Resources!

TRANSFORMING ASSESSMENT TO MAXIMIZE LEARNING

IN ADVANCED PLACEMENT COURSES

For a copy of this presentation and to participate, go to JOINPD.COM and type in the code *nsmlwl*

Presented by Elise Naramore

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Let's move to sit with people teaching similar subjects!

AP Biology

AP Chemistry

AP Environmental Science

AP Physics 2 or C

AP Physics 1

Once in your group, please introduce yourselves.

Introductions

A copy of this Presentation, plus many more resources!

Let's set a goal for this session:

What is one thing to would like to learn here that you could use to upgrade your classroom?

(If you are a non-teaching role, then substitute your setting for "classroom".)

Students, write your response!

In your group, discuss any or all of the following:

- What do you think does <u>not</u> work regarding grading in your AP class?
- What attracted you to a presentation called *Transforming Assessment To Maximize Learning In Ap Courses*?
- What is one issue you're grappling with regarding grading in your AP courses?

What I would like to do today:

- Provide an overview of the Learning Progression Model (LPM)
- Model development of a learning progression.
- Show a learning progression specifically for Advanced Placement science courses.

(Resources are available for a deeper dive.)

Shifting the focus from grades to authentic learning and continuous improvement.

What Learning Progressions Do for Students

- Track mastery over time
- Foster deeper understanding
- Focus on growth and meaningful feedback
- Engage students more fully
- Prepare for AP assessments

Why They Matter Beyond Testing

- Work alongside traditional grading systems
- Develop transferable skills Ensure deep, long-term mastery
- Go beyond test prep for lasting success

The Learning Progression Model

1. Develop Practices
2. Create Learning Progressions
3. Determine pacing and target levels
4. Create a grade translation

STEP 1: Develop Practices

The College Board has already developed Science Practices that align with NGSS.

- Needs to be put in student-centered, easily accessible language.
- Notice overlap between courses.
- Add others, if needed.

THE AP BIO PRACTICES

Science Practice 1

Concept Explanation 1

Explain biological concepts, processes, and models presented in written format.

SKILLS

1.A Describe biological concepts and/or processes.

1.B Explain biological concepts and/or processes.

1.C Explain biological concepts, processes, and/or models in applied contexts.

Science Practice 2

Visual Representations 2

Analyze visual representations of biological concepts and processes.

SKILLS

2.A Describe characteristics of a biological concept, process, or model represented visually.

2.B Explain relationships between different characteristics of biological concepts, processes, or models represented visually

a. In theoretical contexts.

b. In applied contexts.

2.C Explain how biological concepts or processes represented visually relate to larger biological principles, concepts, processes, or theories.

2.D Represent relationships within biological models, including

a. Mathematical models.

b. Diagrams.

c. Flow charts.

Science Practice 3

Questions and Methods 3

Determine scientific questions and methods.

SKILLS

3.A Identify or pose a testable question based on an observation, data, or a model.

3.B State the null or alternative hypotheses, or predict the results of an experiment.

3.C Identify experimental procedures that are aligned to the question, including

a. Identifying dependent and independent variables.

b. Identifying appropriate controls.

c. Justifying appropriate controls.

3.D Make observations, or collect data from representations of laboratory setups or results. (Lab only; not assessed)

3.E Propose a new/next investigation based on

a. An evaluation of the evidence from an experiment.

b. An evaluation of the design/methods.

Science Practice 4

Representing and Describing Data 4

Represent and describe data.

SKILLS

4.A Construct a graph, plot, or chart (*X,Y; Log Y; Bar; Histogram; Line, Dual Y; Box and Whisker; Pie*).

a. Orientation

b. Labeling

c. Units

d. Scaling

e. Plotting

f. Type

g. Trend line

4.B Describe data from a table or graph, including

a. Identifying specific data points.

b. Describing trends and/or patterns in the data.

c. Describing relationships between variables.

Science Practice 5

Statistical Tests and Data Analysis 5

Perform statistical tests and mathematical calculations to analyze and interpret data.

SKILLS

5.A Perform mathematical calculations, including

a. Mathematical equations in the curriculum.

b. Means.

c. Rates.

d. Ratios.

e. Percentages.

5.B Use confidence intervals and/or error bars (both determined using standard errors) to determine whether sample means are statistically different.

5.C Perform chi-square hypothesis testing.

5.D Use data to evaluate a hypothesis (or prediction), including

a. Rejecting or failing to reject the null hypothesis.

b. Supporting or refuting the alternative hypothesis.

Science Practice 6

Argumentation 6

Develop and justify scientific arguments using evidence.

SKILLS

6.A Make a scientific claim.

6.B Support a claim with evidence from biological principles, concepts, processes, and/or data.

6.C Provide reasoning to justify a claim by connecting evidence to biological theories.

6.D Explain the relationship between experimental results and larger biological concepts, processes, or theories.

6.E Predict the causes or effects of a change in, or disruption to, one or more components in a biological system based on

a. Biological concepts or processes.

b. A visual representation of a biological concept, process, or model.

c. Data.

THE AP CHEM PRACTICES

Practice 1

Models and Representations 1

Describe models and representations, including across scales.

SKILLS

1.A Describe the components of and quantitative information from models and representations that illustrate particulate-level properties only.

1.B Describe the components of and quantitative information from models and representations that illustrate both particulate-level and macroscopic-level properties.

Practice 2

Question and Method 2

Determine scientific questions and methods.

