineering technology, applied science majors

Why change?

- Motivates students to try again and study harder
- Reduces need for test accommodations
- Focuses on physics, not participation or attendance points
- No grading of homework
- Puts responsibility on students

How much work is it?

- Lots
- Then less
- Then even less
- And definitely worth it!

My process

- Frustrated with students passing without knowing basic material
- Watch colleague try it (2012)
- Try it—not great, not terrible
- Change system every term based on student feedback and my experience
- Still tweaking (2019)

What didn't work

- Students need to pass each objective twice
- Take away old pass if can't do it later in term
- Separate conceptual from numerical objectives

Get these documents + this poster!



How do grades work?

- No points, have to pass set # of objectives to earn a grade
- Weekly assessments (quizzes)
- Can retake two times if needed
- Entire grade based on assessments + lab reports + writing assignment
- Non-numeric grading
 - High pass
 - Pass
 - Minor error
 - Major error
 - Incomplete/insufficient

My grade scheme—student grade sheet

A-level objectives (earn SP)													A-level: P = 10 SP HP = 20 SP
7 ___ = ___ SP	13 ___ = ___ SP	14 ___ = ___ SP	15 ___ = ___ SP	17 ___ = ___ SP	20 ___ = ___ SP	25 ___ = ___ SP	32 ___ = ___ SP	33 ___ = ___ SP	34 ___ = ___ SP	35 ___ = ___ SP	39 ___ = ___ SP		
C-level objectives (earn XP and SP)													
1 ___ = ___ XP	2 ___ = ___ XP	3 ___ = ___ XP	4 ___ = ___ XP	5 ___ = ___ XP	6 ___ = ___ XP	8 ___ = ___ XP	9 ___ = ___ XP	10 ___ = ___ XP					
11 ___ = ___ XP	12 ___ = ___ XP	16 ___ = ___ XP	18 ___ = ___ XP	19 ___ = ___ XP	21 ___ = ___ XP	22 ___ = ___ XP	23 ___ = ___ XP	24 ___ = ___ XP					
26 ___ = ___ XP	27 ___ = ___ XP	28 ___ = ___ XP	29 ___ = ___ XP	30 ___ = ___ XP	31 ___ = ___ XP	36 ___ = ___ XP	37 ___ = ___ XP + ___ SP	38 ___ = ___ XP					
Lab Standards (average of top 3)						Science Communication (average of top 5)				C-level: Pass = 1 XP High Pass = 1 XP + 10 SP			
40 ___ = ___ XP	41 ___ = ___ XP	42 ___ = ___ XP				43 ___ = ___ XP	44 ___ = ___ XP						
LEVEL UP!												LEVEL UP!	
	F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	
XP	<11	14	17	20	23	26	26	26	26	26	26	26	
SP							40	70	100	130	150	180	

College Physics II Spring 2019 Professor: Laura McCullough

PHYS-242 Experience Points/Skill Points Chart

Examples of assessments (quizzes)

Assessment #3B for 1-D kinematics

Name: _____

Objectives being assessed:
3 I can solve problems using kinematics concepts.
4 I can solve multiple object problems using kinematics concepts.

3: _____ A Cadillac and a Nash Rambler start from rest at the same instant with the Cadillac initially at some distance behind the Rambler. The Rambler and Cadillac have constant accelerations of 1.5 and 2.2 m/s² respectively, and the Cadillac overtakes the Rambler after the Rambler has moved 50 m.
(a) How long does it take the Cadillac to overtake the Rambler?
(b) How far was the Cadillac behind the Rambler initially?

4: _____

3: _____ Thor is standing in a skyscraper 120 m above the ground. He sees a baby fall past the window, having fallen from 40 m higher than he is. With what acceleration must Thor descend to catch the baby just before it is too late? Assume Thor starts moving the same moment the baby passes him.

4: _____

Assessment #8F for Static Electricity

Name: _____

Objectives being assessed:
18 I can use the idea of positive and negative charges repelling/attracting to explain phenomena.
19 I can determine the net electric force on a charged object using Coulomb's law.

19: _____ A small positive charge is placed at point P in the pictures below. Rank the total electric force on the charge in the four situations. If any are equal, show that in your ranking. Please show your reasoning/ work.

A	+	-	P	+
B	P	-	+	-
C	-	P	-	+
D	-	P	+	-

Largest _____ Smallest _____

18: _____ When clothing comes out of the dryer, often two socks will stick together. Explain why this sometimes happens in terms of charging objects. Do the socks end up with the same charge or different charges?

Lab reports with no points!

- Short lab reports: data, graphs, answers to “follow-up questions”
- Lab grading form:

Proficiency rating		
	LAB40	I can communicate clearly in complete sentences.
	LAB41	I include all necessary information in a lab report.
	LAB42	I understand the errors associated with experimental designs.

Writing assignments with no points!

Every other week you will have an assignment relating to the Science News magazine. You will read an article from [https:// www.sciencenews.org/](https://www.sciencenews.org/) and post to D2L.

- For your posts, you should include the following:
- A citation (include a link please).
 - A one or two sentence summary of the article.
 - Why you picked it/ why you thought it was interesting.
 - [The last part changes each week—see the schedule below]

The standards/objectives associated with this assignment are as follows:

- I can communicate clearly about science topics.
- I can apply scientific principles to science writing.

Each time you submit you get graded on both objectives. Your grade will be the average of the top five scores for each objective.