Reasoning Rubric:

THE RUBRIC: Joe

orrect Claim: XXX

ound justification: XXX

ound connection: XXX

onvincing mechanism: XXX

core	Description	Example Student Response	
5	Student explicitly connects a stated claim to their justification of the claim. It must include a scientifically correct mechanistic or causal explanation (likely from the item). And the overall argument is persuasive/convincing.	**D2 T2 V3 S25** The strengths of earthquakes is related to how close they are to the earths surface, they type of rock they travel through, and the temperature when they occurred. If you look at Joe's chart, you see that the softer the rock, the greater MMI. For earthquake A, the MMI was 12. The rock type was soft. Earthquake E on the other hand, had a MMI of 5. The rock type was very hard. This can tell us that the variable of rock type can change the strength of an earthquake. / If you look at how close to the surface the earthquake is, you can see that the strength of the earthquake also changes. Look at earthquake B and C. The strengths of these earthquakes are similar, only 2 units in difference. They both have soft rock, so that wasn't what caused the change in their MMI. If you look at the depth, where the earthquake started, they are very different. Earthquake B started 115 km below the surface, while earthquake C started 222 km below the surface. So this tells us that the closer to the surface the earthquake starts, the more powerful. / The last thing you can look at on Joe's chart is the average temperature where the earthquake took place. Compare B and E, for instance. You can tell that earthquake B was more powerful. Their temperatures were also different. Earthquake B had an average temperature of 31 degrees (C). But earthquake E had an average temperature of 68 degrees (C). This comparison can also tell us that a temperature variable can also change the power of and earthquake. / / These observations can be true for different reasons. In temperature, maybe the warmer climates can cause a reaction that stimulates and earthquake to be weaker. With depth,	Claim? *XXX.* **[XXX]** Justification? *XXX.* **[XXX]** Connection? *XXX.* **[XXX]** Mechanism? *XXX.* **[XXX]**

		maybe the closer the earthquake will be more powerful because it has less ground to cover. And maybe the softer rocks are easier to get through, so it takes less energy out of the earthquake. It doesn't matter whether or not your on an island when a earthquake strikes. Maybe the quake will cause other natural disasters, such as a tsunami, but there is nothing that is unique about an island that will cause the earthquake to be stronger that in the middle of a continent.	
4	Student explicitly connects a stated claim to their justification of the claim. It must include a mechanistic or causal explanation (likely from the item).	**D3 T3 V2 S05** how close they are to the Earth's surface and the type of rock they travel through. If an earthquake doesn.t start very deep in the Earth, it will have more power left, meaning more damage. If they don't travel through hard rock, they wo't have to use their power on getting to the surface, also meaning that they have more power left for surface damage. The surface temperature won't affect the tectonic plates inside the the Earth, so it won't affect the earthquake. **D3 T3 V2 S14** how close they are to the Earth's surface, the type of rock they travel through and the average air temperture when they occurred. This is true because they need more power to go through hard rock surfaces and deep places rather than soft rock surfaces and shallow places. The air temperture contributes to this too. Plus, they were both on the chart. It doesn't matter if they occur on islands or on mainlands, there would be the same result.	Claim? *XXX.* **[XXX]** Justification? *XXX.* **[XXX]** Connection? *XXX.* **[XXX]** Mechanism? *XXX.* **[XXX]**
3	Student explicitly connects a stated claim to their justification of the claim.	**d3t3vis05** The strength of the earthquake relates to how close the earthquake is to the surface of the earth and the rock type. This is because the stongest earthquake was the closest to the earths surface but had the softest rock. The weakest earthquake was the opposite. One calim thats wrong is that the air temperature relates to the strength. This is wrong because the air temperatures are mixed. For example, the coldest air temperature was during the middle intensity.	Claim? *The cause of some earthquakes to have more destructive power than others is the seconds.* **[XXX]** Justification? *XXX.* **[XXX]** Connection? *XXX.* **[XXX]** Mechanism? *XXX.* **[XXX]**
2	Student implies a connection between a stated claim and justification of the claim.	**D6 T6 V1 S21** the type of rock they travel through and how close they are to the Earth's surface. I used the table and made connections between the table's data. It does not use the information from the table. **D3 T3 V2 S20** The depth where the earthquake started and the type of rock that it travels through. There is a graph of data to suggest that depending on the depth and rock that the	Claim? Justification?. **The justification is merely a restaten of the claim.** Connection? **[The connection only exists in that the argument is circular – the claims and justification restatements of the same idea.]**

		earthquake travels through the strength of the earthquake will differ. The location and tempurature do not affect the power of the quake.	Mechanism?. **[There is no mechanistic explanation the relationship between ground material and the strength of an earthquake.]**
1	Student provides a justification that simply restates the claim.	**D3 T3 V1 S02** how close they are to the Earth's surface & the type of rock they travel through. because of the already listed facts this claim is well supported. wether they happen on islands or not will not affect the power of the earthquake, because it does not matter. **D2 T2 V5 S03** How close they are to the earths surface and the type of rock they travel through. Because all the other answers are irrelevant to the question at hand. They have nothing to do with earthquakes.	Claim?. **[Points out the directional relationship between ground density and earthquake strength.]** Justification? *None.* **[Student does not justify their claim.]** Connection? *None.* **[Without a justification there ca no connection between the justification and claim.** Mechanism? *None.* **[No mechanism is given.]**
0	Student does not provide a justification that is related to their claim.	**D2 T2 V3 S26** How far from the earths surface they are and the type of rock they travel through. This is true because science can prove it. Because weather they happen on islands or not wont really affect anything. **D2 T2 V5 S22** A VOLCANO is related to a earthquake. Because a volcano is extremely deadly and dangerous.	Claim? *XXX.* **[XXX]** Justification? *XXX.* **[XXX]** Connection? *XXX.* **[XXX]** Mechanism? *XXX.* **[XXX]**

