Planning Rubrics - Rubric 1: Planning for Scientific Understandings

EVIDENCE: Planning commentary prompt 1, lesson plans, instructional materials, assessments

How do the candidate's plans build students' abilities to use science concepts and scientific practices during inquiry to explain a real-world phenomenon?

EMERGING PERFORMANCE[4]		PROFICIENT PERFORMANCE	ADVANCED PERFORMANCE	
Plans for instruction **focus solely on memorization and following prescribed procedures** for an **"inquiry" with no opportunities** for students to engage in scientific practices through inquiry.	Plans for instruction **include opportunities** for students to engage in scientific practices through inquiry.	Plans for instruction **build on each other** to support students **learning of science concepts, to investigate a** phenomenon and to generate **explanations through engagement in scientific practices through inquiry.**	Plans for instruction build on each other to support students learning of science concepts, to investigate a phenomenon, and to **generate evidence- based arguments.**	Plans for instruction build on each other to support students learning of science concepts, to investigate a phenomenon, and to generate and **evaluate** evidence-based arguments.
There are **significant content inaccuracies** that will lead to student misunderstandings. OR Standards, objectives, and learning tasks and materials are **not aligned** with each other.				
LOOK FORs: Learning tasks • are teacher directed • focus on practice of skills/facts/procedures/conventions • limit Ss opportunities to develop **subject specific understandings**[5] • include consistent content errors • are not aligned with learning outcomes		LOOK FORs: Learning tasks • are aligned with learning outcomes • build skills/facts/procedures and subject specific understandings	LOOK FORs: **All from Proficient and…** Learning Tasks • are sequenced in a learning progression across lessons • build skills/facts/procedures/conventions **and** deep subject specific understandings across all lessons • support students to understand the relationship between skills/facts/procedures/conventions and subject specific understandings	

[4] Text representing key differences between adjacent score levels is shown in bold. Evidence that does not meet Level 1 criteria is scored at Level 1.

[5] See edTPA handbooks for the subject specific understandings

Evidence:

Progression of learning sequence in lesson plans: equations and calculations related to electromagnetic energy and relationship to energy level; solving for unknown given information about some variables (LP1) →flame test (LP2), collecting data to investigate and explain a phenomenon, using principles from LP1→ more practice with solving equations for unknowns related to energy level questions, energy to wavelength transitions (LP3)

This lab has students explaining an unusual scientific phenomenon, where different chemical-soaked splints produce different colored flames. Students are given procedural directions, but are not told what will happen and what causes the chemical response. This allows students to explore the phenomenon and try to explain it themselves. (Planning commentary prompt 1)

…supports to help students express what they believe happened. These supports include asking questions to deepen students thinking and to help students evaluate their own and each other's reasoning. (Planning commentary prompt 1)

During the lab investigation students on a higher academic level were asked to discuss what patterns they noticed with their data as well as explain what they saw happening during the experiment without the same build of questions that will be provided to other students, who will practice explaining scientific phenomena with more teacher guidance in the post-lab discussion. (Planning commentary prompt 3a)

Lab instructions include detailed procedures for conducting lab, including a data table to be completed. (LP2)

Post-lab discussion: what we can find with the data we collected

- What happened when we put the metals into the flame? (colors, etc)
- Why do the different salts have different characteristic flame test colors?
- Where did the colors come from? (Emission of electromagnetic radiation by an excited electron)
- Why did we have to put the salts in the flame for this to happen?
- So what was happening to the atoms when they gave off light?
- How do people's data compare?
- How can we make this more accurate? What is holding us back?
- How did the color observations compare to the wavelength observations?
- What can we do with this information? (Identify metals, tell the energy associated with the emission, etc.)
- What can't we do with this information? (Identify the specific energy level transitions)
- LP2 (scaffolding for constructing an explanation of the lab data)

Students worked on solving problems to record values in a chart, with irrelevant columns indicated for specific problems. (LP3)

Summary of evidence:

Concepts: wavelength, frequency, and energy of a photon; absorption/release of energy within atoms

Phenomenon: the process of absorption or release of energy within atoms (across the learning segment); the production of different colored flames by splints soaked in different chemicals (lesson 2)

Scientific practices through inquiry: Using models, carrying out investigations, analyzing and interpreting data; using mathematical and computational thinking

Plans are presented in a sequence in which **each lesson builds on the previous one**(s) to support **learning of science concepts**. Students are **engaging in scientific practices through inquiry**, but most students are not fully engaged in investigating a phenomenon and generating their own explanations of the phenomenon because of the high degree of scaffolding provided. The evidence is at a strong emerging level, but does not quite reach expectations for the proficient level.

Evaluation: (Check one): ___x___Emerging ______ Proficient _______ Advanced

EVIDENCE: Planning commentary prompts 2 & 3, lesson plans, instructional materials

How does the candidate use knowledge of his/her students to target support for students to use science concepts and scientific practices during inquiry to explain a real-world phenomenon?

EMERGING PERFORMANCE		PROFICIENT PERFORMANCE	ADVANCED PERFORMANCE	
There is little or no evidence of planned supports.	Planned supports are loosely tied to learning objectives or the central focus of the learning segment. AND Candidate attends to requirements in IEPs and 504 plans.	Planned supports are tied to learning objectives and the central focus with attention to the characteristics of the class as a whole. AND Candidate attends to requirements in IEPs and 504 plans.	Planned supports are tied to learning objectives and the central focus. Supports address the needs of specific individuals or groups with similar needs. AND Candidate attends to requirements in IEPs and 504 plans.	Level 4 plus: Supports include specific strategies to identify and respond to preconceptions, common errors and misunderstandings for the majority of students.
LOOK FORs: Planned supports • are superficially aligned with learning outcomes (e.g., some lessons address additional outcomes or miss key outcomes related to the central focus) • are limited or missing • do not address IEP/504 requirements		LOOK FORs: Planned supports • are aligned with learning outcomes •are appropriate for the needs of the whole class •address IEPs/504 requirements	LOOK FORs: All from Proficient and... Planned supports •are designed to scaffold learning for a variety of students (e.g., English learners, struggling readers, underperforming or gifted students) • identify and respond to potential misconceptions or partial understandings	

Evidence:

No students with IEPs; 5 gifted and talented students requiring extra challenge (Context for Learning Information)

For those students who are more skilled at solving problems I planned several opportunities to challenge them, including analyzing incorrect solutions, working on advanced problems, and creating their own challenge problems. For students who are still learning mathematical problem solving I created a flow chart, showing how the various equations could be related and used to solve problems (Planning commentary prompt 3b)

LP1:
- Show image of wave, indicating wavelength and frequency
- Students who finish questions quicker than others will show their work on the document camera.
- Students will trouble-shoot the work of students who are willing to share their incorrect problem solving with the class using the document camera.
- Students may use the equations from their notes to solve problems.

