Teacher/Video	SSUP_ET_TN GR4_SG3_L3_Greever_C1
Content Area	Energy Transfer
STeLLA Strategy	Strategy 5: Engage students in analyzing and interpreting data and observations Strategy F: Make explicit links between science ideas and activities
Context	This is lesson 3 of 5 in the Energy, Every Day, Everywhere unit. In this lesson, students start to explore the marble/ramp system to provide evidence to answer the focus question "How can we change the amount of motion energy of an object?". In this clip, students are sharing their ideas about evidence for energy changes in the ramp/marble system using the class chart of the system.

00:00:03	T	Um...alright, so I asked a couple of people to share their thinking out loud that I heard them talking with their partner about. And we're gonna start with (Maya) and (Jeremiah). So Maya, can you—and here's what I want you all to do. We have this amazing visual here. I would love for you to come up and point to it as you're sharing your thinking with everybody, okay? So if you both wanna come up?
00:00:26	SN	The reason why this one doesn't have energy because it's not moving. And the second one right here, number one, it doesn't have energy because it's all the way at the bottom and it's not moving.
00:00:40	T	Okay. So what is "it" that you're talking about? What doesn't have energy?
00:00:45	S	The ball.
00:00:47	T	So the ball doesn't have energy and what's your evidence for that?
00:00:51	S	That it's not moving.
00:00:52	T	That it's not moving.
00:00:54	S	Mm-hm.
00:00:54	T	And you see that in both before the collision and after the collision, right?
00:01:00	S	Mm-hm.
00:01:01	T	Was there a collision?
00:01:02	S	Yeah.
00:01:03	SN	No.

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00:01:03	T	In tr- in Trial 1? 'Kay.
00:01:05	S/T	No./It seems kinda silly to say before and after 'cause...
00:01:08	SN	They're the same thing (inaudible).
00:01:09	T	'Cause...yeah. Okay and then Jeremiah, what did you say in response to that?
00:01:16	SN	I said I agree with Maya because she's right that this- it isn't moving, so that's why there's no energy.
00:01:25	T	What isn't moving?
00:01:27	S	The ball and the box, none of them are moving.
00:01:31	T	So the ball nor the box are moving. Okay. Did anybody else talk with- about Trial 1 with their partnership?
00:01:38	SN	Uh...
00:01:40	T	Do you have something you wanna say?
00:01:41	S	We, actually—
00:01:42	T	Thank you, ladies.
00:01:43	S	...talked about it within the steps that you did.
00:01:46	T	Okay.
00:01:47	S	With Trial 1, and 2, and 3.
00:01:49	T	Okay, so what did you say?
00:01:51	S	We said first you started from the bottom.
00:01:53	T	Can you come point?
00:01:54	S	Yeah.
00:01:57	T	I don't know about y'all, but I'm visual.
00:02:00	S	First, she started from the bottom right here.
00:02:02	T	Okay.

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00:02:03	S	And then, you had started from the middle. And then, you went back to the top. And then, you started from the top.
00:02:09	T	What started from the top?
00:02:10	S	The ball.
00:02:11	T	The ball. Okay. Alright. Thank you. That's a perfect segue into...
00:02:18	SN	(Braden).
00:02:19	T	Braden's thinking. So Braden can you come up and point and talk to us about what you talked to your partner about?
00:02:25	SN	Okay, so what I talked to (Trey) about, the higher up the ball is, the faster it's gonna go. But when it's at Trial 1, it won't go fast because the ball's at the ground. Trial 2, it's in the middle, so it would go, like, a medium speed. And then, Trial 3, it's all the way up at the top, so it would get a lot of speed.
00:02:48	T	Okay. So you also talked about these bars here. What's the connection with those bars?
00:02:53	S	Um...the higher up it go, the faster it go. So this one have a lot of energy. This one has a medium, and then, that one has none.
00:03:03	T	Okay. So the higher up what is?
00:03:05	S	The higher up the ball is on the ramp would make it go faster.
00:03:10	T	It would go faster. So are you saying that seeing the ball go faster tells us that it has more energy? Is that what you're saying?
00:03:22	S	Yes.
00:03:23	T	What do y'all think about that?
00:03:26	SN	(inaudible)
00:03:27	T	Is there anything else that we observed in Trial 2 versus Trial 3 that might be evidence that Trial 3, the ball had more energy? So we saw the ball go down the ramp. Is there anything else that we observed?
00:03:47	SN	So I- I noticed that the energy bar doubled before and after. Because in Trial 2, it's three bars and Trial 3, it's six bars in before. And then, after collision, it's one bar and two bars for the box in Trial 2. And then, it's double that in after in Trial 3.
00:04:08	T	Okay, so you're mentioning this box which nobody has talked about yet. And- and energy, you have used the term energy, okay. So you're noticing now that in- in this part of it, we've got something—this looks different than it did here. So does anybody have

