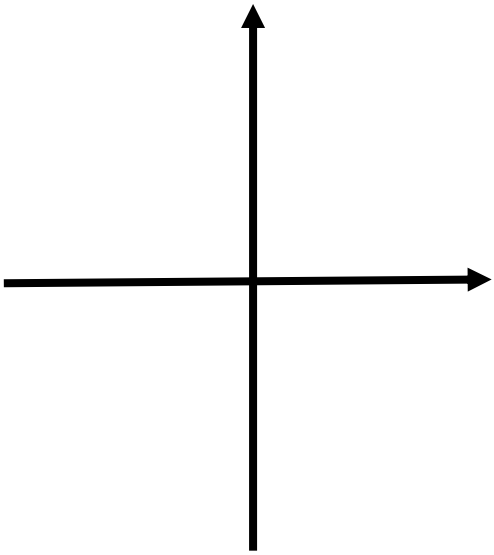
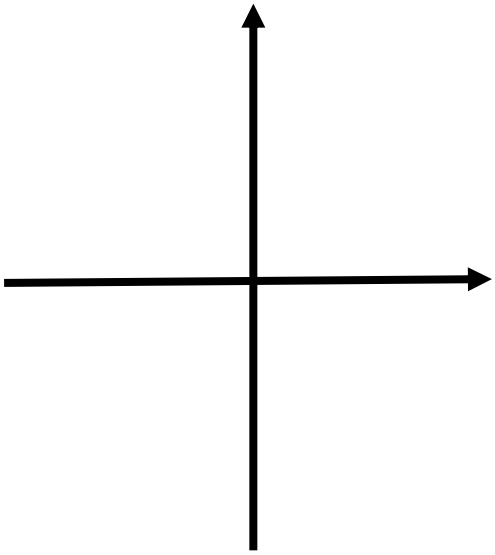
## Analysis of Episode with Pendulum Demonstration (Conservation of Energy)

Ages 13-14 Years of Age

| Time-Stamp (Start) | Dialogue Contribution | | Analysis | |
|---|---|---|---|---|
| | **Teacher** | **Student** | **Language** | **Talk Move** |
| **Introduction of Demonstration (Pose-Pause)** | | | | |
| 00:41 | So, this is a conservation of energy demo, …eh…what we're gonna do is we're gonna get this ball and **lift it up** to your face where **it should get potential energy.**<br><br>When you let go, will it **hit you in the face** or not? | |  | |
| 00:58 | So, if you just wanna move your nose right up close, and when you're ready just let go of the ball. | | | |
| **Plenary Class Discussion about Predictions (Pounce-Bounce)** | | | | |
| 01:20 | Quick question, before we'll watch what's gonna happen. | |  | |
| 01:26 | Harrison. What's **gonna happen** when he lets this ball go? | | | |

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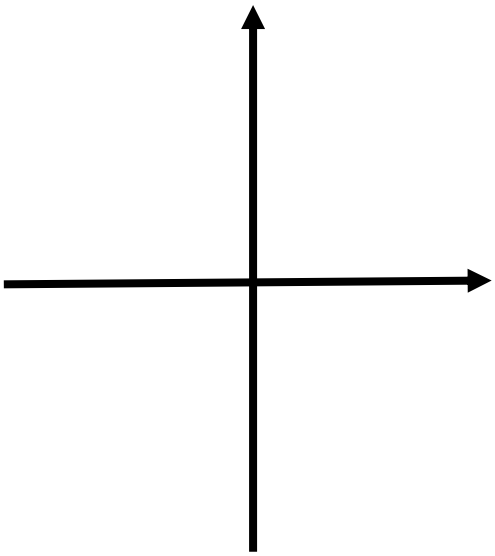
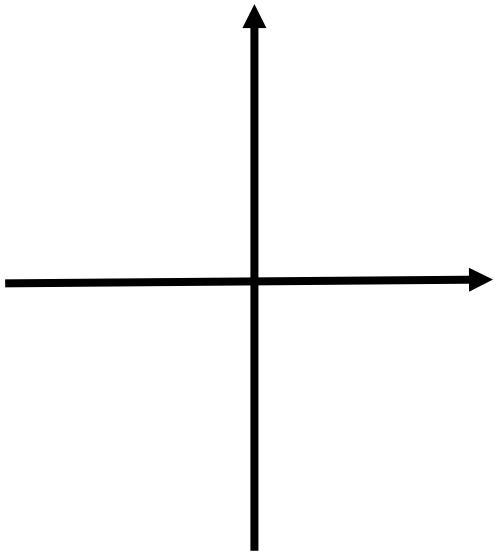
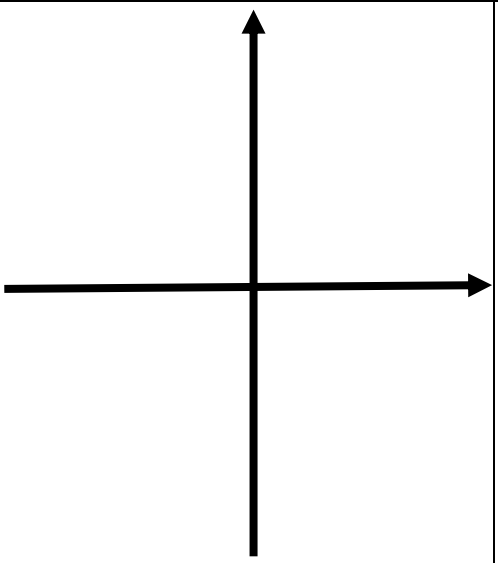
|---|---|---|---|---|
| 01:30 | | It's gonna… **move** and then it's gotta **come back and hit him.** |  | |
| 01:34 | Gonna **move, come back, and hit him.** That's what you say. | |  | |
| 01:38 | Eh..Dan, what you reckon? | | | |
| 01:39 | Uhm… I think it's **gonna come back**, but it's gonna like… be at the **same point** as where he released it. | |  | |
| 01:44 | Ok. Why do you think that? | | | |

