

# A Study of *How* Online Learning Resource Are Used

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## ABSTRACT

This paper defines a model of teacher practice (“teaching as design”), and describes a professional development curriculum in which K-12 teachers design learning activities using resources and tools from education digital libraries. It then presents preliminary findings from an application of this model in which teachers’ artifacts are analyzed to learn *how* online learning resources are used *in situ*. Initial results suggest that learning resources of a smaller granularity are more likely to be adapted or improvised upon in teacher-designed learning activities, which further supports teachers’ becoming contributors of online resources and active participants in an education cyberinfrastructure.

## Categories and Subject Descriptors

K.3.0 [Computer and Education]: *General*

## General Terms

Human Factors, Measurement

## Keywords

Education Digital Libraries; Use; Online Learning Resources

## 1. INTRODUCTION

Despite much research on the technical design and development of education digital libraries, such as the National Science Digital Library (NSDL), much less is known about *in situ* usage of online learning resources by teachers and learners. Previous studies that examined usage tended to rely on a combination of surveys, webmetrics, and qualitative methods such as interviews and focus groups to describe user knowledge, attitudes, and behaviors. While important, these methods have not adequately captured relevant aspects of teacher practice that influence uptake, use and re-use of online learning resources, making it difficult to report empirical data that can benefit digital library developers and stakeholders in the education community.

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To address this methodological gap, this paper first defines a model of teachers’ practice when using digital library resources (“teaching as design”), which includes an approach for characterizing usage along a continuum. It then presents analysis and preliminary findings from an application of this approach with teachers engaged in professional development workshops through the Digital Libraries go to School project. This project is helping to close the loop between users as consumers and contributors [1], by combining web-based tools (the Instructional Architect, NSDL) with a professional development curriculum for teachers.

## 2. TEACHING AS DESIGN

The perspective informing our model is one in which teachers take advantage of the vast wealth of online resources to *design* and *implement* learning activities in ways suitable to their local context. Informed by Brown & Edelson’s [2] perspective of ‘teaching as design,’ we argue that the kinds of learning activities teachers can design are both supported and constrained by the wide availability of high-quality, online resources (such as provided by NSDL), and that these activities are also informed by teachers’ unique knowledge, skills and experience.

In developing an approach that moves beyond *whether* teachers are using online resources to identifying *how* and *what* they do with those resources in the context of education digital libraries, we use the following two dimensions: 1) where on a continuum (offload, adaptation or improvisation) teacher-designed activities lie, and 2) granularity of resources included in those activities.

In examining teachers’ use of curricula, Brown & Edelson define a continuum, ranging from **offloads** to **adaptations** to **improvisations**. In the context of digital library resources, we define the continuum as follows: *Offload*: teachers provide links to resources with little added teacher-created content (e.g., explanations or instructions); *Adaptation*: a midpoint, with teacher-created content and links to resources providing similar amounts instructional intent; *Improvisation*: teachers use links to resources as a starting point, but have clearly made substantial contributions of personal content (e.g., knowledge about the goals of the designed instruction can be readily inferred). It should be noted that in this model, instances on the continuum are neutral with regards to quality or effectiveness of teaching.

Additionally, the granularity (or size) of a resource, as defined by the SCORM standard [3], can impact adaptation. Our hypothesis is that because of many internal dependencies, large

resources are best used with little modification or additional effort, and the number of contexts in which they can be applied is small, therefore leading to offload types of learning activities. Conversely, small self-contained resources afford greater teacher improvisation and adaptation in a wider range of situations.

To implement this model, the Digital Libraries go to School project developed a professional development curriculum for K12 teachers consisting of two, hands-on workshop sessions with between-workshop teaching activities and follow-up communications. In the first session, teachers learn to use a simple, online, end-user authoring service, the **Instructional Architect** (IA). With the IA, teachers can *find* and *gather* NSDL and web resources, *design* web-based instructional activities (called projects) with gathered resources to meet their classroom needs, and *share* these projects with students and peers (Figure 1) [4]. In between sessions, teachers *implement* at least one of their designed activities in their classrooms. Eventually, teacher-created learning activities will be reviewed and added to NSDL. By creating a professional development curriculum that supports teachers as designers of learning activities, which are relevant *in situ*, and that incorporates qualitative and quantitative data throughout, there are now artifacts and data that provide another perspective from which to analyze the use of online resources, as explained in the next section.



Figure 1. A User Project from the Instructional Architect

### 3. METHODS AND ANALYSIS

Findings from two workshops are reported, with 7 K-12 teachers participating in the first and 6 in the second (N=13). Most teachers (85%) reported more than 6 years of experience and most (77%) taught at the secondary level. Our analyses included 24 projects that had been viewed more than 10 times under the assumption that they were likely to have been accessed by students and thus are completed as opposed to draft projects. These projects were viewed a mean of 39.7 times and referenced a mean of 4.6 online resources. In this preliminary work, projects were coded at the end points of the design continuum (offload and improvise) and for the granularity level of resources use in the projects.

Analyses suggest that 11 of the 24 projects (46%) linked to large granularity resources with little amounts of added content (beyond navigational instructions) that either explained or provided a context. As such, they were characterized as **offloads** at *design time*. Five teacher projects (including the example in Figure 1) linked to small granularity resources, while also including teachers'

own contributions in the form of worksheets, explanations, or instructional strategies. As such, they were characterized as **improvisations** at design time (see Table 1). Thus, the hypothesis that large granularity resources were used in offloads and that small granularity resources were used in improvisations was confirmed.

TABLE 1. Relationship between resource granularity and project design

Avg. Resource Granularity	Project design	
	Offload	Improvise
Small	0	6
Medium	3	2
Large	11	2

Unfortunately, this type of artifact analysis fails to reveal additional context that may have been provided by a teacher at implementation time. For example teachers may have provided verbal explanations and guidance before or during the students' learning activities. In this case, it can be argued that the teacher is following an **improvisation** strategy at *implementation time* even though the related artifact looks like an **offload** when viewed at *design time*.

### 4. CONCLUSION

The different strategies teachers use to design learning activities composed of online learning resources are in part related to the granularity of the online resources available in education digital libraries. Over the next two years of this project, further studies will be conducted around the model described here in order to inform the design of online resources and evaluation strategies for education digital library developers. Involving teachers as designers of learning activities that are relevant to their classroom needs helps them participate in the emerging education cyberinfrastructure, first as users of online resources and eventually closing the loop by contributing learning activities back to education digital libraries.

### 5. ACKNOWLEDGMENTS

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