

My World: A Case Study in Adapting Scientists' Tools for Learners

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In previous research, we identified strategies for adapting scientists' investigation tools to be appropriate for use by students to support inquiry-based learning (Edelson & Gordin, 1998; Edelson, Gordin, & Pea, 1999). The goal is to take tools that enable scientists to conduct investigations that extend the boundary of human understanding and adapt them to create tools that enable students to conduct investigations that enable them to extend the boundaries of their personal understanding. The challenge is to take a tool designed for experts who bring substantial understanding of both the subject under study and the investigation techniques supported by the tool and convert it into a tool for novices who will use the tool to develop understanding of subject matter and investigation techniques.

To achieve these goals, we have developed five strategies for adapting investigation tools for learners: (1) *Strategically select functionality*. The goal in this process is to select operations in a way that maximizes investigation power without overwhelming learners with complexity. (2) *Embed experts' tacit knowledge in the user interface*. Scientists bring expertise in content and process to their use of tools. Learners can be scaffolded by making some of that knowledge explicit in the user-interface. (3) *Automate difficult but pedagogically unimportant processes*. In any scientific investigation technique, there are steps that are necessary to do but do not contribute to the achievement of any learning objectives. Automating these steps enables learners to devote their time to activities that provide more benefit for learning. (4) *Add bridging functions*. Bridging functions are functions that can be added to scientists' tools to help learners to understand some important aspect of them. These are functions that would not generally be useful to an expert but provide an important stepping stone to developing understanding of the functions that are present in an expert tool. (5) *Add inquiry support tools*. Inquiry support tools assist learners in managing and tracking the complex process of conducting scientific investigations. They might help to structure the inquiry process or with managing the products of an investigation.

Approximately two years ago, we began to explore the application of these strategies to a form of investigation tool that is widely used in the geosciences, the geographic information system (GIS). While there have been widespread calls for the use of GIS tools in classrooms, the difficulty of using professional tools has proven to be a significant obstacle to its use (Kerski, 2000). My World GIS™, the tool we are developing is designed to provide students from middle school through college with the opportunity to conduct investigations using a wide variety of Earth science, environmental science, geography, and social studies data. To date, the use of these strategies has been based on heuristic analysis. Currently, we are initiating a program of laboratory- and classroom-based user studies to empirically investigate obstacles faced by learners in using GIS and strategies to address them.

References

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