Analyzing CMS Affordances through the RAT Framework for Online Language Teacher Education

A Case Study

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Abstract—**The involvement of institutions of higher learning in distance education has increased dramatically in the last decade. However, there is still room for participation in distance education at the programmatic level, including participation by language teacher education programs. One of the most important decisions made by universities seeking to offer online courses is the choice of a course management system (CMS), and in a field that emphasizes student-centered learning, it is important to study the affordances of a CMS for such student-centered learning. The CMS affordances in this study were analyzed through the RAT framework, which categorizes use of technology into replacement, amplification, and transformation. This paper focuses on the data obtained from one of nine professors identified as integrating technology in exemplary ways in his totally online graduate level education course at a Midwestern US university. Data sources included a pre-interview, observation field notes, and a post-interview. Inductive thematic analysis was conducted. Preliminary findings suggest that most CMS affordances fell within the amplification category with some affordances having the potential for transformation. There were also instances of the replacement use of technology but none of the transformative use of technology. This paper ends with implications for language teacher education.**

Keywords-course management system; CMS; learning management system; LMS; Desire2Learn; D2L; RAT Framework; replacement; amplification; transformation; distance education; online learning; language teacher education

I. INTRODUCTION

The involvement of institutions of higher learning in distance education has increased dramatically in the last decade. In the United States, 1.6 million students or 11% of the student population enrolled in at least one online course in Fall 2002 [1]. This number increased to 3.5 million or 20% of the student population in Fall 2006 [1]. Even then, one-third of higher education institutions, primarily online universities, account for three-fourths of online enrollments [1], suggesting that there is still room for participation in distance education by traditional brick-and-mortar universities.

One of the first decisions made by these traditional universities seeking to offer online courses, indeed a decision made long before a desire to offer such online courses is conceived, is the choice of a course management system (CMS). In the field of education, particularly language teacher education, the interaction between the use of a CMS and a faculty member's teaching beliefs and practice is of great interest. In a field that emphasizes student-centered learning, research suggests that "an instructor's learner-centered conceptions of knowledge and teaching may not be sufficient to allow them to perceive the affordances of a CMS for supporting student learning with technology" [2]. In view of this, a study that focuses on analyzing the affordances of a CMS for such student-centered learning is imperative, and one such study is the one focused on in this paper.

II. LITERATURE REVIEW

There have been many models of technology integration. However, not all of these models focus on "assessing the extent to which teachers' technology integration improved their practice" [3]. One such model is the RAT Framework, which consists of three categories of technology use, namely replacement, amplification, and transformation (RAT), with the last being the most innovative and student-centered [4], and it is through this framework that the CMS affordances as demonstrated in the study will be analyzed.

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The RAT Framework consists of themes (instructional methods, student learning processes, and curriculum goals), with dimensions (e.g. teacher's role, activity task, etc.) within each theme, as demonstrated below [5]:

TABLE I. DIMENSIONS (WITHIN THEMES) FOR GUIDING ANALYSIS OF TECHNOLOGY USE

Instructional Methods	Student Learning Processes	Curriculum Goals
… include …		
Teacher's role	Activity task	"Knowledge" to be gained, learned, or applied
Interaction with students	Thinking process – mental process	"Experience" to be gained, learned, or applied
Assessment of students	Task milieu (individual, small group, whole-class, others)	
Professional development	Motivation	
Preparation	Student attitude	
Administrative tasks		

Each theme and dimension can be categorized into:

- Replacement: "technology used to replace and, in no way change established instructional practices, student learning processes, or content goals" [5];
- Amplification: "technology use that amplified current instructional practices, student learning, or content goals" [5] resulting in increased efficiency and productivity while the tasks remained the same [5, 6]; and
- Transformation: "technology use that transforms the instructional method, the students' learning processes, and/or the actual subject matter" [5] in terms of changes in learning routines, mental work, organizations, players, problem-solving opportunities, and instructor roles, among others [5].

