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## Award Abstract #1256490

## Piloting Graph Literacy Activities in Maine

NSF Org: [DRL](#)  
[Division of Research on Learning in Formal and Informal Settings \(DRL\)](#)

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DRL Division of Research on Learning in Formal and Informal Settings (DRL)  
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## ABSTRACT

The goal of this project is to develop and pilot test a limited number of free computer-based instructional activities that improve student graph comprehension, aimed especially at science students in grades 7 and 8. In addition, the project is developing a pilot assessment instrument focusing on students' comprehension of graphs ("graph literacy"). The activities and the assessment instrument are being pilot tested in Maine, a rural state where family income is below the national average and students are underrepresented in studying STEM topics after high school. The state has identified this topic as an important one to focus on in the coming year.

Graph literacy is the ability to identify the important features of a wide variety of graphs and relate those features to the context of the graphs. This increases the students'

understanding not only of how to interpret graphs, but also of the science content. This definition of graph literacy, while based in the math and science standards, goes beyond skills tested by many assessments of graph knowledge because they focus primarily on reading points off a graph, typically a type of graph that students have studied and are familiar with. While broadening the usual definition for graph skills, the project focuses on scatter and line graphs of the type encountered in many mathematics and science courses in grades 7-12, as well as in newspapers and magazines.

Graphs are central to STEM learning in many subjects and at almost all education levels. In spite of the vital role of graphs, students at all ages demonstrate difficulties using and interpreting graphs. The computer-based Graph Literacy activities being developed are based on extensive prior research about students' use and understanding of graphs, as well as continuing advances in delivering education activities through dynamic, interactive Web pages that do not require schools to install any software. Based on the research literature, there is a consensus that students need to be taught graph literacy in three steps: identifying and encoding the important superficial features of a graph they want to understand, such as the titles, units, and axis labels; linking visual features of that graph to mathematical relationships, based on recurring patterns (e.g., linear increase or decrease); and, integrating all of these features with the context of the graph. The activities we are developing are based on this approach, as are the validated assessments being developed to measure students' graph literacy.

The project is conducting a small, randomized experimental trial of the graph literacy activities in year 2 of the project. The goal of is to determine the effectiveness of the graph literacy activities in improving students' understanding of graphs. The open source software and approaches developed under the prior grant contribute directly to the likely success of this project. Because of growing interest in use of online resources for teaching and learning, this work is potentially transformative for a wide range of audiences, including teachers, students, researchers, and the developers and publishers of instructional materials across all STEM areas and grades. The underlying software technology for Graph Literacy is being made available as open source computer code, and any activities that use the code are released under a creative commons license. As a result, the graph literacy activities, and the pilot assessment instrument, can be widely adopted at no cost.

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