LP2:
- Scaffolded questions to support post-lab discussion

LP3:
- Students who require extra assistance can ask me as I circulate through the class or ask their seat partners during partner time.
- Chart provided for recording calculations for practice problems, with irrelevant columns indicated for some problems

Summary of evidence:

The candidate plans supports tied to the learning objectives are intended to meet specific needs of groups of students with similar needs (advanced students and students still learning mathematical problem solving), in addition to the whole class (e.g., scaffolded post-lab discussion questions).

Evaluation: (Check one): ______Emerging ______ Proficient ___x____ Advanced

Planning Rubrics - Rubric 3: Using Knowledge of Students to Inform Teaching and Learning

EVIDENCE: Planning commentary prompts 2 & 3

How does the candidate use knowledge of his/her students to justify instructional plans?

EMERGING PERFORMANCE		PROFICIENT PERFORMANCE	ADVANCED PERFORMANCE	
Candidate's justification of learning tasks is either **missing** OR **represents a deficit view** of students and their backgrounds.	Candidate justifies learning tasks with **limited attention** to students' prior learning OR personal/cultural/community assets.	Candidate **justifies** why learning tasks (or their adaptations) **are appropriate using**: • examples of students' prior learning OR • examples of personal/cultural/ community assets Candidate makes **superficial connections to research and/or theory**.	Candidate justifies why learning tasks (or their adaptations) are appropriate using: • examples of students' prior learning AND • examples of personal/cultural/ community assets **Candidate makes connections to research and/or theory.**	**Level 4 plus:** Candidate's justification is supported by **principles from research and/or theory**.
LOOK FORs: Justification for plans includes: • superficial descriptions of students' prior learning OR lived experiences • pervasively negative portrayal of students' backgrounds, educational experiences or family/community characteristics (e.g., exclusive focus on student needs or gaps without acknowledging strengths)		LOOK FORs: Justification for plans includes: • concrete, specific connections between tasks and prior learning (academic OR lived experiences/assets) • surface level discussion of theory or research	LOOK FORs: **All from Proficient and** Justification for plans includes: • concrete, specific connections between tasks and prior learning (academic AND lived experiences/assets) • grounded discussion of theory or research (e.g., goes beyond "name dropping")	

Evidence:

Planning commentary prompt 2a

- students showed proficiency in describing electrons as the negatively charged, small part of an atom located in levels in the area surrounding the nucleus. Students also showed a basic understanding of the role electrons play in bonding.
- most students are able to manipulate mathematic equations to solve for a single variable, but some experience nonsystematic errors when practicing this and are still learning how to check their work effectively
- students who took Chemistry I Honors are not familiar with having to explain the phenomenon they see in the lab. In their previous science class, labs have focused almost solely on application, not inquiry or analysis.

They are a very curious group of students and have been taught to question how and why things work the way they do. Phenomena that are not easily explained are particularly fascinating to them, including black holes, fire, and magnetism. This group of students is also very social and enjoys spending time together outside of class. (Planning commentary prompt 2b)

During the lab investigation students on a higher academic level were asked to discuss what patterns they noticed with their data as well as explain what they saw happening during the experiment without the same build of questions that will be provided to other students, who will practice explaining scientific phenomena with more teacher guidance in the post-lab discussion.

(Planning commentary prompt 3a)

For those students who are more skilled at solving problems I planned several opportunities to challenge them, including analyzing incorrect solutions, working on advanced problems, and creating their own challenge problems. For students who are still learning mathematical problem solving I created a flow chart, showing how the various equations could be related and used to solve problems (Planning commentary prompt 3b)

Because many of the students are interested in scientific phenomena I planned the flame test lab for students, knowing that the burning of something to create various colors would pique their curiosity, and help to foster a learner-centered environment (How People Learn: Brain, Mind, Experience, and School; NRC, 2000). (Planning commentary prompt 3a)

Summary of evidence:

The evidence includes a balance of specific examples from students' prior academic learning AND knowledge of students' personal assets, and explains how the plans reflect this knowledge. The candidate refers to research or theory in relation to the plans to support student learning.

Evaluation: (Check one): ______Emerging ______ Proficient ____x___ Advanced

Planning Rubrics - Rubric 4: Identifying and Supporting Language Demands

EVIDENCE: Planning commentary prompt 4, lesson plans, instructional materials

How does the candidate identify and support language demands associated with a key science learning task?				
EMERGING PERFORMANCE		**PROFICIENT PERFORMANCE**	**ADVANCED PERFORMANCE**	
Language demands[5] identified by the candidate are not consistent with the selected language function[6] or task. OR Language supports are missing or are not aligned with the language demand(s) for the learning task.	Candidate identifies vocabulary and/or symbols as the major language demand associated with the language function. Attention to additional language demands is superficial. Language supports primarily address definitions of vocabulary and/or symbols.	Candidate identifies vocabulary and/or symbols and additional language demand(s) associated with the language function. Plans include general support for use of vocabulary and/or symbols as well as additional language demand(s).	Candidate identifies vocabulary and/or symbols and additional language demand(s) associated with the language function. Plans include targeted support for use of vocabulary and/or symbols as well as additional language demand(s).	Level 4 plus: Instructional supports are designed to meet the needs of students with different levels of language learning.
LOOK FORs: Vocabulary is only demand identified. Mismatch between language demands and: • language function • language supports • learning task Supports are not included or focus on vocabulary.		LOOK FORs: Language demands include function, vocabulary AND discourse/syntax Supports generally address vocabulary and one other identified demand (function, discourse or syntax).	LOOK FORs: All from Proficient and… Supports are strategically designed to address all language demands for students with varying characteristics and language needs.	

