Impact of Students' Scaffolded Small-Group Discussions on Their Written Scientific Explanations

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I'm seeing…

… that students sometimes have difficulty translating their classroom conversations into their written work.

… that though social interaction is considered important to scientific knowledge construction (Ward, 2014), there has been little research linking student discourse to written assignments (Mercer, 2000).

I'm asking…

… what is the impact of small-group discourse on the written scientific explanations of earth science and environmental science students in grades 9-12?

My thinking is informed by…

… the tension among educational and psychological researchers about the locus of knowledge construction.

Is knowledge constructed culturally through collective thought and action or is constructed individually through cognitive processes?

Social Cognitive Theory (Bandura, 1986) vs Sociocultural Theory (Vygotsky, 1978)

My personal experiences as both an educator and researcher have led me to develop a *sociocultural* approach to knowledge construction.

Mercer (2000, 2004) identifies language as a tool of culture for both constructing and communicating knowledge.

My research questions are…

1. How does the addition of the latent quality of conversation (QoC) construct change the original MEL project structural equation model?

2. How do students' total discourse scores (TDS) and evaluation scores (ES) change over time and does the order of topics matter for either score?

3. How do selected students' participation in the small group discussions align with their written ESs?

References

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Mercer, N. (2000). Words and minds: How we use language to think together. New York, NY: Routledge.
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Vygotsky, L. (1978). Interaction between learning and development. In M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds.), *Mind and Society* (pp. 79–91). Cambridge, MA: Harvard University Press.
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Proposed Data Analysis

Original Model:

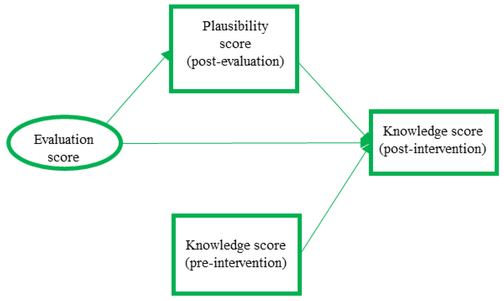


Figure 1. Comparison of mediated (by plausibility re-appraisal) and direct causal models showing the relation of evaluation to post-instructional knowledge, above and beyond pre-instructional (background) knowledge. (Original model from Lombardi, et al., 2018)

Proposed Initial Model:

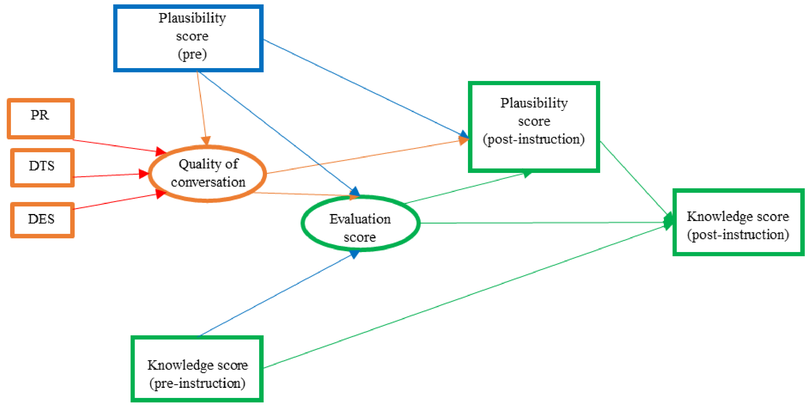


Figure 2. Proposed structural equation model with new conversation factors included. PR- participation rate, DTS- discourse type score, DES- discourse evaluation score.

Hypothesized Final Model:

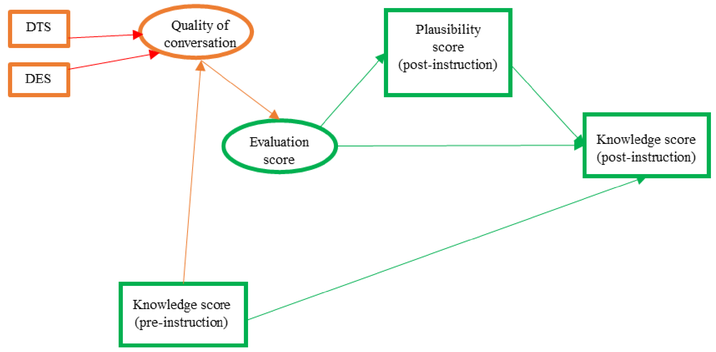
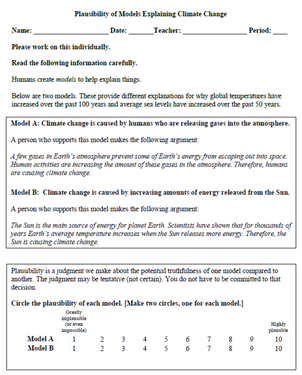


Figure 3. Hypothesized final structural equation model with new conversation factors included.

The MEL-Diagram activity is…

… an instructional scaffold designed engage students in scientific evaluation of the relationship between evidence and explanatory models and to enact plausibility shifts towards scientifically accepted models. (Lombardi, et al., 2018).



Plausibility of Models Explaining Climate Change

Name: _____ Date: _____Teacher: _____ Period: ____

Please work on this individually.

Read the following information carefully.

Humans create *models* to help explain things.

Below are two models. These provide different explanations for why global temperatures have increased over the past 100 years and average sea levels have increased over the past 50 years.

Model A: Climate change is caused by humans who are releasing gases into the atmosphere.

A person who supports this model makes the following argument:

A few gases in Earth's atmosphere prevent some of Earth's energy from escaping out into space. Human activities are increasing the amount of these gases in the atmosphere. Therefore, humans are causing climate change.

Model B: Climate change is caused by increasing amounts of energy released from the Sun.

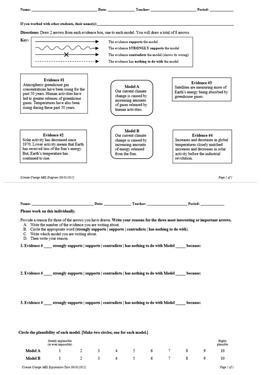
A person who supports this model makes the following argument:

The Sun is the main source of energy for planet Earth. Scientists have shown that for thousands of years Earth's average temperature increases when the Sun releases more energy. Therefore, the Sun is causing climate change.

Plausibility is a judgment we make about the potential truthfulness of one model compared to another. The judgment may be tentative (not certain). You do not have to be committed to that decision.

Circle the plausibility of each model. [Make two circles, one for each model.]

	Greatly supportive (or evidence supports)								Highly plausible
Model A	1	2	3	4	5	6	7	8	9	10
Model B	1	2	3	4	5	6	7	8	9	10



The steps we are taking…

… include two main methods:

1. Transcripts of the student work groups are being coded using sociocultural discourse analysis (SDA; Mercer, 2004) procedures. Codes were originally derived from SDA theory, however additional codes are developed during the coding process.

2. Documents of selected students are being analyzed, looking for the inclusion of phrases from the discourse analysis using in the construction of their explanations. These phrases may have been spoken by them or their coworkers.

It could mean…

… that teachers need to continue to support how their students participate in small-group discourse or that they may need to re-direct this discourse to make it more productive

What the Abell Institute means to me…

The Sandra K. Abell Institute for Doctoral Research has improved my work in the following ways:

1. I have a better understanding of how to connect my theoretical framework to my research
2. I can look at my work more critically.
3. I can be part of a community of peers that supports me and pushes me to be a better researcher.