SKILLS

2.A Identify a testable scientific question based on an observation, data, or a model.

2.B Formulate a hypothesis or predict the results of an experiment.

2.C Identify experimental procedures that are aligned to a scientific question (which may include a sketch of a lab setup).

2.D Make observations or collect data from representations of laboratory setups or results, while attending to precision where appropriate.

2.E Identify or describe potential sources of experimental error.

2.F Explain how modifications to an experimental procedure will alter results.

Practice 3

Representing Data and Phenomena 3

Create representations or models of chemical phenomena.

SKILLS

3.A Represent chemical phenomena using appropriate graphing techniques, including correct scale and units.

3.B Represent chemical substances or phenomena with appropriate diagrams or models (e.g., electron configuration).

3.C Represent visually the relationship between the structures and interactions across multiple levels or scales (e.g., particulate to macroscopic).

Practice 4

Model Analysis 4

Analyze and interpret models and representations on a single scale or across multiple scales.

SKILLS

4.A Predict and/or explain chemical properties or phenomena (e.g., of atoms or molecules) using given chemical theories, models, and representations.

4.B Explain whether a model is consistent with chemical theories.

4.C Explain the connection between particulate-level and macroscopic properties of a substance using models and representations.

4.D Explain the degree to which a model or representation describes the connection between particulate-level properties and macroscopic properties.

Practice 5

Mathematical Routines 5

Solve problems using mathematical relationships.

SKILLS

5.A Identify quantities needed to solve a problem from given information (e.g., text, mathematical expressions, graphs, or tables).

5.B Identify an appropriate theory, definition, or mathematical relationship to solve a problem.

5.C Explain the relationship between variables within an equation when one variable changes.

5.D Identify information presented graphically to solve a problem.

5.E Determine a balanced chemical equation for a given chemical phenomenon.

5.F Calculate, estimate, or predict an unknown quantity from known quantities by selecting and following a logical computational pathway and attending to precision (e.g., performing dimensional analysis and attending to significant figures).

Practice 6

Argumentation 6

Develop an explanation or scientific argument.

SKILLS

6.A Make a scientific claim.

6.B Support a claim with evidence from experimental data.

6.C Support a claim with evidence from representations or models at the particulate level, such as the structure of atoms and/or molecules.

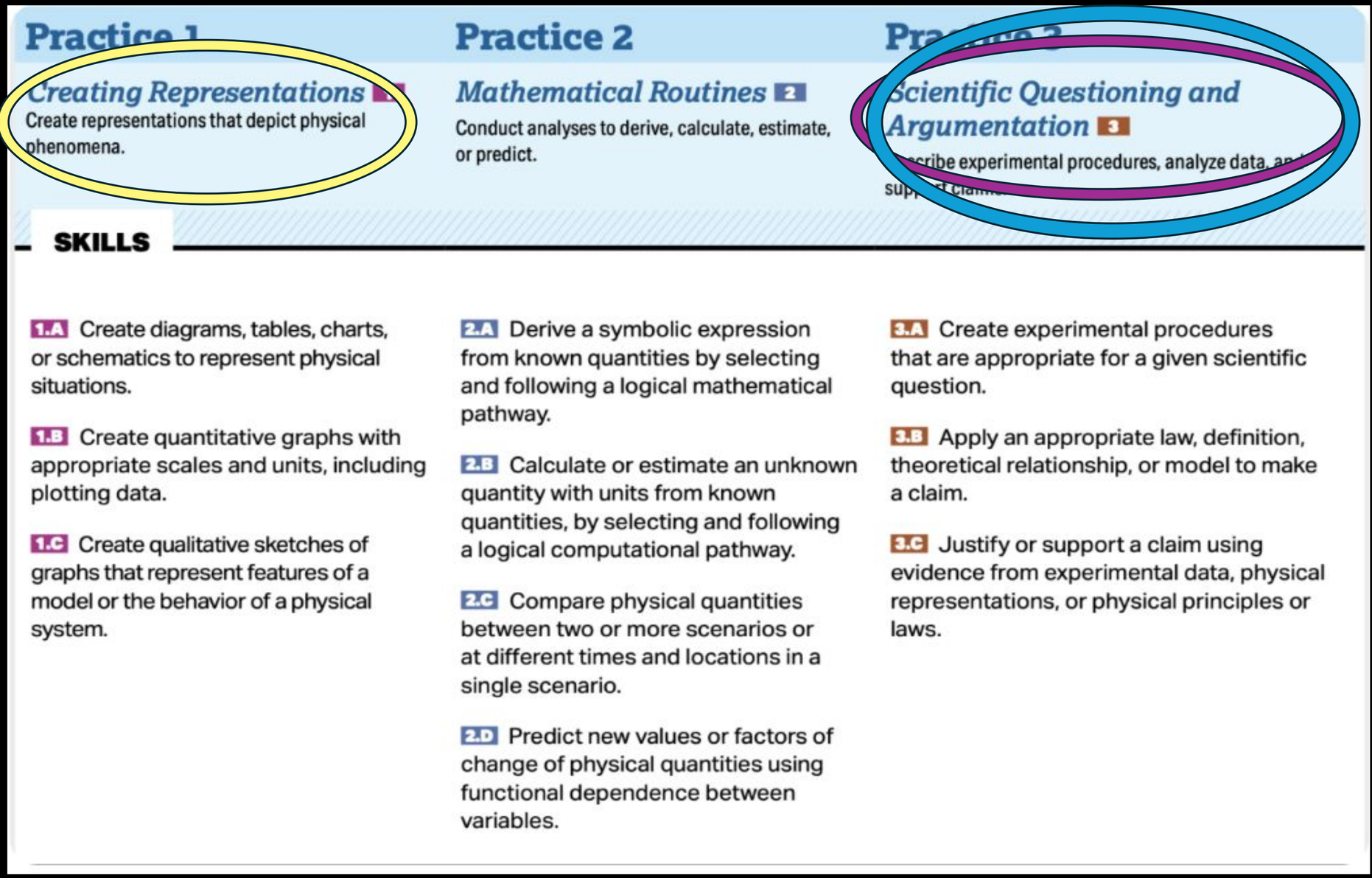
6.D Provide reasoning to justify a claim using chemical principles or laws, or using mathematical justification.