In a study investigating the influence of CMSs on teaching methods and the affordances of these CMSs for student-centered teaching, Apedoe (2009) found that the use of CMSs did not change faculty members' teaching beliefs or practices, and that they were used "primarily for information dissemination purposes" [2], a practice that can be categorized as replacement.

The RAT Framework has also been repurposed to assess not only technology integration, but also non-technology teaching tools like having "students publicly share their mathematical thinking as part of classroom instruction" [7]. Unlike the previous study [2] where technology was primarily used as replacement, here, replacement was implemented by 50% of the 14 teachers studied, and amplification by 93% of the teachers. There were no instances of transformation observed in the study. This study also suggested a possible additional category, namely the "potential to be transformative with minor modifications" [7], which will be used in the current study.

III. METHODOLOGY

The data of this qualitative multiple case study was collected by nine MA TESL students in a Computer-Assisted Language Learning course in a Midwestern US university. These students observed and interviewed nine professors identified as integrating technology in exemplary ways in their courses. Data sources included a month of observation field notes, and pre-interviews and post-interviews conducted before and after the month-long observation. Inductive thematic analysis was conducted using the qualitative software, NVivo 9. It should be noted, however, that this paper only focused on the data obtained from one of the nine professors, Dr. Jindrake (pseudonym), who used Desire2Learn (D2L) as the CMS for his totally online graduate level education course.

IV. DISCUSSION

The most common form of computer mediated communication is asynchronous communication, which allows for the implementation of social-constructivist theory [8], and within D2L, this takes the form of Surveys, News, E-mail, Quizzes, Dropbox, Gradebook, Content, and Discussions. The lone synchronous D2L feature used in this study is the text chat. An analysis of the affordances of D2L through the lens of the RAT Framework and its implications for language teacher education follows.

A. Replacement

A preliminary pass through the data shows less evidence of replacement than amplification, which is understandable since the use of technology generally results in the increase in efficiency. However, the use of *Surveys* in the course can be seen as an example of replacement, since they were used by Dr. Jindrake to obtain anonymous student feedback about D2L and online learning in general and the course in particular. This enabled Dr. Jindrake to involve his students in course decisions, as demonstrated by his decision to allow students to participate in discussions of content both synchronously and asynchronously when he had previously only offered synchronous text chat content discussions.

Other D2L features that appear to lend themselves to replacement functions are *News* and *E-mail*, which were used to provide general feedback and course study guides, and to encourage participation. In other words, these features had an organizational function in Dr. Jindrake's class.

B. Amplification

As mentioned earlier, there were more instances of amplification and amplification with the potential for transformation than there were of replacement. Dr. Jindrake's use of *Quizzes* which allowed for the random selection of 30 questions from a question bank of 100-200 questions is an instance of amplification. The Quizzes could be timed and retaken, and students had access to their notes, allowing for its use as both an assessment and a guided learning tool.

Another instance of amplification was Dr. Jindrake's use of course materials, in particular video lectures. He created short video lectures of no more than 10 minutes using Camtasia and Echo and hosted them on D2L and YouTube. The brevity of the video lectures was necessary because of YouTube time constraint and the recommendations of cognitive science. Indeed, Dr. Jindrake shared in his post-interview: "I took a big, complex idea and broke it into bit[e]-sized bits. Students commented that in this way they learned more than in in-person class. They were able to stop the lecture and review the material." The latter revelation defines the essence of amplification.

The use of the *Dropbox* and the *Gradebook* were another source of amplification: They are "an efficient way to record information" (pre-interview).

C. *Amplification with the Potential for Transformation*

A hallmark of Dr. Jindrake's online course, as represented by his use of D2L, was his minimalist style, which allowed his students to mentally process the information in his course in an optimal manner. This was primarily achieved through the gradual and streamlined presentation of *Content* throughout the semester and the judicious use of numbering, capitalization, indentation, and grouping into manageable chunks.