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		any thoughts around that? I still wanna know- I'm still looking for- for some thinking here around, um...so we can observe the ball rolling down the ramp as evidence for how much energy it has. But what was something else that we saw in our experiment that could- that could also support this idea of energy?
00:04:51	SN	I noticed that the ramp transfers energy to the ball. When it's at the top of the ramp, the ramp gives more energy because...because if it's at the top, it gives more energy to the- to the ball. And then, it rolls down and then crashes into the box. And then after collision, it get- it gets a little bit of energy because it crashed into the box. So therefore, it lowers the energy of the ball- of the ball.
00:05:26	T	Wow. Okay. Can anybody restate what (Camarlin) said, put it in your own words? Who can paraphrase what he said? He just said a lot. He talked about the ramp. He talked about where the ball is.
00:05:38	SN	Yeah.
00:05:39	T	He talked about the ball colliding with the box. And he talked about the ball after colliding with the box. You wanna give it a try?
00:05:50	SN	Um...that when—
00:05:51	T	You can come up and point if you want, if that's helpful. And speak loud, please.
00:05:56	S	Okay. So that when the ball is at the bottom, it has no energy. But like Camarlin said, when it's at the medium or at the- all the way at the top, it collides into the box at the end. And the box has a little bit of more energy now that the ball has collided into the box.
00:06:13	T	So the- the box now has energy after the ball has collided with the box. Why is that?
00:06:20	S	Because the ball- the ball had transferred- transferred energy to the box.
00:06:25	T	The ball transferred energy to the box. What do y'all think about that? Somebody who said, "Me too", can you elaborate on that a little bit? How do we know- what's our evidence that the ball transferred energy to the box? Thank you, ma'am. (Colton)?
00:06:42	SN	So when- when it hit the box, like right here when it hit the box, it gave the box energy. Like, when we did it right here on this, we saw that the box moved after the ball hit it.
00:06:55	T	So the box moving after the ball hit it is our evidence that the ball gave energy to the box.

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Lesson Analysis Protocol: Greever, Energy Transfer_Lesson 3, SSUP_ET_TN GR4_SG3_L3_Greever_C1

1. Identify Lens and Strategy

What instances of making explicit links between science ideas and activities did you observe?

2. Analyze the Video

What do students understand (or not) about energy changes?
How did the teacher's use of the identified STeLLA strategies reveal, support, and challenge student thinking?

Lesson Analysis Step	To Do	Your Analysis
Claim	Turn an observation, question or judgment into a specific claim that responds to the focus question.	
Evidence	Point to a specific place in the video transcript, lesson plan, or student work that supports your claim. Be sure to use timestamps if your evidence comes from a transcript.	
Reasoning	Connect your claim and evidence with reasoning based on STeLLA Strategies, research on teaching and learning, your teaching experience, or scientific principles.	
Consider Alternatives	Alternatives may include an alternative interpretation of evidence, new questions this clip or analysis might raise, and/or alternative question(s), activity(s) or strategies that might have better supported student learning.	

3. Reflect and Apply

What did you learn through this analysis that you want to apply to your own practice?

