Collaborative Model-Building and Peer Critique Online

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The paper describes a large scale design study involving a total of 1100 middle and high school students from California and Massachusetts who collaborated on-line about plate tectonic activity in their respective location. The students, drawn from demographically diverse schools, collaborated on-line using WISE (Web-based Inquiry Science Environment; Linn, 1999). WISE is a web-based integrated set of software resources to engage students in many types of scientific inquiry, including prompted reflection, electronic discussions, evidence sorting and argument mapping, collaborative search for evidence, collaborative design, and analysis (Linn & Hsi, 2000).

Following the WISE design framework, the two main pedagogical principles embodied in the present study were: Make thinking visible and help students learn from one another. In terms of **making thinking visible, we engaged students in two visual modes of representation**. First, using the drawing tool in WISE, students drew their models and used these models as artifacts for reiterative cycles of critique and model-revision. Secondly, students viewed a set of dynamic, runnable models of plate tectonic phenomena in order to better visualize the dynamic, causal, and temporal processes. In terms of **helping students learn from one another,** we engaged students in tasks in which they critiqued their learning partners' models from the opposite coast. We did this to provide students with an opportunity to both think deeply about the domain in order to do the critiques, as well as to promote their understanding of the nature of models in science.

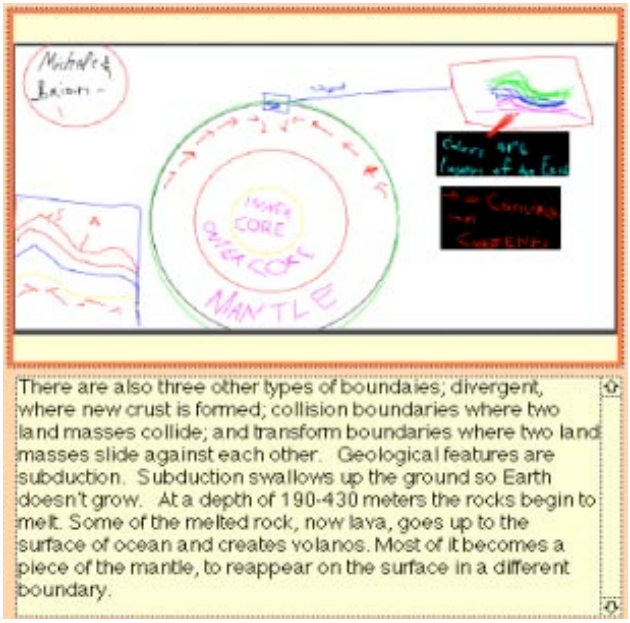

Figure 1: One pair's revised model and explanation.

Data from 15 classrooms is described and examples of student work are presented. Data analysis was focussed on primarily three areas: 1) measuring overall content gains of the domain, 2) measuring epistemological gains about the nature of models as both representations of causal systems and as communication tools, and 3) characterizing the nature of students' model critiques and subsequent revisions on the basis of these critiques. Results suggest that the unit and the east-west coast collaboration was successful in promoting deep content learning as measured by the content gains (Gobert et al, 2002a). Additionally, the task of evaluating and critiquing their peers' models fostered students' epistemologies of models (Gobert et al, 2002b). Follow up analyses are currently focussed on the ways in which students' epistemologies of models served as bootstrapping devices for driving model building, deep content understanding, and transfer.

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References

Gobert, J. Slotta, J. & Pallant, A., Nagy, S. & Targum, E. (2002a). A WISE Inquiry Project for Students' East-West Coast Collaboration, Presented at the Annual Meeting of the American Educational Research Association, New Orleans, LO, April 1-5.

Gobert, J., Snyder, J., & Houghton, C. (2002b). The influence of students' understanding of models on model-based reasoning. Presented at the Annual Meeting of the American Educational Research Association, New Orleans, LO, April 1-5.

Linn, M. C. (1999). Designing the knowledge integration environment: The partnership inquiry process. Created for *International Journal of Science Education.*

Linn, M. C., & Hsi, S. (2000). *Computers, Teachers, Peers: Science Learning Partners*. Hillsdale, NJ: Erlbaum.