Every Point Counts:

Aligning Grades with Learning.

Standards-Based and Standards-Referenced Grading in Practice

by
Oren Levi (He/Him)
Princeton High School

Background: ME!

- Rutgers Undergrad (‘05 -’09)
  - BS in Physics, Minor in Mathematics
- Rutgers Grad School of Education (‘10-’12)
  - Masters in Physics Education
  - Where I met the inspiration for this policy
- Teacher of Physics, Glen Rock HS, 4 yrs
  - Taught EVERY level of physics:
    - CP (College Prep) Physics
    - Honors Physics
    - AP Physics 1
    - AP Physics 2
    - AP Physics C: Mechanics & E&M
- Teacher of Physics, PHS, 11 years
  - Primarily Teach Physics 1 and Phys. 1 ICRP
  - AP Physics 1 and C on and Off

Background: Grading Scheme

- Grade on a “Total Points” scale.
- Weighting is created by assignment point value.
- All assignments can be resubmitted (With reflections)
- Final grade calculated by points earned/points offered

Assignment types:

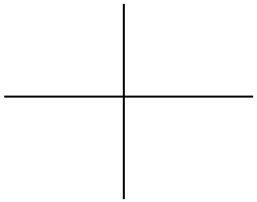
- Quizzes: 4-8 pts
- “Weekly Reasoning”: 4-8 pts
- Labs: 12 - 24+ pts (Based on rubrics)
- Tests/Projects: 30+ pts

Types of grading

These are policies I have either used or observed in use. All were used in Physics classes (or grad school classes)

“All or Nothing”

- Used by Grad school teacher/adviser
- Assignments were not accepted until A+
- Intermediate grades not provided
- Symbols used to indicate progress

Nice try! Try again!	Better, still needs improvement	A+
		

Pros:

- Quick
- 1 Reflection for whole assignment

Cons:

- Abstract feedback?
- Grade?

“All or Nothing”, but with POINTS!

1-4 scale used to represent levels of completion

Nice try! Try again! 1	Better, still needs improvement 2	Only 1 or 2 mistakes 3	A+ 4

Pros:

- Quick
- Gradebook friendly
- 1 Reflection for whole assignment

Cons:

- 2 grades ≤ “F”
- Assignment weighting?
- Gradebook feels “Light”

Traditional Points System

- Traditional, familiar grading scheme
- Students recover specific lost “points”

Pros:

- Gradebook friendly
- Nonverbal feedback
- Allows assignment weighting

Cons:

- One reflection per mistake
- More work
- Gradebook fiddling
- Points need to be “meaningful”

Standards/Rubric/Mastery System

- Questions, and therefore mistakes, connected to specific skills/standards
- Reflections done addressing the Standard
  - eg: “Why does your response not meet the standard?
- Make sure to address each standard multiples times for repeated chances to reassess standard.

Pros:

- Quick-ish
- Very concrete goals
- 1 Reflection can address multiple mistakes addressing the same standard

Cons:

- Not gradebook friendly (at the HS)
- Fiddly questions
- Ambiguous standards

Standards/Rubric/Mastery System…but with points?

A	B	C	D	E	F	G	H	I	J	K	M	
	Missing	0	**Homeworks**						EbA	Evidence-based Reasoning	3.60	
	Basic	0							EnC	Energy Conservation		
Grade	Developing	0	0 - Up to Date						Int.D	Drag/Friction Interaction		
	Proficient	0							Int.E	Electric Interaction		
100%	Advanced Proficient	7							Int.G	Gravitational Interaction		
									Int.M	Magnetic Interaction		
		#REF!						**Original Scores**	Int.S	Elastic Interaction		
Assessment Finder:		Let there be light Lab	Lab	4/17/2020	4/20/2020	NA	Thk.I	4	Inv.A	Model Application Investigat		
							Thk.C	4	Inv.G	Model Creation Investigatior	4.00	
							ScM	3	Inv.T	Model Testing Investigation	3.50	
							Inv.T	3	MnC	Momentum Conservation		
Use the dropdown menu under "Assessment Name" to select the assignment and see the scores you recieved on the standards for the given assessment. To see a comprehensive list of assessments and standards, go to the "Student gradebook" Tab below.							EbA	2	Mot	Defining Motion		
									Mth.A	Algebra		
									Mth.Q	Quantitative Mathematical R		
									Mth.R	Qualitative Mathematical Re		
									Mth.V	Vectors		
									NtL	Newton's Laws		
									REv	Resource Evaluation		
									ScM	Scientific Modeling	3.67	
		#REF!							ScQ	Scientific Questions		
									Sys	The System		
									Thk.C	Collaborative Thinker	4.00	
	Standard			**Assessment Name**	**Original Score**	**Reassessment Score**	**Current Score**	**Reassessment Deadline**	Thk.I	Independent Thinker	4.00	
Standard Finder	EbA	Evidence-based Reasoning		Sunlight Flip	4	4	4	4/30/2020	Thk.M	Metacognitive Thinker		
				Let there be	2	2	2	NA	XUn	Experimental Uncertainty		
				Pin hole view	4	4	4	5/11/2020				
				Index of Refraction observations								
				Mirror Image	4	4	4	6/12/2020				
Use the dropdown menu under				mirror Mirror lab	4	4	4	6/12/2020				

I'd rather not talk about it….