6.E Provide reasoning to justify a claim using connections between particulate and macroscopic scales or levels.

6.F Explain the connection between experimental results and chemical concepts, processes, or theories.

6.G Explain how potential sources of experimental error may affect the experimental results.

THE AP PHYSICS PRACTICES



THE AP ENV. SCI. PRACTICES

Practice 1	Practice 2	Practice 3	Practice 4	Practice 5	Practice 6	Practice 7
Concept Explanation 1	***Visual Representations*** 2	***Text Analysis*** 3	***Scientific Experiments*** 4	***Data Analysis*** 5	***Mathematical Routines*** 6	***Environmental Solutions*** 7
Explain environmental concepts, processes, and models presented in written format.	Analyze visual representations of environmental concepts and processes	Analyze sources of information about environmental issues	Analyze research studies that test environmental principles	Analyze and interpret quantitative data represented in tables, charts, and graphs	Apply quantitative methods to address environmental concepts	Propose and justify solutions to environmental problems
SKILLS						
1.A Describe environmental concepts and processes.	2.A Describe characteristics of an environmental concept, process, or model represented visually.	3.A Identify the author's claim.	4.A Identify a testable hypothesis or scientific question for an investigation.	5.A Describe patterns or trends in data.	6.A Determine an approach or method aligned with the problem to be solved.	7.A Describe environmental problems.
1.B Explain environmental concepts and processes.	2.B Explain relationships between different characteristics of environmental concepts, processes, or models represented visually: ▪ In theoretical contexts ▪ In applied contexts	3.B Describe the author's perspective and assumptions.	4.B Identify a research method, design, and/or measure used.	5.B Describe relationships among variables in data represented.	6.B Apply appropriate mathematical relationships to solve a problem, with work shown (e.g., dimensional analysis).	7.B Describe potential responses or approaches to environmental problems.
1.C Explain environmental concepts, processes, or models in applied contexts.	2.C Explain how environmental concepts and processes represented visually relate to broader environmental issues.	3.C Describe the author's reasoning (use of evidence to support a claim).	4.C Describe an aspect of a research method, design, and/or measure used.	5.C Explain patterns and trends in data to draw conclusions.	6.C Calculate an accurate numeric answer with appropriate units.	7.C Describe disadvantages, advantages, or unintended consequences for potential solutions.
		3.D Evaluate the credibility of a source *(not assessed)*: ▪ Recognize bias ▪ Scientific accuracy	4.D Make observations or collect data from laboratory setups *(not assessed)*.	5.D Interpret experimental data and results in relation to a given hypothesis.		7.D Use data and evidence to support a potential solution.
		3.E Evaluate the validity of conclusions of a source or research study *(not assessed)*.	4.E Explain modifications to an experimental procedure that will alter results.	5.E Explain what the data implies or illustrates about environmental issues.		7.E Make a claim that proposes a solution to an environmental problem in an applied context. 7.F Justify a proposed solution, by explaining potential advantages.

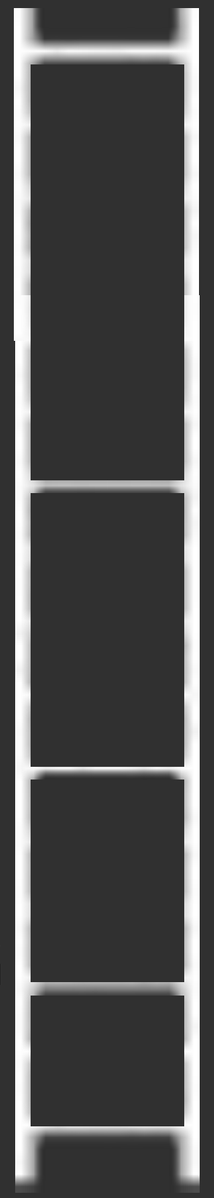
STEP 2: Create Learning Progressions

A learning progression is created when you break down a practice into developmentally-sequenced levels of proficiency.

Instead of deducting points for what students cannot do correctly, you assess what students know or can do, giving feedback based on specific language presented in a rubric.

Achievement Levels	
Not Enough Evidence	
Beginning	***Trying*** to respond with some defined minimum
Developing	Responding with some ***relevant*** information
Proficient	The student ***explicitly*** uses physics in their response
Advanced	The response is ***accurate***
Expert	The response is ***complex*** (or sophisticated), usually tying in multiple concepts

Low Floor → High Ceiling



EXPERT

ADVANCED

PROFICIENT

DEVELOPING

BEGINNING

NOT ENOUGH EVIDENCE

Let's create a learning progression based upon one Practice: *Experimentation* or *Questions and Methods*.