| | | | | |
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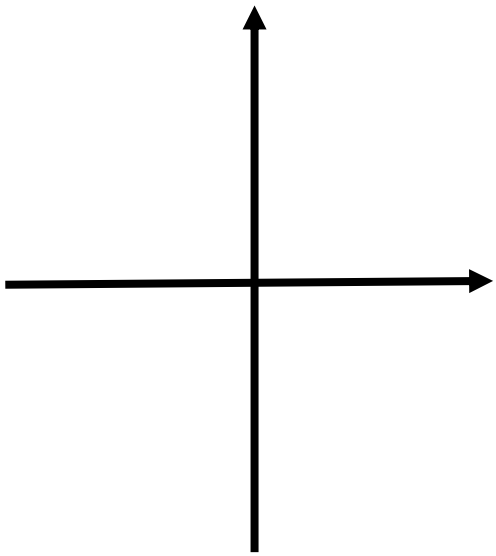
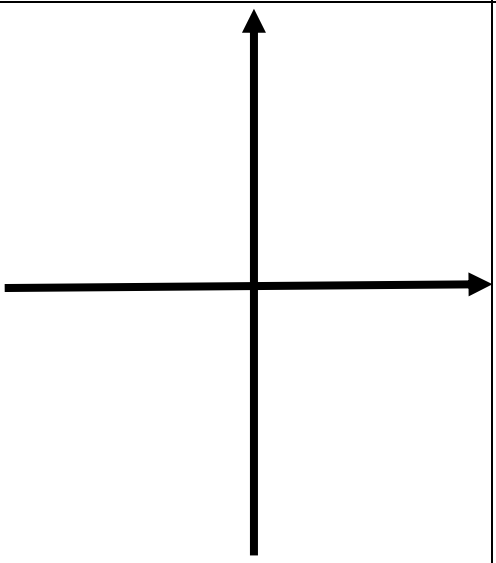
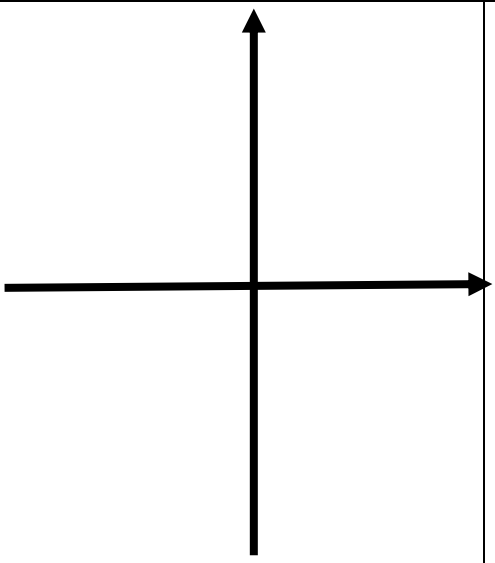
| 01:45 | | Coz, it like.. [?] Same like… like.. .way … [?] … and it comes **straight back down**.. and not… |  | |
| 01:55 | Ok. It's going the same way. Coming straight back down.<br><br>**Think in energy.** Think in energy. | |  | |
| 02:01 | Ehm… Kyle. Do you agree with Dan that it's gonna come back right to the point where he's gonna **drop it** from, or do you agree with… who was it that said it was **gonna hit him**… Harrison. | |  | |
| 02:11 | | Uhm… I agree with Dan. | | |
| 02:14 | Why? | | | |