Evidence:

Language function:

- Students must also be proficient in using these equations to solve problems and explain their observations in lesson 2 by using their background knowledge about the relationship between the release of electromagnetic energy and the movement of an electron to different energy levels within the atom. (Planning Commentary prompt 4a)

Vocabulary:

- Students should be able to identify whether energy is “absorbed” or “released,” using these vocabulary terms. (Planning commentary prompt 4c)

Additional language demands:

- Students must understand what each variable represents and how these values are related to one another. Students must also be proficient in using these equations to solve problems and explain their observations in lesson 2. (Planning commentary prompt 4a)
- Students must also be proficient in using these equations to solve problems and explain the results of electron movement within an atom. Students will need to be able to know and use the symbols in these equations and the syntax associated with the learning segment. (Planning commentary prompt 4c)

Support:

- For Lesson 1, In-class notes are used to make this academic language explicit and were also used as an opportunity to build students’ use of such language. For these equations, the constants and variables are first explained… To help develop a practical understanding of the relationship between the different variables and equations I asked the students in a discussion format about the results of one variable changing…After coming up with this rule, the students explain why this is the case in all the problems we are doing. A note of this is written at the top of the notes, but in future problems this support is gradually taken away, and students have to decide for themselves whether the energy change would be positive or negative. Also, materials such as the flow chart and practice problem table in Lesson 3 are used to lead students to an understanding of the relationship between the values. (Planning commentary prompt 4d)

- I have specified specific questions in the second lesson plan to guide students toward an explanation of the phenomenon. (Planning commentary prompt 4d)
- LP1 document camera notes and LP3 notes define terms and associate terms with symbols.
- Energy described as being released (LP1 notes, LP3 practice problem). Energy/photon described as being "absorbed" or "emitted". (LP1 document camera notes, LP2 post-lab discussion questions, LP3 practice problems, LP3 notes).

Summary of evidence:

The candidate identifies "explain" as the primary language function, identifies two vocabulary terms (absorbed, released), and two additional language demands (use symbols in equations and use equations to solve problems and explain results). Instructional materials and lesson plans reflect consistent use of the term "absorb", but inconsistent use of the term "release" vs. "emit". Candidate supports the language demand through providing notes associating symbols with concepts, modeling how to use the equations to understand the meaning of the symbols and the relationship between variables and provides highly structured questions to guide an explanation of the phenomenon observed. The support provided is targeted for understanding symbols used in the equation, but general for exposing students to the vocabulary identified and for explaining the phenomenon based on using an understanding of the relationships portrayed in the equations.

Evaluation: (Check one): ______Emerging ___x___ Proficient _______ Advanced

[5] Language demands include: language function, vocabulary, syntax and grammar, and discourse (organizational structures, text structure, etc.).

[6] Language function refers to the learning outcome (verb) selected in prompt 4a (e.g., analyze, interpret…).

Planning Rubrics - Rubric 5: Planning Assessments to Monitor and Support Student Learning

EVIDENCE: Planning commentary prompt 5, lesson plans, assessments

How are the informal and formal assessments selected or designed to monitor students' progress toward the standards/objectives?

EMERGING PERFORMANCE		PROFICIENT PERFORMANCE	ADVANCED PERFORMANCE	
The assessments ONLY provide evidence of students' ability to memorize and follow prescribed procedures. Assessment adaptations required by IEP or 504 plans are NOT made.	The assessments provide limited evidence to monitor students' understandings of science concepts, phenomena, and the application of scientific practices during scientific inquiry during the learning segment. Assessment adaptations required by IEP or 504 plans are made.	The assessments provide evidence to monitor students' understandings of science concepts, phenomena, and the application of scientific practices during scientific inquiry during the learning segment. Assessment adaptations required by IEP or 504 plans are made.	The assessments provide multiple forms of evidence to monitor students' progress toward developing understandings of science concepts, phenomena, and the application of scientific practices during scientific inquiry throughout the learning segment. Assessment adaptations required by IEP or 504 plans are made.	Level 4 plus: The assessments are strategically designed to allow individuals or groups with specific needs to demonstrate their learning.
Assessments are NOT aligned with the central focus and standards/objectives for the learning segment.				
LOOK FORs: • Majority of Assessments: o provide minimal evidence of subject specific understandings (e.g., rote responses of facts or skills) o are not aligned with full scope of subject specific outcomes • IEP/504 requirements for adaptations/modifications are not addressed		LOOK FORs: • Majority of Assessments: o provide evidence of subject specific understandings • IEP/504 requirements for adaptations/modifications are addressed	LOOK FORs: All from Proficient and… • Assessments: o provide evidence of the full range of subject specific understandings o are used in each lesson o are differentiated so students show understandings in various ways	

Evidence:

Planning commentary, prompt 5a

- Another assessment to be used in this learning segment is student performing, analyzing, and explaining a flame test lab…. Students also will engage in classroom discussion, which will serve largely as a formative assessment to see what students are thinking, where students have misconceptions, and how they are progressing with the content and their inquiry skills.
- Students are also regularly asked to explain what is actually happening either in the lab or in a sample problem. Hearing student explanations is helpful in determining what language students feel comfortable with and the ways they use the language. Through this students are also given opportunities to display deeper understanding of the phenomenon at work, beyond skill using the mathematical models.
- …observations of students in their seats, at the board, in the lab, in their homework, and in their explanations are all used to assess student progress toward the learning objectives. I can see which objectives need extra attentions, what part of the objectives are proving challenging, and which objectives have been mastered.

Students who need support in the problem solving process are instructed to copy the problem solving flow chart of directly onto their homework, so that they would have more practice using the tool. The students who have difficulty with math are also especially encouraged to show all their work. (Planning commentary, prompt 5b)

I will circulate through the class and be available for answering questions while students work independently and check their work with a neighbor. (LP1)

LP1:

- Questions about relationships of variables and implications of values and equations, solving problems for unknowns

LP 2:

- Advanced students asked for explanations of results with no scaffolding.
- 3 lab rubrics (participation in lab activities, completing data table accurately and fully – not clear if only applicable to row(s) completed individually or entire table completed by group), and answering discussion questions
- Participation in post-lab discussion of the experiment- light described as a color, related to wavelength, related to photons.
- Solve for energy change undergone by the metal ions

LP3:

- Solving problems for unknowns in groups, completing a given chart
- Optional challenge questions

It is not clear how much individual level data is obtained, as some assessments are described as being completed in groups.

None of the written assignments require students to write explanations that go beyond a few words.

No students with IEPs; 5 gifted and talented students need opportunities for greater challenge

Summary of assessments:
The planned assessments provide evidence of students' understanding of concepts, phenomena, and scientific practices at various points within the learning segment.

Evaluation: (Check one): ______Emerging ____x__ Proficient _______ Advanced

EVIDENCE: Video clips, instruction commentary prompt 2

<table>
<tr><th colspan="5">How does the candidate demonstrate a safe and respectful learning environment that supports students' engagement in learning?</th></tr>
<tr><th colspan="2">EMERGING PERFORMANCE</th><th>PROFICIENT PERFORMANCE</th><th colspan="2">ADVANCED PERFORMANCE</th></tr>
<tr>
<td>The clips reveal evidence of disrespectful interactions between teacher and students or between students.