ANCHOR WORDS	*"MINIMUM EVIDENCE MISSING"*	*"TRY"*	*"RELEVANT"*	*"PROCESS IS CORRECT"*	*"ACCURATE"*	*"SOPHISTICATED OR COMPLEX"*
Achievement levels	**Not Enough Evidence**	**Beginning**	**Developing**	**Proficient**	**Advanced**	**Expert**
Practice: _____ _____ _____ _____ _____ _____						

STEP 1: Sort through the statements, grouping them in categories of your own design.

STEP 2: Arrange each category into developmental order.

STEP 3: Repeat for other categories.

NOTE: You do NOT need to use all statements.


10:00

Reflection about the process:

What's one thing you noticed?
What questions came up?
What confused you?
What was inspiring?

MY FIRST FOUR PRACTICES

- **Modeling** : The goal of modeling is to create representations that accurately depict physical phenomena.
- **Solving Problems** : This practice focuses on using mathematical representations to derive, calculate, estimate, or predict scientific phenomena.
- **Asking Scientific Questions** : This practice involves describing experimental procedures and analyzing data.
- **Creating an Argument** : The goal here is to construct a persuasive and meaningful argument, using evidence to support your claim.

USING FEEDBACK

Where students annotate their work, highlighting the changes made from the previous assessment of its type. The goal is to communicate what changes were made, why they made them, and how they have improved over time.

	Not Enough Evidence	Beginning	Developing	Proficient	Advanced	Expert
Using Feedback	I did not identify changes that I made since the previous assessment.	I identify changes that I made since the previous assessment.	I describe at least 6 changes that I made since the previous assessment, correlated to feedback from my peers, the instructor, class discussion, or my own understanding of this rubric.	I request feedback from the instructor, identifying areas with which I am uncertain or struggling. I explicitly state why changes needed to be made (or not made) based on relevant physics or skills requirements.	My requested feedback from the instructor is specific, targeted, and leads to significant progress. My reasoning regarding why changes were made is correct and robust.	I communicate and document the rationale behind alternate approaches to similar (but not identical) situations, based on feedback received prior to the current attempt. I communicate areas of weakness and document the methodical application of strategies that I used to improve.

AP TEST TAKING

The goal is to increase test-taking abilities specifically for the AP exam. They must complete both the Unit Tests and the Personal Progress Checks (MCQ and (FRQ) for each unit accurately, according to their scoring requirements.

	Not Enough Evidence	Beginning	Developing	Proficient	Advanced	Expert
AP Exam Testing	I do not complete both of the Personal Progress Checks (PPCs).	I complete both PPCs: the MCQ and FRQ. I earn a combined score equivalent to a 1 on the AP Physics Exam (combined raw score less than 30%).	I earn a combined score equivalent to a 2 on the AP Physics Exam (combined raw score between 30-44%).	I earn a combined score equivalent to a 3 on the AP Physics Exam (combined raw score between 45-59%).	I earn a combined score equivalent to a 4 on the AP Physics Exam (combined raw score between 60-75%).	I earn a combined score equivalent to a 5 on the AP Physics Exam (combined raw score greater than 75%).

STEP 3: Determine pacing and target levels

- We want students to earn 5’s on the AP exam.
- This means that most practices should be at Expert level by the end of the year.
- How can you move students from entry level to Expert during 9-10 months?

Target Levels are used to scaffold growth and differentiate for individuals when needed.

My Plan

Pacing of Target Levels* for AP Physics (2023-2024)

Practices	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Review
Designing an Experiment	Developing	Proficient	Advanced	Advanced	Advanced	Advanced	Expert	Expert
Analyzing Data	Developing	Proficient	Proficient	Proficient	Advanced	Advanced	Expert	Expert
Arguing a Scientific Claim	Proficient	Proficient	Proficient	Advanced	Advanced	Expert	Expert	Expert
Using Feedback	Developing	Developing	Proficient	Proficient	Proficient	Advanced	Advanced	Expert
Creating Explanations	Proficient	Proficient	Proficient	Proficient	Proficient	Advanced	Advanced	Expert
Problem-solving	Proficient	Proficient	Proficient	Advanced	Advanced	Advanced	Expert	Expert
Interpreting Graphs	Developing	Proficient	Proficient	Proficient	Proficient	Advanced	Advanced	Expert
Creating Graphs	Developing	Proficient	Proficient	Proficient	Proficient	Advanced	Advanced	Expert
Taking an AP Exam	Developing	Developing	Proficient	Proficient	Advanced	Advanced	Expert	Expert

Actual

Pacing of Target Levels for AP Physics (2023-2024)

Practices	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Review
Experimental Design	Developing	Proficient	Proficient	Proficient	Advanced	Advanced	Expert	Expert
Data Analysis	Developing	Proficient	Proficient	Proficient	Advanced	Advanced	Advanced	Advanced
Arguing a Scientific Claim	Proficient	Proficient	Advanced	Advanced	Advanced	Expert	Expert	Expert
Using Feedback	Developing	Developing	Proficient	Proficient	Advanced	Advanced	Advanced	Advanced
Creating Explanations	Proficient	Proficient	Proficient	Advanced	Advanced	Expert	Expert	Expert
Problem Solving	Proficient	Proficient	Proficient	Advanced	Advanced	Expert	Expert	Expert
Interpreting Graphs	Developing	Developing	Proficient	Proficient	Advanced	Advanced	Advanced	Advanced
Creating Graphs	Developing	Proficient	Proficient	Advanced	Advanced	Expert	Expert	Expert

