STC My Generation
Electricity, Waves, and Information Transfer
Assessment Analysis Tools

This rubric is designed to help you quantify your students' work on the Performance Assessment. However, it is up to you how you fit it into your overall classroom grading system. The rubric specifies multiple aspects of the performance in order to help you provide highly specific feedback for your students. For instance, a group of students might design a scientifically sound system that meets their criteria, but if they do not clearly communicate each system interaction in their diagram or presentation, this could indicate need for improvement in the practices of modeling and communicating information.

Performance Assessment: Designing a Disaster Relief System

RUBRIC			
Criteria (Getting Started Steps 2-3)			
	3	*2*	*1*
Additional criteria and constraints are developed/elaborated on.	Students note 3 or more additional criteria and/or constraints beyond the ones given (this may include breaking down the given ones into more detail).	Students note at least 1-2 additional criteria and/or constraints beyond the ones given (this may include breaking down the given ones into more detail).	Students only re-state the listed criteria and constraints or list ideas for devices, rather than focusing on further defining the problem.
Criteria are plausibly possible to meet given the constraints.	All criteria that are described are likely to be achievable given the constraints.	Some criteria may not be realistic given the constraints.	It appears that students have not considered the constraints when developing/elaborating on criteria.
Diagram (Performance Assessment Steps 1-6)			

	3	*2*	*1*
Each component in the system is clearly labeled.	Students clearly label every component of the system.	Students clearly label some of the components.	Students use only drawings or symbols to represent components, with no clear labels.
Each system component is connected to at least one other component.	Diagram clearly shows connections between all components.	Diagram clearly shows the connections between some of the components in their system.	Diagram shows components, but does not show clear connections between them (they may be implied, but are not shown).
The type of information being transferred (and how it is transferred) is noted for each connection in the system.	Diagram clearly shows all information that is transferred between components, specifying when either electricity or waves are involved.	Diagram clearly shows some of the information that is transferred between components, specifying when either electricity or waves are involved.	Diagram does not show what information is transferred between components (it may be implied, but is not shown).
Component functions and interactions are accurate.	All component functions and interactions are supported by the science of electricity and waves.	Some component functions or interactions may not be supported by the science of electricity and waves.	Multiple component functions or interactions are not supported by the science of electricity and waves.
The system meets the criteria listed in the Student Guide.	System meets all of the criteria.	System does not meet a few of the listed criteria. E.g. it does not include a way to transmit medical images	System does not meet any of the listed criteria. E.g. it does not include a way to transmit medical images outside the disaster area.

		outside the disaster area.	
The system accounts for the constraints listed in the Student Guide.	System accounts for all listed constraints.	System does not account for one or two of the listed constraints. E.g. it relies on a full local power supply or working roads in the disaster area.	System does not account for several of the listed constraints. E.g. it relies on a full local power supply or working roads in the disaster area.
The system accounts for any additional criteria and constraints set by the group during planning (this will vary across groups).	System accounts for all the group's additional/elaborated criteria and constraints.	System accounts for some of the group's additional/elaborated criteria and constraints.	System does not account the group's additional/elaborated criteria and constraints.
Presentation (Performance Assessment Steps 7-8)			
	3	*2*	*1*
Students explain what each component is.	Each component is identified and explained.	Most components are identified and explained; one or two may be overlooked or not clearly identified.	Many components are not identified or explained.
Students explain how each component interacts with other components within the system and the overall flow of information.	Students clearly explain the connections between all components and how information flows throughout the system.	Students clearly explain the connections between some components but there may be some gaps that are not clearly explained.	Students do not explain the connections between the components (they may be implied but are not explained in the presentation).