OR

Candidate allows disruptive behavior to interfere with student learning.</td>
<td>The candidate demonstrates respect for students.

Candidate provides a learning environment that serves primarily to control student behavior, and minimally supports the learning goals.</td>
<td>The candidate demonstrates rapport with and respect for students.

Candidate provides a positive, low-risk social environment that reveals mutual respect among students.</td>
<td>The candidate demonstrates rapport with and respect for students.

Candidate provides a challenging learning environment that promotes mutual respect among students.</td>
<td>The candidate demonstrates rapport with and respect for students.

Candidate provides a challenging learning environment that provides opportunities to express varied perspectives and promotes mutual respect among students.</td>
</tr>
<tr>
<td colspan="2">LOOK FORs:
Respect (e.g., attentive listening to student responses)
Disrespectful interactions
Disruptive behaviors (e.g., interfere with lesson flow and engagement)
Controlling or directive environment (e.g., Ss engage in teacher led tasks with little discussion or interaction)
• minimal support for learning goals</td>
<td>LOOK FORs:
Rapport (e.g., T shows positive interactions with Ss)
Mutual respect (e.g., shared between students and teacher)
Low risk (e.g., Students ask and answer questions openly)</td>
<td colspan="2">LOOK FORs:
All from Proficient and…
Challenging (e.g., high-order questions, such as, "what's another way to think of that? Who has another perspective?")
Perspectives (e.g., express alternative responses or perspectives)</td>
</tr>
<tr>
<td colspan="5">Evidence:

<u>Clip 1</u>

Students chuckling at the beginning

Students ask questions, teacher ask questions and students respond without hands being raised.

Students offer various explanations for their observations.

There is a pattern in Clip 1 of the candidate repeating a student comment with a follow-up question, e.g., Clip 1, 2:59 "So the electrons became excited. Does that give off light?"

clip 1, clip 2: Students silent while teacher speaks

<u>clip 2</u>

~0:50 teacher asks students to justify their beliefs about whether the energy was absorbed, emitted, or both, examining the evidence for each in turn</td>
</tr>
</table>

2:44 “Can we use this equation [final energy] for the metals we have?...Why not?

3:30 student says he doesn’t understand

~3:50 teacher- “don’t come in tomorrow” (referencing the weekend), student sighs/chuckles

5:10 student asks question, another student answers

6:56 “So how did the electron get excited in the first place?”

clip 3

beginning- student- “put on safety goggles”

Summary of Evidence:

The candidate demonstrates respect and rapport with students by repeating their statements and asking for elaboration, as well as joking with them. She challenges them to explain their thinking about explaining the phenomenon (metals giving off light when heated) they observed.

Evaluation: (Check one): ______Emerging ______ Proficient ___x____ Advanced

Instruction Rubrics - Rubric 7: Engaging Students in Learning

EVIDENCE: Video clips, Instruction commentary prompt 3

How does the candidate actively engage students in analyzing and interpreting scientific data to construct evidence-based arguments of real-world phenomenon?

EMERGING PERFORMANCE		PROFICIENT PERFORMANCE	ADVANCED PERFORMANCE	
In the clip(s), Candidate **does not ask students to construct an evidence-based argument.**	In the clip(s), Candidate asks students to construct a scientific argument but **students do not provide any evidence to support the argument.**	In the clip(s), **Candidate supports students in constructing a scientific argument** and students **refer to data OR acceptable science concepts but do not explain how it supports the argument.**	In the clip(s), Candidate supports students in constructing **an evidence-based argument** and students **explain how data and acceptable science concepts support the argument.**	In the clip(s), Candidate supports students in constructing **and evaluating** an evidence-based argument and students explain how data and acceptable science concepts support the argument.
There is little or no evidence that the candidate **links students' prior academic learning or personal, cultural, community, or developmental assets with new learning.** OR **Links cause student confusion.**	Candidate **makes vague or superficial links** between **prior academic learning and new learning.**	Candidate **links prior academic learning to new learning.**	Candidate links **both** prior academic **learning and personal, or cultural, community assets** to new learning.	Candidate **prompts students to link** prior academic learning and personal, cultural, community assets to new learning.
LOOK FORs: • Loose connection between tasks and central focus • Tasks do not require a science-based argument OR students do not support arguments with evidence (concepts or data) • Links to prior learning or lived experiences are limited • Students are confused by links to content (e.g., metaphors)		LOOK FORs: • Tasks focus on subject specific understandings • Links (e.g., candidate connects previous instruction/learning to new content)	LOOK FORs: All from Proficient and… • Tasks develop/deepen subject specific understandings • Links (e.g., Teacher or students connects new learning with prior instruction/learning AND lived experiences)	

Evidence:

<u>Clip 1</u>

Student "We looked at the frequency of the wavelengths of light"

Student "Cooler colors tended to come from the lower end of the spectrum…"

c. 0:50 Student- "chloride was a constant" Teacher- "chloride was a constant, so we think it [the light] came from a metal"

1:03: Teacher: "What about the metal made it give off that light?" Students: "Chemical reaction" "Heat caused atoms to get excited." Teacher: So you think the atoms were moving faster?"

1:40 student makes claim about changing from a liquid to gas. Candidate followed up by asking if the chemicals were liquid, e.g., the barium chloride, and students concluded that they were dissolved in water and the water evaporated due to the heat.

2:06 Candidate: So what did you say a second ago? Student- "The photons are excited" Candidate: "So what does that mean?" Student: "They jumped levels."

2:23: Candidate: "So yesterday we talked about how energy can come in the form of light, sometimes visible light. So now what do you think the light was coming from?"

3:00 Student- "electrons getting excited". Teacher: "So the electrons become excited. Does that give off light?" Student: "No but when they jump, it increases their ____" Teacher: So when they jump back down, they give off photons, which give off light. So the wavelengths we recorded could be, what?" Student: "Measure how far they are jumping down." Teacher: "So we measured wavelength and we can use that to measure how far the energy jump was because we can go from wavelength to frequency and from frequency to energy."

<u>clip 2</u>

0:29: Teacher: "So was the energy emitted or absorbed?" Students: "Emitted" "Absorbed" "Both" Teacher asks for a show of hands for each choice.

0:49: Teacher "So someone who thinks it was absorbed, why do you think it was absorbed?" Student: "Because you drew an arrow that way." Teacher: "So I drew this arrow? (pointing) …Teacher: "So that was the electron jumping back down to the lower energy state."

