

The Design and Evaluation of Educative Just-In-Time Teacher Supports in a Web-Based Environment

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Abstract: Researchers have advocated for the development of educative curriculum materials to support teachers as they engage in reform-oriented teaching. In this poster we report on the design and evaluation of a set of just-in-time, educative, teacher supports for an online project-based unit. Our design of the supports was informed by frameworks for educative materials (e.g. Davis & Krajcik, 2005), and we analyzed their use with 17 middle and high school teachers in a pilot study.

Introduction

Engaging students in inquiry practices is challenging and effective instructional materials need to support teachers as they learn and implement reform-based teaching (Varma, Husic, & Linn, 2008). Such materials have been termed “educative” by Davis and Krajcik (2005). While there is a growing body of research on the development of educative materials, most of it refers to paper-based curricula and much less is known about the ways in which online inquiry-based environments can be educative for teachers (Davis, Smithey, & Petish, 2004; Varma et al., 2008). Moreover, educative materials tend to present teachers with a large amount of information. These materials can seem overwhelming to teachers who often request, and need, just-in-time support as they enact the unit or lesson. In this poster we describe our efforts to develop and pilot test a set of just-in-time teacher supports embedded into an online project-based learning environment called the COOL Classroom. Specifically, we designed the supports to aid teachers in their implementation of a unit on the impacts of the Hudson River water on the ocean waters of the Hudson Bay. We conducted a pilot study with middle and high school teachers to ascertain the ways in which teachers used the set of supports. In our poster we will discuss our design of the teachers support, findings from the pilot study, and our current attempts to revise the design in ways that address the challenges identified in the pilot study.

The Instructional Design

The two-week unit, entitled *Hudson River Plume*, focuses on the impact of non-point pollution from watersheds on the Hudson Bay ecosystem, and begins with the driving question “How does your watershed impact the ocean?” The unit included both on-line and off line activities. In this unit students explore Satellite Surface Temperature data sets to study the interaction between river and ocean water, they learn about non-point source pollution in watersheds, and they investigate the process of eutrophication through an online simulation.

The teacher supports, a set of text-box tabs, are superimposed on the student interface and can be toggled on or off (supports are only visible when the teacher is logged in). There are four support categories that we developed based on existing frameworks for educative materials. Ball and Cohen (1996) argued that educative materials can foster teacher learning, and they provided general suggestions to facilitate the development of these materials, for example the need to help teachers understand and deal with student ideas. Davis and Krajcik (2005) built on the ideas of Ball and Cohen (1996) and proposed nine heuristics for pedagogical content knowledge for educative science curricula. The nine heuristics are organized in three strands: pedagogical content knowledge for science topics, pedagogical content knowledge for scientific inquiry, and developing teachers’ subject matter knowledge. In reference to these frameworks we developed four supports: *in-class notes*, *related activities*, *student difficulties*, and *resources*. *In-class notes* provided just-in-time information about running the lesson segment associated with the specific interface (or sequence of interfaces) such as: stopping for discussion, questions to ask students, etc. The *related activities* category provided information and links to additional offline activities relevant to the content on the current interface. Under *student difficulties*, we provided information about common student alternative conceptions and potential misunderstandings. The latter three categories provided pedagogical content knowledge for science topics in terms of teaching strategies, relevant student ideas and difficulties. The final category, *resources*, provided teachers with additional background information about the scientific phenomenon to extend their subject matter knowledge. Text in these tabs was kept as succinct as possible and tabs only appeared if

there was relevant information for that specific interface. Our design goal was to provide support to teachers, that they could use in a just-in-time manner, as they engaged students with specific activities on the specific interface.

Methods

To study teachers' use of the supports we conducted a pilot study with 17 middle and high school teachers. We collected three sources of data from the pilot teachers: (a) teacher journals in the form of an online survey that we asked teachers to complete on a daily basis whenever the unit was implemented; (b) videotape recordings of a focus group session in which the teachers discussed their positive and negative experiences using the unit; and (c) small group exit interviews focused on teachers' experience with the implementation of a handful of specific activities and in particular the teacher supports for those activity pages.

We analyzed the data in terms of the following questions: (a) when did teachers use the supports? (b) which supports were useful for the teachers, and which were not as useful? and (c) in what ways did teachers' implementation of the unit vary from the instructions provided in the supports and what was their reasoning for these deviations? We began by looking at the teacher journals to ascertain trends in teachers' evaluation of the utility of the supports. We then analyzed the focus group sessions and small group interviews to determine when and how teachers were using the supports, as well as to characterize the reasons for low fidelity implementations.

Results and Discussion

Our findings suggest that teachers varied in how they used the supports, specifically there were variations in the just-in-time use of the supports, as well as the chunking or lesson segmentation. The latter variations were often due to underdeveloped or underspecified supports, and the use of supports in a just-in-time manner. Some of the variations in lesson segmentation, such as finding it difficult to have class discussions at times designated in the in-class notes, were due to teachers' misinterpreting the lesson segmentation information provided, or disagreeing with the segmentation as defined in the online environment. A solution to this issue is to make salient, via the web interfaces, where activity sets begin and end. We intend to revise the environment to introduce a third view that will provide a simultaneous view of a segment as a set of thumbnail images of the interfaces included in that segment. This will allow the teachers to view the sequence of segments, and what is included in each segment. We found that sometimes the variation in implementation were due to a lack of information in the supports. This was due to one of two reasons: (a) we as the designers did not anticipate and address problems relating to certain aspects of an activity or students' engagement with it; (b) we as designers provided instructions for implementation but did not explain the reasoning behind these instructions. The solution to the first problem is to more fully develop these supports given new information about the implementation of each activity obtained in the pilot study. The underspecified supports problem was often due to our attempt to keep the text of the teacher supports simple and brief. In our redesign we will supplement the text of the supports to include the missing rationale as well as provide additional information about the design in the *teacher lounge* section of the environment. While we designed the supports for just-in time use (to reduce the cognitive load placed on teachers as they implement), we did not find evidence that teachers used them in such a manner. Most teachers read the supports prior to teaching the day's lesson. It may be that just-in-time supports are not conducive for first-time implementations. A solution to this issue is to enable teachers to print out the teacher supports (with thumbnail images of the student interface) as one document that can help them see the unit in its entirety as well as the specific supports for every student page. In addition we may include an automated prompt to remind teachers to log in so that they can view the supports as they are teaching.

References

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