Another D2L feature which lent itself to amplification with the potential for transformation is *Discussions*. Dr. Jindrake implemented both small group and whole class discussions. Like the Content feature, his Discussions feature was also minimalist and organized. His whole class discussions enabled students to ask questions and share their knowledge and experience. Although he rarely posted, his presence was still felt, resulting in content-rich and student-driven discussions. The small group discussions, on the other hand, served to allow students to schedule synchronous chats, provide peer feedback and conduct content discussions. The content-specific small group discussions were structured—students were "give[n] specific and focused question[s]" (pre-interview) to discuss. Both the whole class and small group discussions served academic and social functions, and the established rapport contributed towards more frequent [9] and intense student interaction [10].

The Discussions' transformation potential was suggested in the pre-interview field notes: "The discussion boards also offer the opportunity to exchange more information than in a face-to-face course. In a face-to-face course, the instructor has to float around from group to group, and he only hears bits and pieces of what is going on. With the online discussion board, however, he is able to hear and see everything and observe the interaction among the students." Later in the post-interview, Dr. Jindrake shared: "My role is consistent with a social constructive approach. … The goal of a good instructor is to become obsolete. I want to create the structure whereby they can have these discussions independently. I want them learning, interacting with the ideas. In this way, students are able to go far beyond my syllabus and my puny course objective in their learning experience." Based on this data, Discussions appear to be the D2L feature that comes closest to a transformative use of technology, and if Dr. Jindrake's "goal of a good instructor" is achieved, transformation would certainly have been realized.

Another feature that lent itself to amplification with the potential for transformation is synchronous *Text Chat*. Dr. Jindrake assigned small groups of 3-4 students, each with specific roles, who chatted for an hour several times in the semester. The transformation potential is hinted at in the pre-interview field notes: "The nature of the conversation in the chat rooms is different than if students were talking to each other face-to-face. For example, when writing, students are thinking at a higher level. In essence, it is a different form of communication. Also, because the chat room groups are so small, it is hard for a student to hide and not participate."

The chat also served a socialization and rapport building function, which carried over to the asynchronous environment. The rapport was also evidenced in discussions that build on previous peer remarks, so that there was more content-specific interaction.

D. *Transformation*

Based on preliminary data, there did not appear to be any indication of the transformative use of technology in Dr. Jindrake's class. This does not come as a surprise since previous research has demonstrated the same results [2, 3, 7].

V. Implications for Language Teacher Education

Implications for language teacher education can be seen from two perspectives, namely that of educating language teachers and demonstrating best practices to pre- and in-service teachers so that these practices can in turn be implemented with their face-to-face and online language students.

Not surprisingly, the bulk of technology use was found in the category of amplification, and the D2L features which offered the most potential for transformation were Discussions and Text Chat, primarily because these two features lent themselves most easily to student-centered implementations.

It has been suggested that the progression from replacement to transformation may be maturational in nature [11]. In view of this, in his pre-interview, Dr. Jindrake advised instructors new to technology to "go in baby steps. Try one new thing a semester. … When learning, it's okay to be mediocre, and don't try to do too much." It would also be a good idea to have a D2L integration list rated from beginner to advanced so that language teacher educators can systematically integrate more complex D2L features over time.

When it comes to teaching language students, Dr. Jindrake's minimalist design suggests that it is important not to overwhelm students with too much content or language, or provide an overly rich multimedia experience. For example, short consumable videos with a face inlet showing body gestures and facial expression are crucial. Synchronous audio or video chats could also be an option since they emphasize language skills different from those focused on in text chats.

It would also be illuminating to consider what transformative uses of D2L would look like in the context of language teacher education. According to Dr. Jindrake,

possibilities include "having students video tape themselves and submit[ting] this for peer-evaluation" (post-interview) and virtual practicums. Possible transformative uses of D2L for language teacher education and further analysis of the data are next on the agenda for this study.

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