1:12: Teacher "So who said emitted?...Why did you say emitted?" Student": "Because the color went away after a while." Student: "I feel like he went to another shell."…Teacher: So when the electron jumped back down, it gave off light but it couldn't drop back down any more, that's when it stopped giving off light… So the reason we say emitted is because the light was given off so that was energy that added to a5. And then, absorbed was the heat. So the change in energy emitted, so would it be positive or negative?" Students: "Negative""

commentary, prompt 3a

- Also in Clip 3, at [0:10] students give an explanation for what they think is happening to cause the light they see, helping them to consider the phenomenon more deeply.
- In Clip 1's post-lab discussion the students are describing their observations [0:09], explaining what they observed, how they got data [0:15], the accuracy of data [3:38], and it's use in calculations [3:15]. They also described why they believe the phenomenon occurred and what was happening on the atomic level [2:45] and comment and correct each other's explanations. In Clip 2 students share with each other whether they believe the photon is emitted or absorbed and why they believe that [0:32]. Students also discuss with each other what the data can and cannot be used to analyze [2:00].
- In Clip 1 and Clip 2 students use what they know about the composition of atoms, Bohr's model of the atom, and stable configurations of electrons to describe how photon emission and absorption occurs (Clip 1 [6:07]), as well as evaluate how the data collected could be used (Clip 2 [2:00]).

Summary of Evidence:

The candidate uses a series of questions to support students in constructing an argument about how the light was given off when the splints soaked in a metal solution were heated. Students justify their claims by using relevant science concepts, but make minimal references to observational data about the light and no references to the quantitative data in their explanations. Candidate uses an explicit reference to previous learning to support an explanation in clip 1, but both candidate and students refer to concepts and relationships presented the day before to explain how the light was given off.

Evaluation: (Check one): ______Emerging ___x___ Proficient _______ Advanced

Instruction Rubrics - Rubric 8: Deepening Student Learning

EVIDENCE: Video clips, Instruction commentary prompt 4a

How does the candidate elicit responses to promote thinking and understandings of science concepts and abilities to apply scientific practices during scientific inquiry?				
EMERGING PERFORMANCE		**PROFICIENT PERFORMANCE**	**ADVANCED PERFORMANCE**	
Students provide few responses. OR Candidate responses include significant content inaccuracies that will lead to student misunderstandings.	Candidate primarily asks surface-level questions and evaluates student responses as correct or incorrect.	Candidate elicits student responses related to understanding science concepts, scientific practices and inquiry, and the phenomenon being investigated.	Candidate elicits and builds on students' own ideas about science concepts, scientific practices and inquiry, and the phenomenon being investigated.	Candidate facilitates interactions among students so they can evaluate their own data collection, procedures, interpretations, or evidence-based explanations.
LOOK FORs • Surface level questions (e.g., one word answers) • Candidate talk (e.g., lecture only) • Consistent or egregious content inaccuracies		LOOK FORs • Questions prompt some higher-order thinking related to subject specific understandings	LOOK FORs: All from Proficient and... Question build on student thinking about subject specific understandings Interactions among students (e.g., Ss respond to and build on peer comment) Students evaluate their own thinking	

Evidence:

<u>Clip 1</u>

c. 0:50 Student- "chloride was a constant" Teacher- "chloride was a constant, so we think it [the light] came from a metal"

1:03: Teacher: "What about the metal made it give off that light?" Students: "Chemical reaction" "Heat caused atoms to get excited." Teacher: So you think the atoms were moving faster?"

1:40 student makes claim about changing from a liquid to gas. Candidate followed up by asking if the chemicals were liquid, e.g., the barium chloride, and students concluded that they were dissolved in water and the water evaporated due to the heat.

2:06 Candidate: So what did you say a second ago? Student- "The photons are excited" Candidate: "So what does that mean?" Student: "They jumped levels."

2:23: Candidate: "So yesterday we talked about how energy can come in the form of light, sometimes visible light. So now what do you think the light was coming from?"

3:00 Student- "electrons getting excited". Teacher: "So the electrons become excited. Does that give off light?" Student: "No but when they jump, it increases their ____" Teacher: So when they jump back down, they give off photons, which give off light. So the wavelengths we recorded could be, what?" Student: "Measure how far they are jumping down." Teacher: "So we measured wavelength and we can use that to measure how far the energy jump was because we can go from wavelength to frequency and from frequency to energy."

3:12: Teacher: So the wavelengths we recorded could be used to do what?" Student: "Measure how far the energy jump was." Teacher: "So we measured wavelength and we can use that to measure how far the energy jump was because we can go from wavelength to frequency and from frequency to energy." Student: "It would be difficult to do that accurately…Because one man's orange is another man's goldish-orange mixture" Teacher: "So what vcould I do to make it more standard?" "Students: "More specific color standard" "Got to take opinion out of it." Teacher: "How could we get numbers? We got some numbers today." Student: "We got the wavelength, but it was hard." …Teacher" That scale that we had. How could we have gotten more exact readings on that scale? Students: "Digital." "Let computers do it"

<u>clip 2</u>

0:29: Teacher: "So was the energy emitted or absorbed?" Students: "Emitted" "Absorbed" "Both" Teacher asks for a show of hands for each choice.

0:49: Teacher "So someone who thinks it was absorbed, why do you think it was absorbed?" Student: "Because you drew an arrow that way." Teacher: "So I drew this arrow? (pointing) …Teacher: "So that was the electron jumping back down to the lower energy state."

1:12: Teacher "So who said emitted?...Why did you say emitted?" Student": "Because the color went away after a while." Student: "I feel like he went to another shell."…Teacher: So when the electron jumped back down, it gave off light but it couldn't drop back down any more, that's when it stopped giving off light… So the reason we say emitted is because the light was given off so that was energy that added to a5. And then, absorbed was the heat. So the change in energy emitted, so would it be positive or negative?" Students: "Negative""

2:04: Teacher: "Can we use this equation [final energy] for the metals we have? Student: "No." Teacher: "Why not?...We know the z is 3 because the charge of the nucleus is +3. We only use this equation for hydrogen or when there is one electron. The reason for that is all electrons are interacting. What are some ways they are interacting? Student: "pushing against each other." "Pushing against each other and repelling each other. These equations don't take that into account. For hydrogen, there are no inter-electron forces. For other elements, we can get to the change in energy, but we can't get all the way down to the change in energy state."