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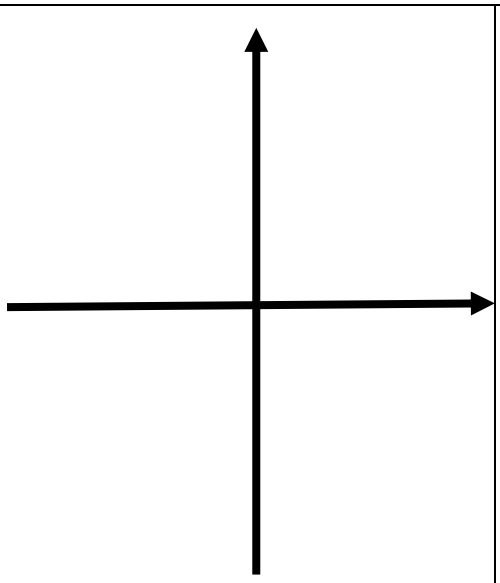
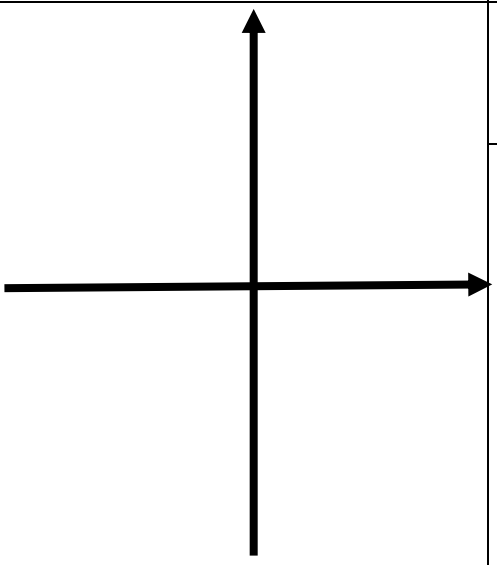
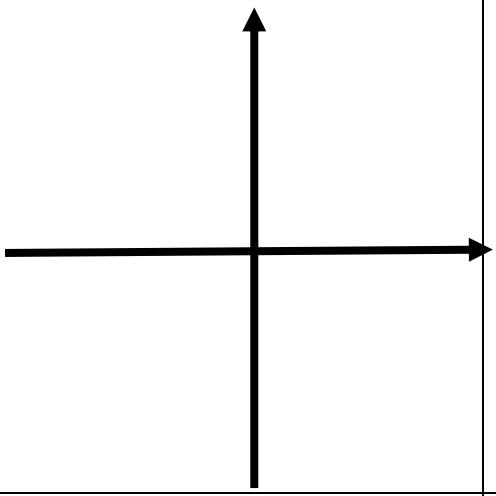
|---|---|---|---|---|
| 02:14 | | Uhm… **energy can't be created.** So… |  | |
| 02:22 | So, you're saying.. ne… **new energy can't be created.** | |  | |
| 02:27 | Ok. Holly, what do you think? | | | |
| 02:28 | | I think it won't go back to the exact point because there will be **waste energy** within that.. meaning it would be [?] less and less each time until eventually it just stops |  | |
| 02:36 | Ok. So, we've got different opinions. Let's see, ay! | | | |

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|---|---|---|---|---|
| **Conducting Demonstration (incl. Outcome)** | | | | |
| 02:42 | And when you're ready, just let go of the ball | | | |
| 02:49 | Hehehe! | Hahaha! | | |

# Useful Tool for Facilitating Effective Dialogues in the Classroom

## 'Checklist': Descriptions and Examples of *Talk Moves*

Barnes, Gray, and Grinath (2022)[1] have used this scheme to study how *talk moves* are used to elicit and work with student ideas.

