

Positioning Ideas: Creating and Relating Physics Identities Through Video Analysis

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Learning Context: Learning Physical Science (LEPS)

LEPS uses technology such as student response systems (“clickers”), videos of lab experiments, and online discussion forums to maintain many of the inquiry aspects of PSET and allow for instruction in a traditional lecture hall. LEPS includes learning goals associated with physics content and understanding how people learn and how scientists develop new science ideas. In learning about learning (LAL) and nature of science (NOS) activities, LEPS students watch videos of children and undergraduates talking about science. The LEPS students discussed the videos in an online asynchronous threaded discussion format.



Data Collection and Initial Analysis

Question: How do prospective K-5 teachers demonstrate their understanding of content knowledge when analyzing video tapes of other learners in online discussions?

Data. Discussion board postings for Unit 2 (Forces) for all students (N=34) in one class - undergrad juniors and seniors who intended to become elementary teachers.

Analysis. We coded postings based on the function of the text (see table for sample codes)

Text	Code
1 It seems that fifth graders are getting force mixed up with energy. They were correct when they said the force comes from the foot, however, both groups ... said that the force of the kick stays with the soccer ball as it continues to move. This is very logical. The 2 nd /3 rd grader understands that to keep the toy car moving it needs some sort of power source, such as a battery or electricity; otherwise the car will come to a stop. <u>My ideas about force were similar to both of these ideas. Now that I have learned about force, I understand that force is applied, but does not stay with an object after contact no longer exists.</u>	AC
14 Therefore, after the foot is done making contact with the soccer ball, there is no more force- only energy. <u>Like the 2nd/3rd grader said, I believe that for an object to continue to move forward without a direct force being applied some sort of other power must be present, unless there is no friction present. None of the elementary students directly discussed friction. The 2nd/3rd grader did talk briefly about gravity. He said that gravity helps the car slow down. <u>This would be the same thinking as the last undergraduate student that spoke.</u> All of the ideas relating to friction slowing the object down make sense...</u>	OIP OIC OIC AC AU

Finding 1: LEPS Students position their own ideas

LEPS students to exhibited their understanding of physics primarily through comparing their ideas to those of the children and undergraduates in the video.

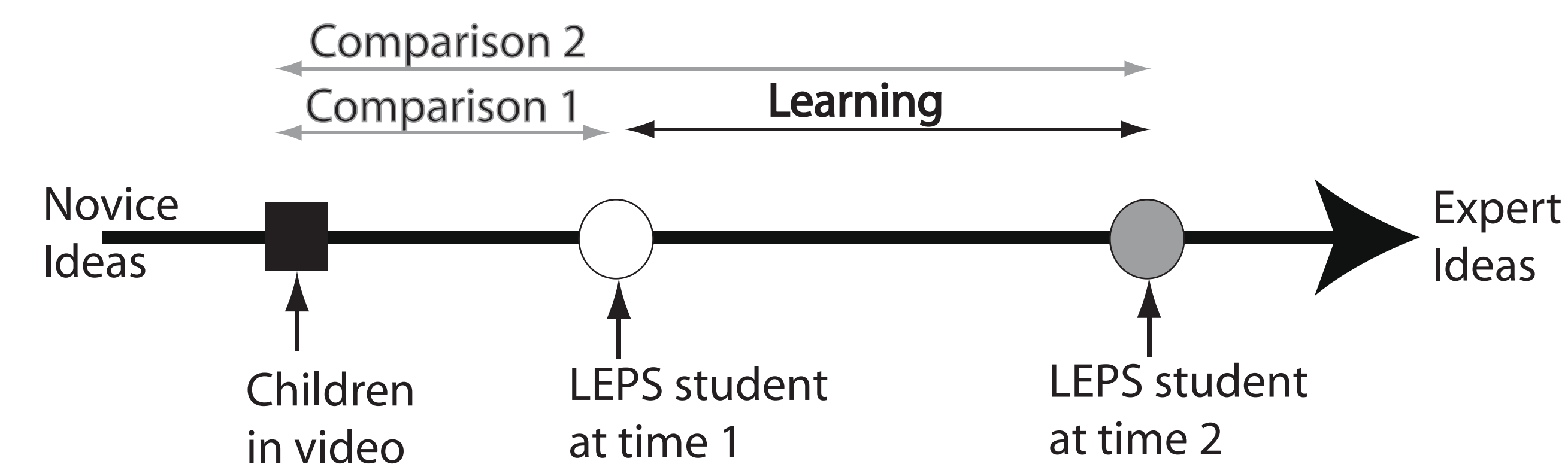
This occurred through a discursive practice we call *positioning ideas*. We identified this practice as the co-occurrence of the following codes within a given posting: *analyzing other's ideas* (children's or undergraduates') and the code(s) *state own ideas* (current or prior) *ideas* or *direct physics talk*.