THE RUBRIC:

orrect Claim: Student states that earthquake destructiveness is dependent on crust temperature, depth, and hardness of ground. Student may focus on mu
ctors, but only one is sufficient.

ound justification: It is clear that the student is basing their claim on data from the table they were given.

ound connection: Student makes the connection that earthquake destructiveness is *inversely* proportional to crust temperature, depth, and hardness of gro
tudent may focus on multiple factors, but only one is sufficient.

onvincing mechanism: Student explains that greater destruction occurs when seismic waves transmit more easily (i.e., softer ground) and have less time
eir energy to dissipate (i.e., begin closer to the Earth's surface).

core	Description	Example Student Response	Notes
5	Student explicitly connects a stated claim to their justification of the claim. It must include a scientifically correct mechanistic or causal explanation (likely from the item). And the overall argument is persuasive/convincing.		Claim? *If it's cooler, closer to the surface, ar ground is soft the earthquakes will be more destructive.* **[Student states that earthquak destructiveness is dependent on crust temperature, depth, and hardness of grou** Justification? **[It is *implicitly* clear that the student has appealed to the temperature, d and hardness columns of the data table.]** Connection? **[Since the student says "cooler "closer to the surface," and "the ground is soft," they have gone beyond listing the tal columns (e.g., temperature, depth, hardne and actually juxtaposed the data to make inferences about the DIRECTON of associations between each factor and**

		earthquake destructiveness.] Mechanism? *This would make it closer and e to move quickly.* **[Student grasps that the cl an earthquake occurs to the surface and th time there is for its energy to dissipate, the greater its destructiveness. Furthermore, t student grasps that destructiveness is asso with a COMBINATION of depth and grou hardness, and not just reliant on one of the factors independent of the other. Hence th mechanism is CONVINCING]**
4	Student explicitly connects a stated claim to their justification of the claim. It must include a mechanistic or causal explanation (likely from the item).	Claim? Justification? **[It is *implicitly* clear that the student has appealed to the temperature, d and hardness columns of the data table.]** Connection? *T* **[Student has gone beyond lis the table columns (e.g., temperature, depth hardness) and actually juxtaposed the data make inferences about the DIRECTON of associations between each factor and earthquake destructiveness.]** Mechanism? **[While the student does indee pose some mechanistic links between claim and justification, they are NOT CONVINCING for the following reasons:** **1) the student says the earthquake wil bigger when the ground is harder, l the data suggests precisely the oppo**

		2) the student does not explicate how a cooler crust temperature facilitates faster earthquake wave propagatio **3) the student considers earthquake d independent of the material earthq waves are propagating through (e.g what about deep earthquakes propagating through soft ground v shallow earthquakes propagating through hard ground?)]**
3	Student explicitly connects a stated claim to their justification of the claim.	Claim? **[Student states that earthquake destructiveness is dependent on crust temperature, depth, and hardness of grou** Justification? **[It is explicitly clear that the student has appealed to the temperature, d and hardness columns of the data table.]** Connection?. **[Student has gone beyond list the table columns (e.g., temperature, deptl hardness) and actually juxtaposed the data make inferences about the DIRECTON of associations between each factor and earthquake destructiveness.]** Mechanism? **[No mechanism is provided to explain the inverse relationship between destructiveness vs. temperature, depth, an hardness.]**
2	Student implies a connection between a stated claim and justification of the claim. Or the justification restates the claim.	Claim? *The ground hardness affects the earthquake size.* **[Student states that earthq destructiveness is dependent on hardness**

		ground. This is an example of where a focu only one factor is sufficient to get credit fo advancing a claim.] Justification? *A reason found out was from th chart.* **[It is clear that the student has appe to the hardness column of the data table.]** Connection? **[No. The final sentence just restates the claim, so an explicit connectio between claim and justification is not provided.]** Mechanistic link? **[No. A mechanism entail first having a connection. As no explicit connection was made, nor does the student provide an explicit mechanism.]**
1	Student provides a claim that answers the question.	Claim? *Some earthquakes can be more destructive than others because of the way ho much the crust actually moves.* **[Student stat that earthquake destructiveness is depend on the way the crust moves.]** Justification? **[No. It is not clear that the student appealed to the data table as they t to focus on the way the crust moves, which not one of the variables in the data table. T one place where they do refer to a variable the data table – depth – they seem to indic that deeper earthquakes are more destruct which is opposite what the data table sugg** Connection? **[No. As no explicit appeal was made to the data, the student does not hav justification and hence cannot make a connection between claim and justification**

		Mechanistic link? **[No. A mechanism entails first having a connection. As no explicit connection was made, nor does the student provide an explicit mechanism. Note that the student does seem to think mechanistically in terms of crust movement, but this mechanism does not link their claim to the evidence presented in the data table]**
0	Student does not provide a claim that answers the question.	**[At most, student reiterates notion that earthquake magnitudes can vary (e.g., "Most are very soft and some are very rough, some shake houses and some people notice it is happening"). The remainder of the student response merely presents some general comments about earthquakes. At no point is a claim advanced regarding why earthquake destructiveness can vary.]**