

# **Inquiry Practices As Systems: Characterizing Important Elements of Reasoning**

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Reform in science education has focused on inquiry as a way of teaching students complex scientific practices in the context of open-ended investigations. Yet students have difficulties making strategic decisions about the direction of their investigations and drawing on content knowledge to make sense of data (Edelson, Gordin, & Pea, 1999). Furthermore, the inquiry practices called for in reforms are quite broadly specified. Implementing these practices requires engaging students in specific tasks, and interactions. How do teachers and students put general ideas like hypothesis testing, building explanations, and defending models into practice in classrooms?

The question we ask in this analysis is: *what are elements of reasoning in which teachers engage students when supporting them in complex inquiry practices?* We look at two teachers enacting an inquiry-based, middle-school curriculum focusing on ecosystems and natural selection. The curriculum, entitled *Struggle in Natural Environments: What Will Survive?* includes an investigation of the effects of invasive species on ecosystems. Major content goals include structure/function relationships, competition, and food web interactions. Students also engage in inquiry skills such as modeling and developing explanations. Students use what they learn throughout the unit to propose and defend a plan to rid the Great Lakes of the sea lamprey, an invasive species. Because of the ambitious nature of this investigation, we wanted to understand how teachers supported students in engaging in inquiry practices during the course of the unit.

We present examples of two classroom sequences conducted over eight weeks that comprise the inquiry practices of *understanding and applying a model* and *developing a scientific explanation*. We use Collins and Ferguson's (1993) theory of epistemic forms (types of knowledge) and epistemic games (reasoning that builds or applies the knowledge structure) to characterize the specific kinds of tasks that combine to form the overall inquiry practice. We see that teachers build a system of interrelated tasks to engage students in a complex practice such as understanding a model. For example, teachers had students first identify the elements of the model, then predict the results of changes to the model, and finally apply the model to a new situation. These reasoning tasks were part of the overall modeling inquiry practice. This analysis suggests how teachers might translate broadly stated inquiry practices into specific reasoning tasks for students in classrooms.

## **References**

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