Rubrics based on standards but also with points!

- Rubrics for learning outcomes (Like standards but more specific)
- 2-5 pts scale, but “mastery” at 4
  - Will explain in a sec
- Rubric has built in feedback and instructions
- Leaves room for assignment scaling, gradebook friendly, fairly quick

This is what I do now

Learning outcomes:

These rubrics represent the learning goals of this class. Almost every assignment, if it is being graded, will be addressing one of these learning goals. Your mastery of these learning goals will be tracked in Canvas and will represent your progress in the class. Your goal should be to have a mastery level of at least “Demonstrating” on each outcome. These outcomes will appear as rubrics in the assignment and will be used to calculate your grade.

Emerging = 2 pts	Developing = 3 pts	Demonstrating = 4 pts	Refining = 5 points

Verbal Reasoning

I am able to clearly explain and justify the key steps of my reasoning process

Explanation is:

- Clear
- Sufficiently detailed
- Easy to follow
- Shows physical and conceptual understanding.
- When justifying reasoning, please only use ideas and language from class (not the internet).

Qualitative Verbal Reasoning
(Conceptual Explanation)

I am able to clearly explain and justify my thinking about a conceptual physics question using appropriate language and ideas from class.

Emerging	*Developing*	*Demonstrating*	*Refining*
• An explanation is provided. • Uses everyday language or some physics ideas to begin describing the phenomenon.	• Explanation includes at least one correct physics idea. • Some physics vocabulary is used. • Reasoning shows a partial attempt to connect ideas to the question.	• Explanation is clear, coherent, and directly addresses the conceptual question. • Correct physics ideas are used consistently and appropriately. • Reasoning shows a clear cause-and-effect or principle-based structure. • Vocabulary from class is used correctly and meaningfully.	All of "Demonstrating" as well as…. • Identifies assumptions or limitations in the reasoning. • Draws connections to other ideas from class that are related and help inform the explanation.

The Learning Outcome Rubrics:

In case I forgot to open the link….

Construct Rubrics from existing standards

- Use existing standards
  - **State standards (NGSS)**
  - **District standards**
  - **any provided standards or rubrics**

We will look at the Sci-Eng practice number 3 from NGSS: **Planning and Carrying Out Investigations**

(Specifically Appendix-F)

Appendix F: Science and Engineering Practices Describes the progression of the practices across K-12, detailing the specific elements of each practice that are targets for students at each grade band.

Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.
- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
- Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts.
- Select appropriate tools to collect, record, analyze, and evaluate data.
- Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.
- Manipulate variables and collect data about a complex model of a proposed process or system to identify failure points or improve performance relative to criteria for success or other variables.

Learning Objective: *Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems.*

- Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.
- decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
- Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts.
- Select appropriate tools to collect, record, analyze, and evaluate data.
- Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.
- Manipulate variables and collect data about a complex model of a proposed process or system to identify failure points or improve performance relative to criteria for success or other variables.

Learning Objective: *Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems.*

- Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.
- decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
- Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts.
- Select appropriate tools to collect, record, analyze, and evaluate data.
- Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.
- Manipulate variables and collect data about a complex model of a proposed process or system to identify failure points or improve performance relative to criteria for success or other variables.

Emerging	Developing	Demonstrating	Refining
• Select appropriate tools to collect, record, analyze, and evaluate data. • A procedure is written in some form that may possibly lead to a pattern	• Plan and conduct an investigation or test a design solution • decide on types, how much, and accuracy of data needed to produce reliable measurements	• Design considers limitations on the precision of the data (e.g., number of trials, cost, risk, time) • investigation is designed in a safe and ethical manner including considerations of environmental, social, and personal impacts. • Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.	• Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled. • Manipulate variables and collect data about a complex model of a proposed process or system to identify failure points or improve performance relative to criteria for success or other variables.

Example Assignments:

- Homework
- Quiz
- Test
- Lab
- Project

Final Thoughts

Questions?

Slideshow link

Philosophy

"I believe that one of the best ways to learn is to learn from one's mistakes. No one is perfect the first time around, not even me (IKR?). Thus it has been my practice to allow students to fix mistakes they make on ALL(or most) ASSIGNMENTS. While some assignments have certain stipulations, the outcome is the same: You made a mistake/got something wrong, you answer a few questions, reflect on your mistakes, show me that you've learned the thing you made the mistake on, and you get all* your points back."

- From my class syllabus

The Rules:

- Resubmission must be returned within 1 week of receiving the graded assignment
  - Subsequent resubmissions of the same assignment follow the same rule
- An honest attempt must be made on the first submission.
- Every incorrect answer requires a full, well thought reflection to earn points back

Specifically designed reflection questions

The Reflection Questions:

Answer the following questions for EVERY MISTAKE:

1. Why is your answer or response incorrect or incomplete?
2. What is the correct response or answer? Justify why it is correct.
3. What did you have to learn/understand/change in the way you were thinking to be able to get the correct idea/solution?

Optional: Tests

- Still able to resubmit tests
- Stipulations due to the high stakes and high weight
- Some options:
  - Depending on score, Can recover all or partial
    - eg: <Avg - Recover half, >=avg, recover full
  - Allow reflection and retest based on wrong questions
  - Retest only specific questions based on incorrect
  -

Sample Responses:

- A good one
- A Mid one
- A Bad one