sun warming the block, they raised the idea of energy being put into the system in some fashion to allow the block to have the energy to move. For all the joking, that principle was correct (e.g., a hand would have had to lift the block to its original height, also adding energy to the system).

V. DISCUSSION

In this 12-minute episode, teachers spent their time on making sense of the physics of the survey responses, asking their own questions about the physics, and providing insights into their attitudes toward students. They conveyed several messages about the teaching and learning of energy. Some were explicit, while others were implicit in the way they themselves talked about the content.

Teachers had multiple perspectives on student learning. They advocated keeping instruction simple and not "overly complicated," giving reasons such as staying focused and not letting too many "why" questions get in the way of teaching that day's lesson. Based on previous conversations with these and other teachers, we believe they were aiming for the greatest number of students in their class to succeed. At the same time, teachers believed that students could be far more advanced, though their contributions might be disruptive to a class. The teachers' dilemma was between staying "simple and concise" and honoring creative ideas that arose in the classroom. We believe that this is a common problem for teachers, balancing between covering course material as simply as possible and honoring the creativity and knowledge of their students, even when it is more complex than what is expected.

In their own actions, teachers showed what sensemaking looked like. Teachers used multiple models when discussing the physics. They showed a consistent (and persistent) desire to understand the reasons for the box's initial motion. Their attention to the mechanism of the box's initial motion led to suggestions about pedagogy and several questions about the physics. On a formal level, they used both force- and energy-based models to make sense of a problematic situation. In seeking a mechanism and using multiple models to address their questions, they contradicted their desire for a simple, not "overly complicated" model of the situation.

While accounting for the box's initial motion, teachers also reversed themselves on which explanations were appropriate. At the beginning, a teacher had critically stated that the problem with response 2 was, "Because it starts with ending. Like, they talk about when the box stops at the bottom of the ramp. Well, we are talking about the box sitting at the top of the ramp." Later in the conversation, implicit talk about energy transformation and conservation, as well as recognizing the value of evaluating the system's time evolution, was shown to provide a richness of information that had not been part of the earlier discussion. Applying a systems analysis of energy provided a reason for the box's initial motion.

In addition to this formal work, they offered several ridiculous explanations (magnets, wind, the box's effort, and melting) to explain why the box might start moving. The teachers' laughter at the time of presenting these ideas suggested they were not being serious as they invented fantastic, silly models, but their ideas still contained kernels of the correct ideas in them. We note that teachers remembered these ideas even as a more serious analysis of the problem was discussed.

VI. CONCLUSIONS

In this episode, teachers discussed pedagogy and grappled with content in ways that illustrated tensions between competing ideas about what kinds of student thinking to respond to. Should they keep it simple, promoting and working with assigning appropriate names to energy forms and principles? Or should they honor the complexity in thinking and wondering that students may bring to the classroom? The teachers' own persistent curiosity and the richness of their discussion about causality and mechanism in a simple energy scenario was inconsistent with their initial desire to keep these complex elements out of student instruction.

In our professional development, we use data gathered from teachers (or, in other settings, students) to foster conversation about content and pedagogy. By analyzing the comments of their colleagues, they explored important ideas about the content and the modeling of the physics, sought further knowledge about causality and mechanism, and discussed different pedagogical approaches to help make sense of the situation. The teachers' desires to keep instruction as simple as possible were inconsistent with their own curiosity to understand the situation, as well as their desire to honor students' ideas that went beyond what was asked in class. These results indicate a rich environment for discussing knowledge of content and students [2] as well as the disciplinary substance of the material [4].

ACKNOWLEDGEMENTS

We thank Alex Axthelm, Oai Ha, and Greg Kranich for their help with the manuscript. We also thank the teachers of the Maine Physical Sciences Partnership who participated in the activity. This work was supported in part by NSF grants MSP-0962805 and DRL-1222580.

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