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ABSTRACT
This paper discusses issues surrounding the development of a learning object repository (FLORE) for teaching and learning French at the postsecondary level. An evaluation based on qualitative and quantitative data was set up in order to better assess how second-language (L2) students in French perceived the integration of this new repository into their course and study practice. A total of 46 students participated in the study and provided feedback that will be recycled into developmental changes for the repository. Based on a design experiment methodology, the research provides specific implication for the integration of online resources in a course or program of study. Initial results of the experiment supports the development of online tools such as FLORE while at the same time suggesting the value of carefully implementing such computer-based tools into a curriculum.

KEYWORDS
Learning Object Repository (LOR), French, Design Experiment, Evaluation

INTRODUCTION AND RATIONALE
At a time when online resources are literally exploding, it is becoming more and more tempting for learners to simply rely on documents that they can access from their home computer (Shetzer & Warschauer, 2000). Likewise instructors can easily explore an increasing number of resources and include them in their courses in order to provide to their students more authentic materials as well as an opportunity to develop electronic literacy skills (Kern, 2006; Gonglewski & DuBravac, 2006). Computers in society are now considered a way of life—a normality—and consequently information technology has become a regular method of pursuing social, educational, and business goals (Thorne & Payne, 2005). From browsing through a simple website to exploring a complete online encyclopedia, finding resources for learning and/or doing research is becoming easier and easier, hence reducing the “digital divide” that once clearly existed between individuals and/or nations (Warschauer, 2003). In language learning, the internet has equally become a prime teaching and learning medium. It gives access to millions of authentic learning opportunities and discovery opportunities, and many instructors may nowadays assume that their students are taking full advantage of these opportunities ... but are they really? How does the computer mediate and transform our practices as language learners and practitioners? These questions still need to be answered at length if we want to progress from a teacher-centered approach to a student-centered learning environment where electronic and critical literacies are being developed in order to fully engage learners in the coconstruction of knowledge (Shetzer & Warschauer, 2000) and help them succeed in an ever increasingly technological world (Kellner, 1998).

Despite the apparent wealth of resources provided by the internet, many factors may
interfere with optimum use of web-based resources: reliability, quality, lack of proper assessment, and decontextualization of the resources (Nash, 2005; Friesen, 2004; Richards, McGreal, Hatala, & Friesen, 2002; Wiley, 2003). Current research in learning objects focus primarily on promoting and developing technically enhanced systems to distribute learning objects (Friesen, 2004) as well as exploring innovative ways to properly evaluate these systems (Nesbit, Belfer, & Vargo, 2002; Krauss & Ally, 2005). Although essential to the development of learning object repositories (LORs), the projects above, however, do not focus on a specific educational context nor do they explicitly address users’ needs or integration of LOR systems in the educational paradigm (Friesen, 2004; Nash, 2005). Assessing and understanding how educators and learners navigate through these virtual learning environments is crucial to the development of efficient tools for learning electronically. This view is congruent with Biggs’ (2003) argument that

The power of ET in storing and accessing information is impressive and well understood: probably too well because, as we have seen, some people do not go beyond that and see the ‘educational’ value of electronic technology beginning and ending with its ability to access information from the World Wide Web. (p. 217)

Indeed, although considerable research has been carried out in the field of LORs, few studies address the issue of their integration in a specific educational environment or examine patterns of exploration by their users.

In this study, we rely on empirical data to investigate how second-language (L2) students in French perceived the integration of a new repository into their course(s) and study practices. Thus, the study is designed to add information to our knowledge of learners’ practices within an electronic environment based on the tasks performed, on users’ reflections regarding the tasks, and on their feedback regarding the functionality of the tool they used. Inherently set within a cognitivist theoretical framework, this case study was motivated by two questions: (a) How, and to what extent, do learners actually use learning objects and their associated infrastructures? and (b) How can the design aspects of this infrastructure and content be adapted to better support existing and emerging educational practices?

**FLORE: A FRENCH LEARNING OBJECT REPOSITORY FOR EDUCATION**

**Background**

Despite the exponential development of the internet over the last 10 years, finding online resources for teaching and learning can be at times cumbersome because most users rely on search engines such as Google or a static list of websites gathered randomly over the years. As explained by Richards et al. (2002) “this lack of precision makes it difficult to unearth and identify quality learning resources” (p.72). The frustrations that users may feel also arise from the fact that it is difficult to find resources that correspond to their level and area of interest (French being the object of study in this case). This observation motivated the development of a LOR that would include links to French language websites, webpages, and detailed information to help users select the resource that would best fit their learning and pedagogical needs. LORs can be simply described as databases or portals (i.e., the repository) that store smaller units of digital resources (i.e., the object) such as a website, a part of a website, a table, or an image that is used for education purposes (hence called a learning object) and that can be repurposed to fulfill other learning needs (Millar, 2002; Richards et al. 2002). The FLORE database and the interface can be accessed at http://www.flore.uvic.ca. FLORE contains approximately 900 links to either full websites or parts of websites that contain tables, exercises, texts, or videos related to French language, culture, or literature.
**Brief Description of the Metadata Procedures in FLORE**