This occurred in posting by 87% (27 of 31) students who posted a response for the analyzed sections .

Finding 2: Students' identified common features of their own & children's ideas

LEPS students noticed that children had good ideas. (e.g. “The children's ideas about force are very logical. They know that something is happening at the moment that their foot and the ball touch in order for the ball to move.”)

This type of statement in which the LEPS student discussed the logic, intelligence, or the reasonableness of the children's ideas occurred in all of the analyzed postings. In all but one of these postings, the LEPS students identified commonalities between the ideas that they s began the course with and the ideas expressed by the elementary students in the videos.



Code	Example
Direct talk about physics (PHYS)	There is another force that is also acting on the soccer ball, which is making it slow down. This is frictional force.
Analyze other's ideas - Children (AC)	The children understand that the foot is a force acting on the ball
Analyze other's ideas - Undergrads (AU)	This is similar to the undergraduate's ideas of the fore of friction acting on the cart changes the speed of the cart
State own ideas - prior (OI-P)	Before this class ... I used to think that some force was transferred to the ball
State own ideas - current (OI-C)	However, now I know ... the minute contact is lost the force is no longer working on the object

Implications

Questions in which students are guided toward positioning ideas (requiring both the analysis of others' ideas and reflection on their own ideas) help students develop narratives that position themselves as experts with respect themselves earlier in the course.

Helping teachers establish identities as science learners is an important function of the science courses that pre-service elementary teachers enroll in. Integrating this type of activity into science

Explaining findings:

The role of the video: establishing a referent

Video of others provides a point of comparison for their own ideas. If students are asked to compare their current ideas to their prior ideas, they cannot make very educated estimates of how much their ideas have changed. Knowing whether one knows “a lot” or “a little” is difficult when one does not know what there is to learn. As a result, comparing these two assessments of their own knowledge does not result in very specific estimates of their learning. However, when the student compares her ideas to a known value (e.g., the elementary children's ideas expressed in the video), she can establish her own ideas (pre and post) more precisely. This facilitates a better idea of the change in ideas.

The role of the discussion board: postings as narratives

The LEPS students' responses contain several narrative-like features: a clearly defined teller, tale and audience; and a trajectory that leads the audience to a conclusion. Positioning in narrative analysis is connected to the formation of identity. Thus, if the discussion postings are taken as narrative accounts of their physics learning, how the students position themselves within the narrative and with respect to their audience and the characters in their story (students in the videos) provides us important information about the student's evolving identity as a physics learner. In LEPS students position themselves as knowledgeable in physics with respect to the children in the videos.

Perhaps, more importantly, they also position their current selves as experts in relation to their prior selves before they enrolled in the LEPS course.



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Acknowledgements
This research was supported by NSF grant 0732233. We thank Fred Goldberg for collecting data used in this study and the rest of the LEPS team (Steve Robinson, Ed Price, & Rebecca Kruse) for useful discussion about the LAL activities.