My Plan

Pacing of Target Levels* for AP Physics (2024-2025)

Practices	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Review	Project
LP12 – Modeling	**Proficient**	Proficient	**Advanced**	Advanced	Advanced	**Expert**	Expert	Expert	Expert
LP13 – Solving problems	Developing	**Proficient**	Proficient	Proficient	**Advanced**	Advanced	Advanced	**Expert**	Expert
LP14 – Asking Scientific Questions	Developing	**Proficient**	Proficient	**Advanced**	Advanced	Advanced	**Expert**	Expert	Expert
LP15 – Creating an Argument	**Proficient**	Proficient	**Advanced**	Advanced	Advanced	**Expert**	Expert	Expert	Expert
LP4 - Using Feedback	**Proficient**	Proficient	Proficient	Proficient	**Advanced**	Advanced	Adv		
LP11 – AP Exam Practice	Developing	**Proficient**	Proficient	**Advanced**	Advanced	Advanced	**Ex**		

*Note: These may be adjusted depending on class circumstances. Please listen

Actual

Pacing of Target Levels for AP Physics 2 (2024-2025)

Practices	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Review	Project
Modeling	Proficient	**Advanced**	Advanced	Advanced	Advanced	Advanced	**Expert**	Expert	Expert
Solving Problems	Proficient	Proficient	Proficient	**Advanced**	Advanced	Advanced	**Expert**	Expert	Expert
Asking Scientific Questions	Proficient	Proficient	Proficient	Proficient	**Advanced**	Advanced	Advanced	**Expert**	Expert
Developing an Argument	Proficient	**Advanced**	Advanced	Advanced	Advanced	Advanced	Advanced	**Expert**	Expert
Using Feedback	Proficient	Proficient	Proficient	Proficient	**Advanced**	Advanced	Advanced	Advanced	Advanced
Test Taking Skills	Proficient	Proficient	Proficient	**Advanced**	Advanced	**Expert**	Expert	Expert	xx

STEP 4: Create a grade translation

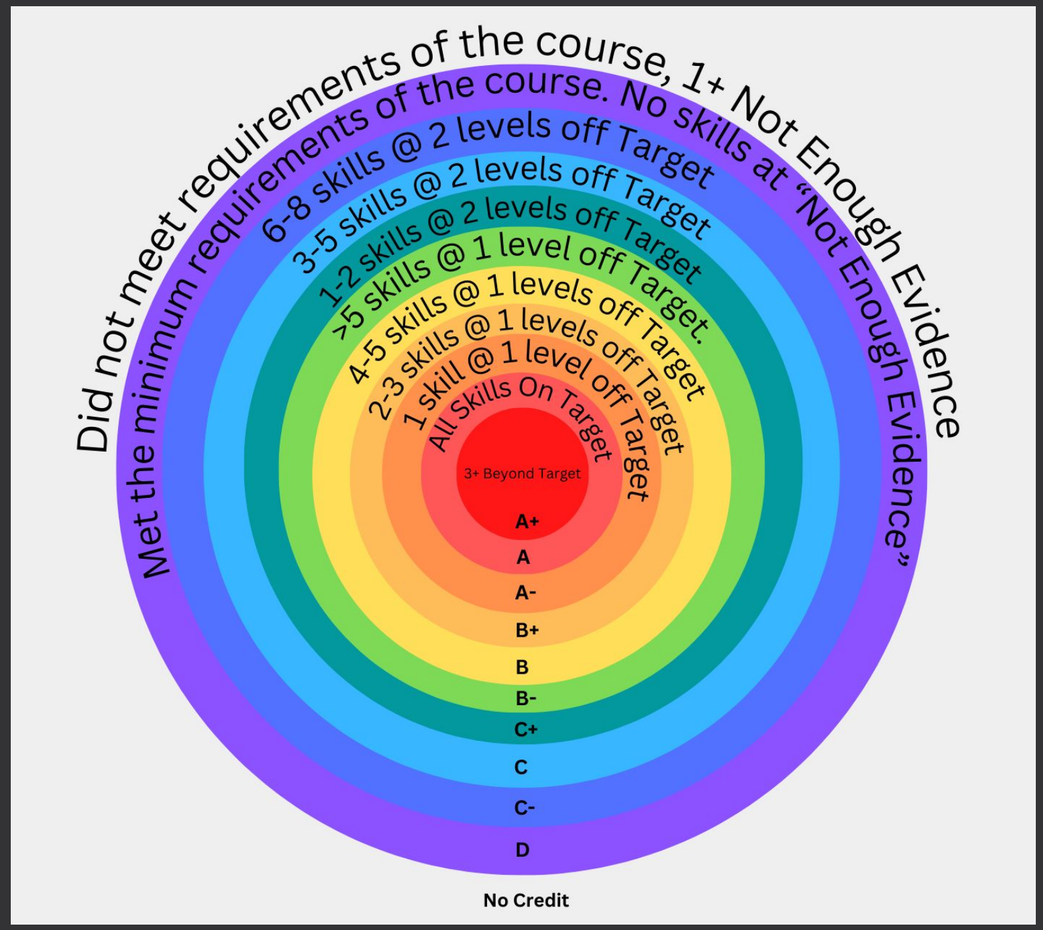
The grade translation is tied to the expected target levels. Communicate those expectations at the beginning of each unit.