Metadata can be defined as a set of labels providing information to describe the learning objects within a repository (Mortimer, 2002) similar to the descriptions held in a library catalogue (Richards and al., 2002). We chose to adopt the Canadian Core Learning Resource Metadata Protocol (CanCore) standards instantiation (http://www.cancore.ca) and adapted some of the descriptors in order to search information specific to learning a second language. CanCore was designed to help with standards of LOR descriptors and "facilitate the sharing and management of on-line education materials or learning objects" (p. 72). CanCore was developed purposely as a metadata application profile and includes elements to describe all aspects of learning objects including common cataloguing fields such as "title," "description," and "keywords," and also more obscure elements like "aggregation level" and "semantic density." In the case of FLORE we also added a few elements such as tags allowing us to describe the level of competence or a subject taxonomy relevant specifically to the teaching of French in Canada and other countries in the French-speaking world (Caws, Friesen, & Beaudoin, 2006). These additional elements are specific to second language learning, not just to French, and could be used to design LORs for other languages.

In order to increase access speed and facilitate data management and potential data sharing, the database was later transferred from *FileMaker* to an open database connectivity (ODBC) compliant database management system using PHP for queries.

**Interface**

Our current interface is graphic-based and includes functions that are available, first for unregistered users, and second for registered users. Registration is free and simply requires a login and password. When registered, users have the option to individualize the site (Beaudoin, 2004) and, by doing so, raise their level of interactivity with the system (Chanier, 2000)—a feature that is important for users (see below). The interface is available in French and in English (see Figure 1).

Figure 1
FLORE Homepage Interface.
Functions for Unregistered Users

The basic search function allows users to do a search on the field of study, the author, or any other metadata element. The advanced search function offers an opportunity to search the field of study (as checkbox options), the title, the description, the author, the URL, and the level of competence in French. Boolean operators are available in the advanced search function, but not in the basic search function. Another function that is available to all users is a display of the top 10 websites referenced in FLORE. This allows users to rapidly access the most commonly used sites without having to search for them. Finally, users can suggest sites, a useful feature since the internet is constantly evolving and users are often aware of valuable new resources.

Functions for Registered Users

In addition to all the functions described above, registered users can use functions that provide levels of individualization. The most popular of these functions is the bookmark (see Figure 2), which allows users to maintain links to their favorite resources within the repository itself and to have access to these resources from any computer connected to the internet. Furthermore, users have the option of organizing their bookmarks by creating specific categories. They can also share these bookmarks with other users as a way, for example, to promote favorite websites within a group of students. Registered users can also access a listing of recently visited resources, along with the date and time of visit, as well as explore the most frequently visited websites in the repository. Finally, they have the option of evaluating the objects that they are exploring. This function will be revised to include a more summative evaluation by third-party reviewers to comply with studies that show the importance of integrating a thorough process of evaluation (Krauss & Ally, 2005; Nesbit et al., 2002).

Figure 2

Bookmarking and Evaluation Features in FLORE

METHOD

The research methodology used to assess the impact of a LOR on students’ learning practices is adapted from the design experiment model initially developed by Brown (1992). This meth-
ontology is based on continuous cycles of refinement and development of an object of study, such as an educational tool or environment, thus presenting many advantages over pre-/postexperimental designs in which traditionally the treatment cannot be changed to maximize the intervention’s effectiveness. As explained by Cobb, Confrey, DiSessa, Lehrer, and Schauble (2003), design experiments are designed to better understand a “learning ecology” (p. 9) and thereby directly support learning in a specific environment. In our case study, the setting is the electronic learning environment of a LOR.

We chose this methodology because our portal was initially a prototype, and we knew that by setting up a series of evaluations and user feedback mechanisms, we could directly feed our results in the repository development and get closer to an educational tool that would suit users’ needs, goals, and practices. The research process can be represented as Figure 3.