This discussion moved from lab observations, to data collection, to why the phenomenon occurred, to how we can use the data in analysis, to the quality of data collection, and finally we moved to discussing what the data cannot be used for (calculating the energy level shifts due to complex electron interaction). (Instruction commentary prompt 4a)

Summary of Evidence:

The video clips demonstrate a pattern of the candidate building on student ideas, sometimes extending the explanation and sometimes repeating the idea and asking a follow-up question. These addressed explanations of the phenomenon using scientific ideas and also addressing data quality.

Evaluation: (Check one): ______Emerging ______ Proficient ___x____ Advanced

Instruction Rubrics - Rubric 9: Subject-Specific Pedagogy: Analyzing Data

EVIDENCE: Video clips, Instruction commentary prompt 4b

How does the candidate facilitate students' analysis of the data based on scientific inquiry?				
EMERGING PERFORMANCE		**PROFICIENT PERFORMANCE**	**ADVANCED PERFORMANCE**	
The candidate does not ask students to present or summarize their data and there is no analysis of data.	Candidate asks students to display data and the candidate takes the primary role in analyzing the data with an inappropriate method and/or major omissions.	Candidate asks students to display data and the candidate takes the primary role in accurately analyzing data using appropriate methods with no major omissions.	Candidate asks students to display data and facilitates a data analysis discussion where students demonstrate the ability to find patterns OR inconsistencies within the data.	Candidate asks students to display data and facilitates a data analysis discussion where students demonstrate the ability to find patterns AND inconsistencies within the data.
LOOK FORs:		LOOK FORs:	LOOK FORs: All from Proficient and …	

Evidence:

There was no systematic presentation or summarization of data seen in the clips, but there were references to data.

<u>Clip 1</u>

c. 0:50 Student- "chloride was a constant" Teacher- "chloride was a constant, so we think it [the light] came from a metal"

3:12: Teacher: So the wavelengths we recorded could be used to do what?" Student: "Measure how far the energy jump was." Teacher: "So we measured wavelength and we can use that to measure how far the energy jump was because we can go from wavelength to frequency and from frequency to energy." Student: "It would be difficult to do that accurately…Because one man's orange is another man's goldish-orange mixture" Teacher: "So what vcould I do to make it more standard?" "Students: "More specific color standard" "Got to take opinion out of it." Teacher: "How could we get numbers? We got some numbers today." Student: "We got the wavelength, but it was hard." …Teacher" That scale that we had. How could we have gotten more exact readings on that scale? Students: "Digital." "Let computers do it"

<u>Clip 2</u>

1:12: Teacher "So who said emitted?...Why did you say emitted?" Student": "Because the color went away after a while."

Commentary, prompt 4b

- "What did we just do?" After this opening question I asked a sequence of probing questions to facilitate discussion and deepen the level of student thinking. This series of questions used a student's answer to the previous question as a launching pad for the next question. For example, at [0:15] I use the answer of "from the lights" as a way to frame the next question: "Where did the lights come from?"
- . Several students did just that, noting that the chlorine ion was constant in all the chemicals.
- By discussing the cause of the phenomenon, a conversation about data quality was supported. In clip 1 [3:35], a student pointed out the challenges of accuracy that are

faced in data collection because of the procedure and tools.

Summary of Evidence:

The candidate provides no evidence of asking students to present or summarize their data.

Evaluation: (Check one): ___x___Emerging ______ Proficient _______ Advanced

EVIDENCE: Video clips, Instruction commentary prompt 5

How does the candidate use evidence to evaluate and change teaching practice to meet students' varied learning needs?				
EMERGING PERFORMANCE		**PROFICIENT PERFORMANCE**	**ADVANCED PERFORMANCE**	
Candidate suggests changes unrelated to evidence of student learning.	Candidate proposes changes that are focused primarily on improving directions for learning tasks or task/behavior management.	Candidate proposes changes that address students' collective learning needs related to the central focus. Candidate makes superficial connections to research and/or theory.	Candidate proposes changes that address individual and collective learning needs related to the central focus. Candidate makes connections to research and/or theory.	Level 4 plus: Candidate justifies changes using principles of research and/or theory.
LOOK FORs: • Proposed changes o Address candidate's own behavior without reference to student learning o suggest "more practice" or time to work on similar or identical tasks without revision o address problems with student behavior and how to "fix" it		LOOK FORs: • Proposed changes o address gaps in whole class learning/understanding o re-engage students in new, revised or additional tasks o include surface level discussion of research or theory (e.g., name drop or use a term without connection to own practice)	LOOK FORs: All from Proficient and… • Proposed changes o are concrete, specific and elaborated o address gaps in student learning for different students in different ways (e.g., modified tasks or different resources/materials, extra scaffolding with teacher or peer) o are grounded in principles from theory or research (e.g., go beyond name dropping or jargon)	

Evidence:

Instruction commentary, prompt 5:

- I would have included the supports for calculating energy and wavelength earlier in the segment, rather than in the later lessons.
- I would have used a guiding notes and lab response sheet for the learning segment. These sheets could have included key vocabulary words, the flow chart for problem solving, practice problems, reflective questions, and space to record notes, equations, and information
- If the table and flow chart had been implemented earlier in the segment students may have more quickly established stronger patterns of problem solving and a greater knowledge of the meanings of variables as well as their relationships
- In addition to implementing the supports earlier, I also would have included a column on the table where students had to describe what the data they were manipulating would look like on an atomic level. In all the calculations during lesson 3, what the data meant for atomic structure got a little lost.
- Giving students guiding questions prior to the discussion may have helped them reflect on the lab and prepare for and think through their ideas. Because some of the shy students are not willing to talk unless they are correct, this may have given them an opportunity to think through their explanations before sharing,

Summary of Evidence:

The candidate proposes changes that reflect whole class learning needs, with no references to research/theory