Do not change the grade translation once it is made (unless there is a real problem).

Instead, you can modify the target levels during a unit, if necessary.

Our Grade Translation

Grade	Requirements
A+	Beyond the targeted level of development in 3 or more skills. All other skills on target
A	On target for all skills.
A-	1 level off target for no more than 1 skill. All other skills on target
B+	1 level off target for no more than 3 skills. All other skills on target
B	1 level off target for no more that 5 skills. All other skills on target
B-	> 5 skills 1 level off target
C+	2 levels off target for no more that 2 skills
C	2 levels off target for no more than 5 skills
C-	2 levels off target for no more than 8 skills
D	Met the minimum requirements of the course. No skills at “Not Enough Evidence”
No Credit	Did not meet the minimum requirements of the course



Using a Pattern of Performance

	Modeling	***Solving Problems***	***Asking Questions***	***Arguing a Claim***	***Using Feedback***	***AP Test Taking***
Unit 9	Proficient	Beginning	Proficient	Developing	Beginning	Advanced
Unit 10	Proficient	Proficient	Developing	Proficient	Proficient	Advanced
Unit 11	Proficient	Advanced	Proficient	Proficient	Advanced	Expert
Unit 12	Advanced	Developing	Proficient	Proficient	Advanced	Expert
Unit 13	Advanced	Advanced	Advanced	Advanced	Advanced	Expert
Semester 1 POP						

STEP 5: Use them on assessments

The Practices	*My Assignments*		
	Personal Progress Checks (FRQ/MCQ)	*Lab Reports*	*Unit Tests (FRQ/MCQ)*
Modeling		*x*	*x*
Solving problems			*x*
Asking Scientific Questions		*x*	*x*
Creating an Argument		*x*	*x*
Using Feedback		*x*	*(x)*
AP Exam Practice	*x*		*x*

THERE ARE 7 UNITS WHICH MEANS A TOTAL OF 20 LABS/ACTIVITIES, 7 PPCS AND 7 UNIT TESTS, plus 2 PRACTICE EXAMS.

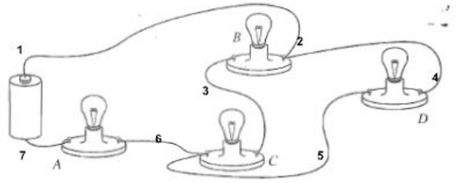
How to use the rubric on an assessment

Name: _____ Period ____ Date: _____

Checkpoint 11.1 Naramore AP Physics 2

	Not Enough Evidence	Beginning	Developing	Proficient	Advanced
LP12 – Modeling 1A, 1B, 1C	I do not create or revise a model.	I create and/or revise a model (diagrams, tables, charts, schematics, qualitative and/or quantitative graphs.)	I create and/or revise a relevant model. I use the model to identify the relevant characteristics of a system (components) or phenomenon (interactions between components).	I create and/or revise the correct model. The model identifies the correct characteristics of a system and/or phenomenon. I explicitly state the relevant big idea(s), process(es), theories, and/or law(s).	The model is correctly made and includes all required features. The big idea(s), process(es), theories, and/or law(s) is correctly stated, used, and/or modeled. When appropriate, I use advanced analysis methods (see Note 2). When appropriate, I use my model(s) to generate data, support explanations, make predictions, analyze systems and/or reconcile divergent outcomes (see Note 3).
LP13 – Solving Problems (2A, 2B, 2D)	I do not show the pictorial or mathematical representation when solving the problem.	I show some relevant work when solving the problem (pictorial and/or mathematical representation).	I describe the given situation using relevant pictorial representations And I choose a relevant mathematical representation.	The process I use generates an answer to the question asked. I show my supporting work so that someone can follow my thought processes. I select and follow a logical computational pathway. When appropriate, I justify why using a particular equation to analyze a situation is useful and/or state the conditions under which this particular equation can be used.	I work with the algebraic form of the equation(s) without substituting values. I correctly derive, calculate, or estimate an unknown quantity from known quantities. I include units when appropriate. When appropriate, my justification of the equation and/or statement of use conditions are correct.
LP14 – Scientific Questioning (3A)	I do not identify or ask a scientific question. I do not describe experimental procedures. I do not state a source of experimental error.	I ask a scientific question. I describe experimental procedures used to gather data. I list multiple issues of measurement uncertainty and/or assumptions in data collection (see Note 10). I do some relevant data analysis (see Note 7).	I identify or ask a relevant scientific question. I describe experimental procedures that allow relevant data to be collected (see Note 8). I identify relevant issues of measurement uncertainty and/or assumptions in data collection. I do some relevant data analysis.	The scientific question has the appropriate scope and specificity (see Note 9). I describe data-collection strategies that are descriptive enough for someone else to replicate the data collection during the experiment. I correctly describe issues of measurement uncertainty and/or assumptions in data collection. I describe and/or conduct one or more correct quantitative analyses of the data in order to answer the posed question, including the most significant analyses of the data. I use the available analysis tools correctly.	The M&M are correct and complete. I predict how each source contributes to the error in the experiment. I offer reasonable and specific suggestions to fix those sources of experimental error next time. I include all the most significant and effective analyses of the data, omitting none. It is done correctly. When appropriate, I make a reasoned estimate or calculation of the percent error or percent difference.
LP15 – Argumentation (3B and 3C)	I do not make a claim.	I make a claim. I support the claim with evidence or reasoning.	The claim is relevant to the question. My claim states a scientific or mathematical relationship or a specific value. I support the claim with evidence. I state relevant physics concept(s) as reasoning.	Based upon the available evidence, my claim is correct. I present convincing evidence, in the form of qualitative or quantitative relationships, connection, and/or patterns. I describe the correct physics concept(s) as reasoning.	The supporting evidence used to justify my claim is correct. The reasoning is clearly related to the variables in the claim. There is no extra or irrelevant information. I justify my answer in a clear, coherent, paragraph-length explanation (see Note 13).