**For you as teacher:**
*Ambitious* talk moves result in more effective dialogues than the *conservative* talk moves. So, make sure that *ambitious* talk moves are dominant in your lessons.

| Talk move category | Specific moves | Description |
|---|---|---|
| Ambitious | Probing question | Broad question with many possible valid responses; e.g., *The water is really dark and murky and there's no more apple snails. So what's something that could be going on?* |
| | Press for explanations | Move students toward higher cognitive thinking by pressing for meaning; e.g., *So what are just some explanations that you guys talked about in your groups? How's that going to affect everything?* |
| | Distribute participation | Provide opportunity for additional students to contribute to the classroom ideas; e.g., *What else? What are some other ways?* |
| | Acknowledge contributions | Indicate student contribution holds value without assessing correctness. Often showcasing active listening and encouragement; e.g., *A decrease in algae, okay.* |
| | Revoice | Repeating student contributions to emphasize part of response, ask for clarification, summarize multiple connections, or connect student ideas to specific science concepts; e.g., *So, we are going to say that makes the water dark. Okay. So increasing fertilizer causes a decrease in the algae. And we're going to say that the fertilizer is enough to kill the algae, the snails eat the algae.* |
| Conservative | Display question | Teacher requests simple facts, procedure, or definition with one correct answer the TA is expecting; e.g., *So, what are fertilizers known as, for the plants that is?* |
| | Evaluating correctness | Assessing student contributions are correct or incorrect; e.g., *Energy, that's right!* |
| | Minilecture | Respond to student contributions by delivering content in a short lecture; e.g., *So all ecosystems are limited by primary producers, which is a really interesting concept because the spring has lost a lot of grass. Grass in the bottom of the spring is slowly receding, a lot of the apple snails that you guys saw. There's some snail shells up front. This is actually a nonnative snail, but they're actually... There's none left and it's causing some ecological shifts. Also in the spring that water is getting really murky. It was full of algae.* |

[1] Barnes, E. R., Gray, R., & Grinath, A. S. (2023). Talk moves as pedagogical tools for eliciting and working with student ideas in an undergraduate general biology laboratory. Science Education, 107, 89–123. https://doi.org/10.1002/sce.21762

## (Another) 'Checklist': Goals for Productive Discussions and Nine Talk Moves

Talk Science is a programme to help teachers lead more productive science discussions. Although the project aimed at grades 3 through 5, this template (goals for productive discussion and nine talk moves) are still very helpful to facilitate effective dialogues in the classroom in higher grades.

**For you as teacher:**
I consider this complementary to the checklist of Barnes, Gray and Grinath (2022) shown above.

| **Goal One** Help Individual Students Share, Expand and Clarify Their Own Thinking | Notes/Frequency of Use |
|---|---|
| ☐ **1. Time to Think**<br>- Partner Talk<br>- Writing as Think Time<br>- Wait Time | |
| ☐ **2. Say More:**<br>"Can you say more about that?"<br>"What do you mean by that?"<br>"Can you give an example?" | |
| ☐ **3. So, Are You Saying…?:**<br>"So, let me see if I've got what you're saying. Are you saying…?"<br>(always leaving space for the original student to agree or disagree and say more) | |
| **Goal Two** Help Students Listen Carefully to One Another | |
| ☐ **4. Who Can Rephrase or Repeat?**<br>"Who can repeat what Javon just said or put it into their own words?"<br>(After a partner talk) "What did your partner say?" | |
| **Goal Three** Help Students Deepen Their Reasoning | |
| ☐ **5. Asking for Evidence or Reasoning**<br>"Why do you think that?"<br>"What's your evidence?"<br>"How did you arrive at that conclusion?" | |
| ☐ **6. Challenge or Counterexample**<br>"Does it always work that way?"<br>"How does that idea square with Sonia's example?"<br>"What if it had been a copper cube instead? | |
| **Goal Four** Help Students Think With Others | |
| ☐ **7. Agree/Disagree and Why?**<br>"Do you agree/disagree? (And why?)"<br>"What do people think about what Ian said?"<br>"Does anyone want to respond to that idea?" | |
| ☐ **8. Add On:**<br>"Who can add onto the idea that Jamal is building?"<br>"Can anyone take that suggestion and push it a little further?" | |
| ☐ **9. Explaining What Someone Else Means**<br>"Who can explain what Aisha means when she says that?"<br>"Who thinks they could explain why Simon came up with that answer?"<br>"Why do you think he said that?" | |


Adapted from: Chapin, S. O'Connor, C., & Anderson, N., (2009). *Classroom Discussions: Using Math Talk to Help Students Learn, Grades 1-6. Sausalito, CA: Math Solutions Publication*