Students explain how each device uses waves and/or electricity to perform its function.	Students clearly explain how electricity and waves are involved at each step in the system.	Students clearly explain how electricity and waves are involved at some of the steps in the system.	Students cannot clearly explain how electricity and waves are involved in several parts of their system; there may be scientific misconceptions present.
Students explain how the system solves the problem.	Students explicitly explain how their system solves the problem they were tasked with.	Students may hint at how their system solves the problem, but do not explicitly explain it.	Students only explain what the system does; they do not explain how it solves the problem.
Students explain how the system meets the criteria.	Students explicitly state how their system meets each of the criteria (those listed in the book and those they added/elaborated on).	Students explicitly state how their system meets some of the criteria (those listed in the book and those they added/elaborated on).	Students' solution may not meet all of the criteria and they may therefore be unable to explain how their solution meets them.
Students explain how the system accounts for the constraints.	Students explicitly state how their solution works within the all the constraints of the disaster.	Students explicitly state how their solution works within some of the constraints of the disaster.	Students' solution may not have accounted for many of the constraints and they are therefore unable to explain how their solution works within them.
Responding to questions and feedback: Students can defend and explain their design choices by referring	Students always refer to their criteria and constraints as well as their knowledge of the science when	Students sometimes refer to their criteria and constraints as well as their knowledge of the science when	Students are unable to defend or explain their design choices or respond to questions by referring to group members' opinions.

to their criteria and constraints, and their knowledge of the science of electricity and waves.	defending or explaining their design choices.	defending or explaining their design choices.	

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Use the Pre-Assessment to find out what ideas, skills, and areas of difficulty your students have before starting the unit. The Pre-Assessment should not include the teaching of science ideas in the unit, and ***it should not be associated with grades or points for correct or incorrect answers****. Instead, it is a chance to gather information in order to plan productive ways to guide students' learning throughout the unit. Therefore, the point numbers in the rubrics that follow are not intended for use in grading; rather they are for your own information, to help you quantify where your students are with specific aspects of the practices and concepts involved in some key Pre-Assessment tasks.*

As they have not yet begun the unit, most students will be unlikely to fully understand the science of electricity and waves. However they may have some skill in practices such as constructing an explanation or drawing a model or some knowledge of relevant principles from previous science classes. This Pre-Assessment should help reveal what resources your students have that you can build on throughout the unit.

Pre-Assessment: Electricity and Waves Help Us Communicate

RUBRIC			
Getting Started Step 4			
	3	*2*	*1*
The explanation has a clear claim.	A claim statement is present and clearly answers the question.	A claim statement is present; it may not clearly answer the question.	No clear claim statement is present.
The explanation includes relevant evidence.	More than one piece of evidence is stated; all pieces are relevant to the claim.	At least one piece of evidence is stated that is relevant to the claim.	No evidence is stated or evidence provided may be irrelevant.

The explanation includes relevant scientific principles.	At least one relevant scientific principle is stated (this can be in the student's own words — formal language is not required)	At least one scientific principle is stated (this can be in the student's own words — formal language is not required); may not be clearly relevant to the claim.	No scientific principles are stated.
Evidence is correctly identified with circles.	Student circles all places where evidence is stated.	Students circles some places where evidence is stated.	Student does not circle anything; (may not have provided any evidence, OR may not recognize evidence statements even when present).
Scientific principles are correctly identified with underlines.	Student underlines all scientific principles.	Student underlines some scientific principles.	Students does not underline anything (may not have provided any scientific principles, OR may not recognize principles even when present).
Scientific principles mentioned are accurate.	All principles mentioned are accurate (but may be explained in student's own words).	Most principles mentioned are accurate but some misconceptions may be present.	Student does not state any principles; OR the only ones mentioned likely correspond to misconceptions.
Getting Started Steps 6 & 8 (these are the same for light and sound respectively)			
	3	*2*	*1*
All key components are represented.	All key components are represented (a	One component may be missing (e.g.	More than one component is missing.

	source, light/sound, and surroundings).	the source may be missing or unclear).	
The *process* of light/sound travelling is represented.	The diagram uses some kind of representation to show what happens over time, rather than just before and after.	The diagram may show before and after, but not what happens over time.	The diagram may show the components but nothing about what happens with them.
All key components and processes are labeled.	All components and processes are labeled.	Most components and processes are labeled.	Student labels little to nothing on the diagram.
Model accurately represents how light/sound travels.	Diagram (the model) accurately reflects scientific principles about light/sound.	Diagram may indicate a few possible misconceptions.	Diagram does not show any accurate understandings of light/sound.
Investigation PA.1 Step 2 & Student Sheet PA.1			
	3	*2*	*1*
Components, processes, and connections are represented consistently for each device diagram.	Representations and labels are used consistently across diagrams (e.g. student uses same style of drawing for a capacitor no matter what device it is in).	Representations and labels are mostly consistent but may vary some according to context; student may not recognize all similar components across devices.	No clear attempt for consistent representation is seen across the drawings.
For each diagram, all components are clearly connected to at least one other component in the system.	Sketches for each device show that the parts are a systems and they interact.	Sketches for some devices may show only individual parts but not a representation of	Sketches for most or all devices show no indication of how the individuals parts would work together as a system.