Figure 3
Alignment of Research Design and LOR Development

The focus of the case study described here was on language learning, and as a result the experiment used a combination of qualitative and quantitative methods of data collection. The program of research that we initiated to analyze the impact of a LOR on teaching and learning French was directly based on the development of a specific learning object infrastructure (here FLORE), and the research program provided an invaluable opportunity to study the teaching and learning practices that this particular infrastructure could support, foster, or develop. The results of an evaluation in fall 2004 were analyzed and used to make changes to FLORE (Caws, 2005). Subsequent to this pilot study, a more in depth case evaluation was launched. The case study described here is based on the data collected in fall 2005 and spring 2006; the 2004 fall study serves as a reference point for our analysis.
**Participants**

The participants involved in the study were L2 students of French enrolled in either first- or second-year courses at the University of Victoria or at Simon Fraser University. A total of 46 students participated in the study and provided feedback in one format or another (see the Procedure section below). Table 1 summarizes the distribution of the participants between the two universities.

<table>
<thead>
<tr>
<th>Evaluation Timeline</th>
<th>Institution</th>
<th>Course</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2005</td>
<td>University of Victoria</td>
<td>FREN 155, FREN 175, FREN 185</td>
<td>33</td>
</tr>
<tr>
<td>Spring 2006</td>
<td>Simon Fraser University</td>
<td>FREN 220</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>46</td>
</tr>
</tbody>
</table>

Participants were selected for this study because they were enrolled in a French course where the exploration of FLORE was chosen as a required resource for one specific assignment or as a recommended resource to perform specific tasks or to review grammatical items already studied in class. Since FLORE was used either as a required learning tool or a recommended resource, every student in the course was given various options for their participation, which means that all students could use FLORE but not all students elected to evaluate FLORE. This case study is thus based on the feedback provided by all the students who gave us consent to use their data.

**Procedure**

Our procedures involved multiple data collection tasks performed within each course, and they varied from one university and course to the other. In using various procedures and collecting data from multiple sources, we tried to increase the reliability of our study by looking at patterns within each of the data sets (Seliger & Shohamy, 1989). We also strived to ensure the validity of our measures by correlating findings between the various procedures, hence adopting a methodological triangulation perspective (Patton, 1980). Because our case study concentrated on a specific phenomenon or learning paradigm (learning within a LOR) and also aimed at assessing learners’ perspectives on a specific learning tool and in a natural learning setting (Creswell, 1998), we intentionally selected data collection procedures with a less explicit focus (e.g., diaries, observations and course artifacts) offering a fairly broad and general view of the phenomenon, and we combined them with data collection procedures with a more explicit focus (e.g., semistructured questionnaires and focus group interviews) (Seliger & Shohamy, 1989). By obtaining data from a variety of sources, we avoided the risk of imposing too many constraints on the participants’ evaluations while at the same time giving ourselves an opportunity to gather specific data on explicit items with regards to the repository itself or to the students’ learning patterns. In order to ensure that the participants would remain anonymous, we assigned a number to each participant and used this numerical identification in all data analysis. Table 2 summarizes the variety of data collection procedures used for the study.
Table 2
Data Collection Procedures Used in the Study

<table>
<thead>
<tr>
<th>Data collected</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>University of Victoria</td>
</tr>
<tr>
<td>Online questionnaires</td>
<td>33</td>
</tr>
<tr>
<td>Journals</td>
<td>12</td>
</tr>
<tr>
<td>Class artifacts</td>
<td>18</td>
</tr>
<tr>
<td>Observations</td>
<td>9</td>
</tr>
<tr>
<td>Focus group interviews</td>
<td>-</td>
</tr>
</tbody>
</table>

The tasks in the exploration and evaluation of FLORE also varied from one university and course to the other. As summarized in Table 3, some of the documents that we used were sometimes part of a required assignment, while in other cases FLORE was simply used as a resource to help students review materials covered in class. Some students elected to participate in every task related to our study, but others performed only the required tasks and did not complete the online questionnaire at the end of the study.

Table 3
Distribution of Tasks and Data Collection in Each Course

<table>
<thead>
<tr>
<th>Institution</th>
<th>Course</th>
<th>Tasks</th>
<th>Data collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Victoria</td>
<td>FREN 155</td>
<td>Resource for specific task in the lab (exploration of sites related to lexical and grammatical understanding of texts)</td>
<td>Journal writings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Online questionnaire</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Observations</td>
</tr>
<tr>
<td>University of Victoria</td>
<td>FREN 175</td>
<td>Resource for specific task in the lab (research on specific grammatical items discussed in class)</td>
<td>Observations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Online questionnaire</td>
</tr>
<tr>
<td>University of Victoria</td>
<td>FREN 185</td>
<td>Resource for one specific assignment</td>
<td>Online questionnaire</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Class artifacts</td>
</tr>
<tr>
<td>Simon Fraser University</td>
<td>FREN 220</td>
<td>Resource for grammatical revision of items studied in class</td>
<td>Online questionnaire</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Journals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Focus groups</td>
</tr>
</tbody>
</table>

The research assistant and the course instructor explained the assignments/tasks to the participants in class. We selected assignments/tasks that integrated well into the program and for which FLORE had the potential to help students achieve better results. The pedagogical philosophy behind using such a system was to encourage the development of cognitive strategies of learning, in particular to encourage students to explore resources on their own and to find those that would assist them in developing their language skills. As such, FLORE was used to guide students to become more autonomous in their learning and more critical in their exploration of resources.