1. In the circuit shown above, A, B, C, and D are identical lightbulbs. Assume that the battery maintains a constant potential difference between its terminals (i.e., the internal resistance of the battery is assumed to be negligible) and the resistance of each lightbulb remains constant.



(a) Draw a schematic diagram of the circuit.

Free Response Question #1: Translation between Representations (TBR)

	Not Enough Evidence	Beginning	Developing	Proficient
LP12 – Modeling 1A, 1B, 1C	I do not create or revise a model.	I create and/or revise a model (diagrams, charts, tables, qualitative schematics, qualitative and/or quantitative graphs.)	I create and/or revise a relevant model. I use the model to identify the relevant characteristics of a system (components) or phenomenon (interactions between components).	I create and/or revise the correct model. The model identifies the correct characteristics of a system and/or phenomenon. I explicitly state and use the relevant big idea(s), process(es), theories, and/or law(s).

Students are performing various electrostatic experiments to investigate charge distribution. The students have a charged plastic disk with an insulating handle and two uncharged metal plates.

In one experiment, the students want to determine the charge on the plates of a capacitor by mea... the plate separation and potential difference between the plates. They have a capacitor with pla... $0.0025\ m^2$, which is also the area of the plastic disk. The capacitor plate separation d can be ... charge the capacitor, the students bring the plastic disk very near but not touching one of ... the right, and connect the wire plates, as shown to the right, and connect the plates with a wire. Then they remove the wire and record the potential difference ΔV between the plates. The table below contains the data the students collect.

Plastic Disk

Plate Separation, d (m)	0.002	0.004	0.006	0.008	
Potential Difference, ΔV (V)	20	33	57	75	85

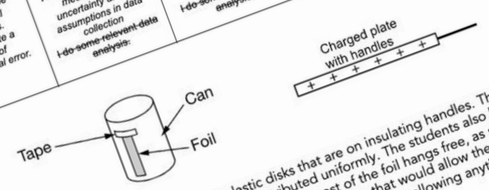
(5 points)

(a) On the grid, create a linear graph using the values for the quantities indicated in part (b)(i). Use the additional rows in the table to record any quantities you indicated that must be calculated from the students' data.

(b) Using the graph, calculate the charge on one of the capacitor plates.

Free Response Question #2: Experimental Design (LAB)

	Not Enough Evidence	Beginning	Developing	Proficient
LP14 – Scientific Questioning (3A)	I do not identify or ask a scientific question. I do not describe experimental procedures. I do not state a source of experimental error.	I ask a scientific question. I describe experimental procedures used to gather data. I list multiple issues of measurement uncertainty and/or assumptions in data collection ~~I do some relevant data analysis.~~	I identify or ask a relevant scientific question. I describe experimental procedures that allow relevant data to be collected (see Note 8). I identify relevant issues of measurement uncertainty and/or assumptions in data collection. ~~I do some relevant data analysis.~~	*The scientific question has the appropriate scope and specificity* I describe data-collection strategies that are descriptive enough for someone else to replicate the data collection during the experiment. I correctly describe issues of measurement uncertainty and/or assumptions in data collection. ~~I describe and/or conduct one or more correct quantitative analyses of the data in order to answer the posed question, including the most significant analyses of the data.~~ ~~I use the available analysis tools correctly.~~



In an experiment, students have various charged plastic disks that are on insulating handles. The amount of charge on each disk is different, but in each case it is distributed uniformly. The students also have an aluminum can with a strip of aluminum foil taped to it, so that most of the foil hangs free, as shown above. The apparatus is placed on an insulating surface. Describe a procedure that would allow the students to use the apparatus to compare the amount of charge on each of the disks without allowing anything to touch the disks. *(4 points)*

Free Response Question #3: Mathematical Routines (MR)

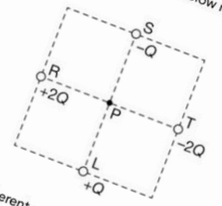
	Not Enough Evidence	Beginning	Developing	Proficient
LP13 – Solving Problems (2A, 2B, 2C, 2D)	I do not show the pictorial or mathematical representation when solving the problem.	I show some relevant work when solving the problem (pictorial and/or mathematical representation).	I describe the given situation using relevant pictorial representations And I choose a relevant mathematical representation.	The process I use generates an answer to the question asked. I show my supporting work so that someone can follow my thought processes. I select and follow a logical computational pathway. When appropriate, I justify why using a particular equation to analyze a situation is useful and/or state the conditions under which this particular equation can be used.