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Teacher/Video	SSUP_ET_L5_Parco_C1
Content Area	Energy Transfer
STeLLA Strategy	Strategy F: Make explicit links between science ideas and activities Strategy G: Link science ideas to other science ideas Strategy H:Highlight key science ideas and focus question throughout
Context	This is lesson 5 of 5 in the SSUP Energy Every Day, Everywhere series. In this lesson students use system diagrams to represent observable changes and evidence of changes in energy in the car launcher system and apply science ideas about energy to a bike crash scenario. In this series of clips, the class is sharing activities that link to the science ideas they have figured out and reviewing systems diagram components in preparation to apply their understanding of energy to the car launcher system

Timecode	Speaker	Dialogue/Logging
00:03	T	Let's take a look at the science ideas that we've figured out so far, Lessons 1 through 4. Up here we started with the blue, then we moved to red, orange, and then Lesson 4, it's kind of down here and I'll read them so if you can't see them, just listen.
00:18	T	We figured out that something has energy if it's moving. Okay, what kind of motion energy did we refer to that as, as we went on through it? Yes, Mason?
00:28	SN	Probably vision?
00:30	T	If something has motion, what kind of energy are we talking about?
00:34	S	Movement energy or motion energy.
00:37	T	Motion energy, okay. We figured out that certain parts of the launcher system had energy and we talked about where we saw those energy changes. We also discovered that energy can be transferred from one object to another in a collision.
00:51	T	Can someone give an example of where we saw that? Jake?
00:55	SN	In the marble system, the red marble only gave it only to activate the finger. It rolled down to move motion energy into the blue marble.
01:03	T	Okay, so the red marble gave the blue marble motion energy-
01:06	S/T	Yes./which transferred- that was transferred.
01:08	S/T	Yes./Can someone give me another example of where we might've seen transfer of energy? Isaiah?

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01:13	SN	When the marble hit the styrofoam blocks.
01:16	T	When the marble hit the styrofoam block. What- what gave- what- what happened there? What kind of transfer occurred?
01:23	S	The red marble hit the styrofoam block. So it transferred its energy to the styrofoam block 'cause it hit it, then when you hit something-
01:39	T	Okay, was there a change in energy from when the red marble hit the styrofoam block?
01:42	S	Yeah. Yeah, the red marble got slower.
01:45	T	Okay, so the red marble had less motion energy, okay, good. We also learned that motion- we learned about motion and stored or potential energy. Can someone give me an example of stored or where we might have seen stored or potential energy? Noah.
02:08	SN	(Inaudible).
02:18	T	Okay.
02:19	S	But up here, it was trying to go by itself but it couldn't, so it was, like, storing up energy. And then (inaudible) after you let go (inaudible).
02:31	T	Okay, did you want to add on to that, Jake?
02:32	SN	Yeah, like I'd like to add on to what Noah said.
02:33	T	Okay, go ahead.
02:36	S	I'm using- another example is a flashlight.
02:39	T	Okay.
02:40	S	And that too often, (inaudible) hand crank, or just turn it on.
02:44	T	All right.
02:45	S	So when you turn- it has a battery or something that allows further to the energy that it uses to power the light.
02:53	T	Okay, Noah, let's put that away.
02:54	S	So the battery or- or whatever it uses is where the potential energy is.
03:00	T	Okay. Is- was there another example? Can you recall another example where we had potential energy? Or stored energy? There's a clue right up on the easel there. Is anyone-

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03:13	SN	The ruler black ramp.
03:15	T	The ruler black ramp. Where was the potential energy or stored energy? Grace?
03:20	SN	In the marble when it was elevated.
03:22	T/S	In the marble when it was elevated, okay./So when it was at the bottom of the ramp, it, like, on the desk, it moved slow.
03:27	T	Okay. All right, and so in addition to that, we also learned that position energy increased- when position energy increases, that motion energy increases. So does that relate a little bit back to that ramp investigation that we did?
03:45	S	And that position energy turns into motion energy.
03:52	T	Position energy can transfer or be transformed into motion energy, okay. And down at the bottom of Lesson 4, we learned that evidence of energy changes that we observed using our senses were what? We…
04:10	SS/T	Saw-/Saw what? What did we see?
04:12	SN/SN	Saw-/Light.
04:13	T	We saw light.
04:14	SN	Movement.
04:15	T	We saw movement.
04:17	SN	Noisemakers.
04:19	T	We heard…
04:20	S/T	Sound./Sound.
04:21	S	And we felt-
04:22	T	And we talked a little bit about feeling that…
04:25	S/T	Resistance./Resistance with the windup toy.
04:27	S	Yeah.
04:28	T	Right? Okay. So today, we're going to continue thinking about energy changes. The transfer of energy, the transformation of energy. And I'd like for us to take a look at the focus question, so let me turn this around.