Evaluation: (Check one): ______Emerging ___x___ Proficient _______ Advanced

Assessment Rubrics - Rubric 11: Analysis of Student Learning

EVIDENCE: Assessment commentary 1, evaluation criteria, work samples

How does the candidate analyze evidence of student learning with respect to standards/objectives?				
EMERGING PERFORMANCE		**PROFICIENT PERFORMANCE**	**ADVANCED PERFORMANCE**	
The analysis is superficial or not supported by either student work samples or the summary of student learning. OR The evaluation criteria, learning objectives, and/or analysis are not aligned with each other.	The analysis focuses on what students did right OR wrong using evidence from the summary or work samples.	The analysis focuses on what students did right AND wrong and is supported with evidence from the summary and work samples. Analysis includes some differences in whole class learning.	Analysis uses specific examples from work samples to demonstrate patterns of student learning consistent with the summary. Patterns are described for whole class.	Analysis uses specific evidence from work samples to demonstrate the connections between quantitative and qualitative patterns of student learning for individuals or groups.
LOOK FORs: • Lists correct OR incorrect answers • Claims unsupported by work samples • No alignment between assessment and objectives		LOOK FORs: • Lists correct AND incorrect answers • Lists some areas where whole class excelled or struggled	All from Proficient and LOOK FORs: • Describes students' understandings and struggles citing evidence (e.g., As demonstrated in sample 3…) • Learning trends related to individual or group understandings/misunderstandings (e.g., Scores on essay question lower for ELLs; struggled with taking and supporting a position beyond personal opinions…)	

Evidence:

Commentary, prompt 1c- table with percentage of class that does each component correctly

Prompt 1d

- As seen in the table, all students were able to apply equations and use accurate calculations to transition from wavelength to frequency and frequency to energy
- Within these various misunderstandings there were several patterns with the mistakes made. Of the sixty percent who did not include the correct sign for ΔE, there were three main groups. . One third showed all their work, but only calculated the energy of the photon and stopped there. They assumed the two would be equivalent and went no further. Another third showed their work, but based it on an incorrect flow chart that moved from frequency directly to the energy change, which resulted in them having the incorrect sign of the change.   The last third, as in Sample 2, showed minimal work and it is unclear whether they stopped working after finding Ephoton or if they forgot to take into consideration the step between the two.
- Half of the students, such as in Sample 3, were able to do the complete calculations, but simply used the wrong wavelength value because a conversion was necessary from the recorded wavelength to the wavelength used in the speed of light equation
- Twenty percent of students, such as in Sample 1, worked each calculation correctly, used all the correct units, took account of the sign of the energy change, and did so without writing out each equation use.
- All of these students, however, did not completely report their findings because they left out the units of the final values calculated. This may be because there were not explicit instructions to do so or because they are used to simply solving the calculations that come so naturally to them and do not consider including all the information necessary

Summary of Evidence:

The candidate identifies specific patterns of learning, probing beneath what students did right and wrong to identify possibilities for what groups of students with similar errors do and do not understand. These were often supported by reference to specific work samples.

Evaluation: (Check one): ______Emerging   ______ Proficient   ____x___ Advanced

Assessment Rubrics - Rubric 12: Providing Feedback to Guide Learning

EVIDENCE: Assessment commentary prompt 2a, work samples

What type of feedback does the candidate provide to focus students?

EMERGING PERFORMANCE		PROFICIENT PERFORMANCE	ADVANCED PERFORMANCE	
Feedback is unrelated to the learning objectives OR is inconsistent with the analysis of the student learning. OR Feedback contains significant content inaccuracies.	Feedback addresses only errors OR strengths generally related to the learning objectives. OR Feedback is inconsistently provided to focus students.	Feedback is accurate and primarily focuses on either errors OR strengths related to specific learning objectives, with some attention to the other. Feedback is provided consistently for the focus students.	Feedback is accurate and addresses both strengths AND needs related to specific learning objectives. Feedback is provided consistently for the focus students.	Level 4 plus: Candidate describes how s/he will guide focus students to use feedback to evaluate their own strengths and needs.
LOOK FORs: • General feedback on errors OR strengths (e.g., "Good detail!") • Unequal feedback given (e.g., 1 sample with feedback and 1 sample without) • No relation to objectives or analysis (e.g., feedback on grammar when objective on causes of WWII) • Feedback inaccurate (e.g., numerous or essential items are marked incorrect when correct or vice versa)		LOOK FORs: • Specific feedback connected to objectives (e.g., "As you explain the causes, remember to include key nations involved.") • Feedback emphasizes strengths OR weaknesses with mention of other • Equal feedback given (e.g., same amount and kind across focus students)	All from Proficient and LOOK FORs: • Balanced specific feedback on strengths AND weaknesses • Guides student self evaluation of strengths and weaknesses (e.g., "I will have students use rubric to evaluate their own draft and discuss results with peer."	

Evidence:

All work samples include check marks and scores

Work sample 1:Charges of the ions are written in green

Work sample 3:"check the units of wavelength"

Sample 2:"check your units for wavelength. ΔE should be negative because photon emission"

Summary of Evidence:

Feedback addressed errors only. The candidate put a checkmark by columns of data entered correctly, but this is not sufficient to constitute feedback on strengths.

Evaluation: (Check one): ___x___ Emerging ______ Proficient _______ Advanced

EVIDENCE: Assessment commentary prompt 2b

How does the candidate provide opportunities for focus students to use the feedback to guide their further learning?				
EMERGING PERFORMANCE		**PROFICIENT PERFORMANCE**	**ADVANCED PERFORMANCE**	
Opportunities for applying feedback are not described. OR Candidate provides limited or no feedback to inform student learning.	Candidate provides vague explanation for how focus students will use feedback to complete current or future assignments.	Candidate describes how focus students will use feedback on their strengths and weaknesses to revise their current work, as needed.	Candidate describes how s/he will support focus students to use feedback on their strengths and weaknesses to deepen understandings and skills related to their current work.	Level 4 plus: Candidate guides focus students to generalize feedback beyond the current work sample.
LOOK FORs: • Generic discussion for use of feedback (e.g., "to use for upcoming exam") • No discussion for use of feedback • No feedback given on samples		LOOK FORs: • Explicit discussion for how students use feedback to improve work (e.g., "Use questions I asked to deepen your response by answering them using research sources and adding that information to your essay.")	All from Proficient and LOOK FORs: • Discussion of support for student use of feedback (e.g., one-on-one conferences to use feedback to improve draft) • Leads to deeper understandings of current or future work (e.g., content of conference focuses on improving content understanding/skills within draft)	

Evidence:

Prompt 2c

- For the objectives related to data collection and laboratory procedure, students have many other laboratory experiences throughout the semester. In relation to the mathematical and electron-related standards, students use this information in later homework assignments, review activities, and a summative assessment
- In the remainder of the unit students also have an opportunity to respond to feedback since we will rely on an understanding of energy change to discuss ionization energy

Summary of Evidence:

While the candidate describes opportunities for students to apply the feedback, the explanation is vague.