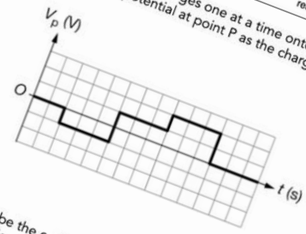
Three ... ll spheres, with net charges of +500 nC, +300 nC and ... the corners of an ... triangle with sides of length 70 cm. Calculate the m... ...cting on the ... charge at the top of the triangle due to the other ...

Free Response Question #4: Qualitative/Quantitative Translation (QQT)

	Not Enough Evidence	Beginning	Developing	Proficient
LP15 – Argumentation (3B and 3C)	I do not make a claim.	I make a claim. I support the claim with evidence or reasoning.	The claim is relevant to the question. My claim states a scientific or mathematical relationship or a specific value I support the claim with evidence. I state relevant physics concept(s) as reasoning	Based upon the available evidence, my claim is correct. I present convincing evidence, in the form of qualitative or quantitative relationships, connection, and/or patterns. I describe the correct physics concept(s) as reasoning.

A configuration of charges was assembled by placing individual charges one at a time onto a square as shown below left. The graph below right shows the electric potential at point P as the charges were placed onto the square.





In a clear, coherent paragraph-length response, describe the order in which the charges were assembled into their final configuration. Justify your claims by citing relevant physics principles and features of the graph. *(5 points)*

How to communicate progress to students

Name: _____ Period ____ Date: _____

Unit 10 Test: Electrostatics Version A Naramore AP Physics 2

Learning Progression Scores:

LP12 Modeling _____
LP14 Scientific Questioning _____
LP13 Solving Problems_____
LP15 Argumentation _____
LP11 AP Test Taking _____

Timing: 23 points x 2 min/point = 46 minutes + 10 buffer = 56 minutes.

AP SCORING:
Multiple Choice:
1. _____ *2.* _____ *3.* _____
4. _____ *5.* _____

MCQ _____/5
FRQ 1) _____/5
FRQ 2) _____/4
FRQ 3) _____/4
FRQ 4) _____/5

Total: _____/23 = _____%

LP11 -- AP Exam Testing	I do not complete both of the Personal Progress Checks (PPCs).	I complete both PPCs: the MCQ and FRQ. I earn a combined score equivalent to a 1 on the AP Physics Exam (combined raw score less than 30%).	I earn a combined score equivalent to a 2 on the AP Physics Exam (combined raw score between 30-44%).	I earn a combined score equivalent to a 3 on the AP Physics Exam (combined raw score between 45-59%).	I earn a combined score equivalent to a 4 on the AP Physics Exam (combined raw score between 60-75%).	I earn a combined score equivalent to a 5 on the AP Physics Exam (combined raw score greater than 75%).

CONCERNS AND CHALLENGES

- simplify: complexity and wordiness of the language
- flexibility: add qualifiers like “When appropriate” and “and/or” to some of the descriptors.
- pacing: timing of tests to fit into a class period when AP testing is so different.
- focus and repetition: choosing questions to test unique skills.

Benefits:

- clear, actionable feedback
- student agency
- understand the expectations
- Structured
- removes some pressure for perfection
- plan for gradual improvement over time
- authentic learning
- engage deeply with the material
- skill development and critical thinking

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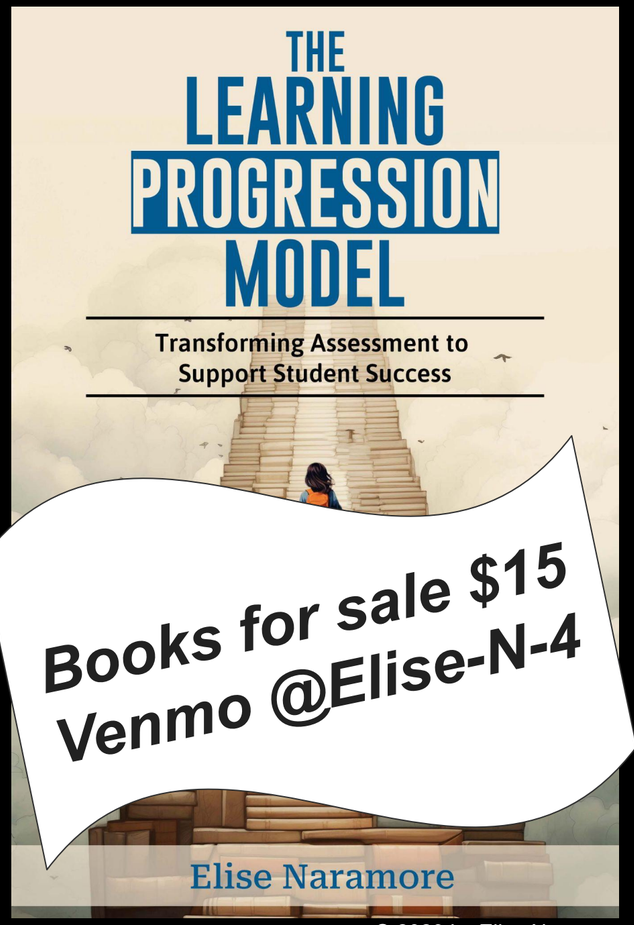
Want to strengthen your existing rubrics without making the full leap to LPM?

Sat, Mar 29, 2025 11:40 AM in the Terrace Ballroom for Revitalize Your Rubrics: Streamline Grading and Elevate Feedback



Presented by Elise Naramore

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Please complete NSTA evaluation

REIMAGINED SCHOOLS

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