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04:45	T	All right. Our focus question is up here. Who'd like to read that focus question for me?
04:51	SN	I would.
04:52	T	Mason, could you read that focus question for me?
04:55	S	Where does energy come from and where does it go when it- what- go- when changes happen in the system?
05:06	T	Okay.
05:11	T	Thank you. All right, you're going to have an opportunity now to show, provide evidence, reflecting back on all of our system diagrams, to show and represent how changes with-within this system diagram occur.
05:35	T	Raise your hand if your recall the ramp system diagram that we drew. Okay? Some of you still have your papers the other day from the windup toy, the noisemaker, okay?
05:47	T	We had to diagram the system and use all of the things that are important to a system diagram. To show how those energy changes occurred today, we're going to go back to our car launcher system and do the same thing.
05:59	T	This time you get to work in a group. Let's go over what a good system diagram has to include. What do you think? Liam.
06:07	SN	Where the system energy changes are occurring.
06:11	T	Okay, let's start at the top and work our way down, but yeah. So where the system energy changes are occurring, that's important. Let me turn this around and see if we did that in our diagram. Does everybody remember this diagram?
06:25	SN/T	Yes./Did we indicate where the system changes in energy were occurring?
06:30	S	Yeah.
06:31	T/S	Okay./We had symbols.
06:33	T	We had some symbols that we used. What else is part of a good system diagram? Cora.
06:38	SN	The labels.
06:39	T	Labels. If you don't have labels, we don't know what we're looking at.
06:44	S	It's not really even a diagram.

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06:45	T	It's not really- it's not a very useful diagram.
06:47	S	Yeah.
06:48	T	Okay? Jake, what else?
06:49	SN	Observable changes taking place.
06:51	T	Observable changes that are taking place. Do we indicate that on our ramp system right there?
06:57	S	Yes.
06:58	T	Okay. We have observable changes. We have a start- a- a beginning, a middle, and an end. And it's different each way or at each phase, at each stage. Okay, what else? What makes a good system diagram? Something that we haven't mentioned yet.
07:15	T	Going back to our focus question, one of the most important ones that we're going to be looking at today are where does the energy come from and where does it go when the changes happen in a system?
07:26	T	Isn't that that last bullet point there? Where the energy in the system goes, where it's transferred or how it's transformed? Okay.
07:36	T	So I'm going to give you and your group some time to create a system diagram for our car launcher system using those guidelines, looking back and reflecting on the practice that we've done together with our ramps. Okay?

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SSUP Lesson Analysis Protocol: SSUP_ET_L5_Parco_Clip 1

1. Identify the Lens & Strategy

- What instances of linking science ideas to the activities do you observe?
- What instances of linking science ideas to other science ideas do you observe?
- What instances of highlighting the Focus Question and key science ideas throughout do you observe?

2. Analyze the Video Using the Analysis Question(s)

- What do students seem to understand (or not) about [insert science content focus]?
- How did the use of the identified strategies help students develop the science content storyline (or not)?

Lesson Analysis Step	To Do	Your Analysis
Claim	Turn an observation, question or judgment into a specific claim that responds to the focus question.	
Evidence and Reasoning	Point to a specific place in the video transcript, lesson plan, or student work that supports your claim. Connect your claim and evidence with reasoning based on STeLLA Strategies, research on learning, your teaching experience, or scientific principles. Also look for evidence that challenges your claim.	
Alternatives	Consider an alternative interpretation or explanation. Consider new questions this might raise. Consider alternative question(s), activity(s), or strategies	

3. Reflect on and Apply Lessons Learned from the Process

Teachers reflect on the experience.

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Reflection - Day 5 Name:_____

How has lesson analysis, particularly the analysis of classroom video, influenced your understanding of the science content? Of the lesson/unit?

How could the strategies we have learned so far support your planning and enactment of the lessons of this unit?

What questions do you have about implementing these strategies in your own context?

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