Evaluation: (Check one): ___x___Emerging ______ Proficient _______ Advanced

EVIDENCE: Assessment commentary prompt 3, work samples and/or video clips

How does the candidate analyze students' use of language to develop content understanding?				
EMERGING PERFORMANCE		**PROFICIENT PERFORMANCE**	**ADVANCED PERFORMANCE**	
Candidate identifies language use that is superficially related or unrelated to the language demands (function,[7] vocabulary, and additional demands). OR Candidate does not address students' repeated misuse of vocabulary.	Candidate provides evidence that students use vocabulary associated with the language function.	Candidate explains and provides evidence of students' use of the language function as well as vocabulary OR additional language demand(s).[8]	Candidate explains and provides evidence of students' use of the language function, vocabulary, and additional language demand(s) in ways that develop content understandings.	Level 4 plus: Candidate explains and provides evidence of language use and content learning for students with varied needs.
LOOK FORs: • Lists only vocabulary use • Lists language use that is not connected to identified vocabulary, or other demands (e.g., identifies language use of grammar when demands are about summarizing information)		LOOK FORs: • Lists and explains students' use of vocabulary and related function • List and explains students' use of discourse or syntax	All from Proficient and LOOK FORs: • Lists and explains vocabulary, function and syntax or discourse used by whole class OR students with varied needs • Language use clearly supports content understandings	

Evidence:

Prompt 3

- Student Work Samples 1, 2 and 3 all illustrate varying levels of proficiency using academic language, specifically the equations that model the energy as well as the variables used to represent different aspects of the model.
- In all three samples, students are correctly applying the equations they have learned to the data they have collected and understand their use to the point of being able to manipulate them to find the desired information
- In Sample 1 and Sample 3 it is also visible that students understand what the different variables represent and can employ the Greek symbols in their work.
- Sample 1 also shows the student can cite the relationship of these values by recognizing that when the wavelength value is the same for two data recordings, then the resulting calculations will be the same, a skill that sample 3 does not yet illustrate in her work. Sample 1 also shows an understanding of the equations in terms of the constants being used and their units. He converts his wavelength into meters so that it can be used with the constant c, which is 3.0 x 108 m/s.

Summary of Evidence:

The candidate provides evidence of the use of symbols (a form of vocabulary) and explains their use in solving the equations, and also explains and provides evidence of students' varying abilities to use equations to model the energy in the lab experiment and manipulate the equations to find information (demonstrating understanding of the syntax of equations). The candidate does not address use of the language function (explain). The evidence matches Look Fors at both the Emerging (lack of attention to the language function) and Proficient (attention to vocabulary/symbols and other language demand) levels.

Evaluation: (Check one): ___x___Emerging ____x__ Proficient _______ Advanced

[7] The selected language function is the verb identified in the Planning Commentary Prompt 4a (analyze, explain, interpret, etc.).

[8] These are the additional language demands identified in the Planning Commentary Prompt 4c (vocabulary and/or symbols, plus either syntax or discourse).

Assessment Rubrics - Rubric 15: Using Assessment to Inform Instruction

EVIDENCE: Assessment commentary prompt 4

How does the candidate use the analysis of what students know and are able to do to plan next steps in instruction?

EMERGING PERFORMANCE		PROFICIENT PERFORMANCE	ADVANCED PERFORMANCE	
Next steps **do not follow** from the analysis. OR Next steps are **not relevant to the standards and learning objectives** assessed. OR Next steps are **not described in sufficient detail** to understand them.	Next steps **focus on repeating instruction, pacing or classroom management issues.**	Next steps **propose general support that improves student learning related to**: • conceptual understanding, • use of scientific practices during inquiry, OR • evidence-based argument about a scientific phenomenon. Next steps are **loosely connected with principles from research and/or theory.**	Next steps **provide targeted support to individuals or groups to improve their learning relative to:** • conceptual understanding, • use of scientific practices during inquiry, OR • evidence-based argument about a scientific phenomenon. Next steps are **connected with principles from research and/or theory.**	Next steps **provide targeted support to individuals and groups to improve their learning relative to**: • conceptual understanding, • use of scientific practices during inquiry, AND • evidence-based argument about a scientific phenomenon. Next steps are **justified with principles from research and/or theory.**
LOOK FORs: Next steps: • Do not make sense (e.g., students need more support on writing arguments and candidate focuses next steps on vocabulary definitions) • Are not aligned to learning objectives • Present vague information (e.g., "will provide more support for objectives.")		LOOK FORs: • Next steps generally attend to whole class needs in relation to content (e.g., "use a Venn diagram to support writing of research paper.") • Discussions of research/theory are surface level	All from Proficient and LOOK FORs: • Strategic support for individuals AND groups related to subject specific knowledge • Next steps are grounded in research/theory	

Evidence:

Prompt 4

- To address the problems students had with taking units into account, I incorporated sample problems and homework problems that required changing units of the given. I also consistently showed all units as we worked problems during practice sessions and encouraged students to do the same to avoid making mistakes because of units. I also included a “check your work” checklist on the summative assessment that included the question “Does your final answer make sense?”… On the new flow chart used in lesson 3 I also added the units of each value being calculated and plugged in so that students could visually see when to change dimensions.
- To address the issue of students not understanding the difference between Ephoton and ΔE, I created a review activity where students had to complete a chart moving from one value to the other using the equations they know. On this chart there was a column for Ephoton and a column for ΔE, separated by a column to mark whether the photon was emitted or absorbed from the atom. This required students to see that they must take this middle step into consideration and helped them get in the habit of going from Ephoton to ΔE correctly.
- For the students who did not include final units in their responses, I placed on the “check your work” checklist the question, “Did you include units in your final answer?” During further class discussions and problem solving if students did not include units in an answer I would ask them what the number they calculated meant. For example, if they told me an answer was seven, I would say to them, ”Tell me what you mean by seven,” or “Seven what? Seven puppy dogs?
- For higher level and mathematically inclined students like Student A, I created a challenge problem to work on after finishing a problem while they were waiting between working individually and working with a group. After they finished the challenge problem I had these high level students try to create their own challenge problems for others to solve. For the students in need of more support I decided to put them in groups so that they would be able to hear from other students and see how they were solving similar problems. This was particularly helpful in helping Student B develop an ability to ask peers for assistance in problem solving.

There were no references to research/theory.

Summary of Evidence:

The candidate identifies next steps to address specific needs of groups of students relative to use of scientific practices during inquiry (including dimensions of solutions as part of mathematical thinking) and conceptual understanding (difference between Ephoton and ΔE) and to increase the amount of challenge or support, as needed. The evidence shows characteristics of both Proficient

Evaluation: (Check one): ______Emerging ___x___ Proficient _______ Advanced