		how they work as a system.	
Student's proposal for how the components work together is based on accurate scientific understandings.	The arrows and labels explaining how each device's parts would work together appear to be based on accurate scientific principles.	The arrows and labels explaining how each device's parts would work together appear to show evidence of some possible misconceptions as well as some correct ideas.	The arrows and labels explaining how each device's parts would work together are either missing or only reflect misconceptions.
Investigation PA.3 Steps 2 & 3			
	3	*2*	*1*
Claim.	A clear claim is present that answers the question.	A claim is present but it may not clearly answer the question.	No claim is stated.
Evidence.	Evidence is stated in the form of observations about the circuit, its components, and how they interact.	Evidence is stated but is not clearly linked to observable details about the circuit (e.g. "the lightbulb produces white light").	No evidence is provided to support the claim.
Reasoning.	Reasoning is present and clearly links the evidence to the claim.	Reasoning is present but may not clearly link the evidence to the claim (e.g. "things always turn on when you flip the switch").	No reasoning is provided (the student may assume the link between the evidence and the claim is self-evident).
Oral argumentation.	Student asks multiple questions	Students asks some questions of peers;	Student does not ask many questions of

	of peers, to clarify and challenge points as appropriate.	may mainly clarify points rather than challenging them.	peers; presents own ideas, listens to others, but does not see connections or points of interaction.
Investigation PA.3 Steps 4-7			
	3	*2*	*1*
Prediction.	Prediction is clearly stated (typically in if-then format, e.g. "if we decrease the amount of energy supplied, then the lightbulb will not light up.")	Prediction is stated but not fully clarified (e.g. "if we change the amount of energy, the light will probably change and maybe get brighter).	Prediction statement is not recorded.
Planning and carrying out a simple investigation.	With peers, student discusses and records plausible ideas about how to conduct the investigation; records preliminary steps to be followed and roles to be assigned.	With peers, student discusses plausible ideas about how to conduct the investigation; may remain vague about exact steps to be taken and roles for group members.	Student does not discuss possible ideas or only ideas that are not plausible or relevant.
Measurement and data collection.	With peers, student decides on what data to collect and how they would accurately measure it.	With peers, student decides on what data to collect; may not have clear plans about how to measure it.	Student does not make a plan to collect data as part of the investigation.
Reflecting on What You've Done Steps 1-2			
	3	*2*	*1*

Model components are labeled/explained.	Model sketch in notebook has all components clearly labeled with what it represents (that is, how it relates to how electricity powers devices).	Model sketch in notebook has all components clearly labeled but not always clearly connected to how electricity powers devices.	Model sketch in notebook does not have its components labeled.
Model is used to communicate how electric devices work.	Student effectively uses the model to explain at least one aspect of how electricity powers devices.	Student explains the model fully but is less clear on what it shows about how electricity powers devices.	Students cannot fully explain how the model itself works.
Limitations of the model are considered and explained.	Student considers and describes multiple limitations of the model (and describes aspects of electricity that it cannot usefully model).	Student considers and describes multiple possible limitations of the model; cannot necessarily describe aspects of electricity that it cannot usefully model due to lack of knowledge about electricity.	Student cannot describe any limitations of the model (may be due to lack of content knowledge).
Reflecting on What You've Done Step 5			
	3	*2*	*1*
Questions are developed.	At least 5 relevant questions are developed.	Multiple questions are developed; some may not be relevant to electricity, light, or sound.	No more than a couple of questions are developed.

Questions are plausibly answerable.	All questions are plausibly answerable through scientific experimentation.	Some questions may not be answerable through scientific experimentation (e.g. "is light better than sound?").	Many or most questions are irrelevant or not answerable though scientific experimentation.
Plans for each investigation.	Plans for each investigation are realistic and specifically address how they will answer the question.	Plans for the investigations are generally realistic; may be unclear about how they specifically answer the question.	Plans for the investigation reveal lack of knowledge about logistics of setting up materials; vague on how they will answer the question.