In FREN 155 “Vocabulary” and FREN 175 “Intermediate Grammar Review” at the University of Victoria, FLORE was simply recommended as an electronic resource to revise specific grammatical or lexical items and was used in the computer lab whenever the class met to do research during the class. These class meetings allowed the research assistant to observe participants while they were using the system. In FREN 185 “Introduction to French
Linguistics” students were required to look for 10 learning objects (that is 10 websites or parts of websites) in FLORE that would help them understand linguistics items that had been studied previously. In addition, students had to evaluate these resources and explain why they believed these particular resources were useful by outlining at least one key point that the selected resource had taught them. This assignment was submitted to and graded by the instructor. These assignments constituted our course artifacts as described in Tables 2 and 3 above. In all three courses, participants were required to spend 3 hours on FLORE before filling out the online questionnaire. In the questionnaire students were asked to rate different functions or outcomes of FLORE on a 7-point Likert scale, indicate the functions that they had used in the repository, and provide additional comments in an open-ended question (see the questionnaire in the appendix to this article).

In FREN 220 (Intermediate Composition) at Simon Fraser University, students were asked to spend 3 hours on FLORE and find specific grammatical items related to those that they were studying in class. While working in FLORE, participants were directed to write their findings, personal observations, and any other comments in a journal. After 3 hours of exploration, they completed the online questionnaire. Finally, students participated in a focus group session in groups of 6 each in which the participants had a chance to express their opinions and answer specific questions.

Several reasons motivated the integration of FLORE into each of these courses. First, we wanted to provide students with a chance to look for additional information on the topics discussed in class in case they did not fully understand the explanations provided by the instructor. Second, we wanted to offer students the opportunity to take a more active role in their learning. Current research in student learning shows that it is crucial to offer students a chance to be active learning participants and that promoting an inquiry-based approach in the classroom helps learners acquire complex concepts more effectively (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005). This philosophy of learning is also congruent with Bruner’s view that “knowing is a process, not a product” (1996, p. 72) and that learners need to be inherently engaged in a process of exploration and discovery in order to become experts in the subject they are studying. Finally, our research design and goals were set within a theory of learning in higher education that is summarized in Ramsden’s argument that “we can only improve the quality of university education if we study its effects on students and look at the experience through their eyes” (2003, p. 20).

In order to promote students’ research skills, we integrated the assignments/tasks at points in the courses at which the students were required to do searches on the internet. This activity seemed a good way to stimulate students’ curiosity by providing them with learning objects specifically related to the topics covered in class but not necessarily tested in class. Finally, in keeping with our research design methodology the activity provided us with another opportunity to evaluate the efficiency of FLORE within an established educational setting.

**Data Analysis**

Data analyses were based on a variety of techniques. All numerical data obtained in the questionnaires were analyzed using descriptive statistics: frequencies of responses to look for common phenomena and central tendency measures to look for average tendencies of perspectives towards the LOR.²

In analyzing the qualitative research data (e.g., answers to nonnumerical questions in the survey, journals notes, focus group interviews, and class artifacts) we looked both for pat-
terns across the data texts and also significant variations. Using the students’ journal notes, we tried to derive categories of perspectives or comments that we then either confirmed or disconfirmed with the rest of the data. Finally we looked for correlations between the participants’ answers and/or comments and the instructional methods used to integrate the LOR into the courses. To examine the reliability of the data, the research assistant derived her own set of patterns from the data that she transcribed. In addition, data validity was somewhat assured by the fact that we gathered multiple data sets from multiple groups of students. Hence the categories that we describe here are patterns on which the research assistant and I agreed and that remained relatively consistent throughout the various categories of data.

RESULTS AND DISCUSSION

Student Questionnaires

The first part of the online questionnaire elicited data of ethnographic value in order to frame a better picture of our participants in general and to better assess their previous experience with technology in particular. Table 4 summarizes the results of this assessment.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Word processing</td>
<td>3</td>
<td>7</td>
<td>6.20</td>
<td>1.01</td>
</tr>
<tr>
<td>2. Data processing (Excel, ...)</td>
<td>1</td>
<td>7</td>
<td>4.24</td>
<td>1.90</td>
</tr>
<tr>
<td>3. Web searching</td>
<td>4</td>
<td>7</td>
<td>6.22</td>
<td>0.71</td>
</tr>
<tr>
<td>4. E-mail</td>
<td>5</td>
<td>7</td>
<td>6.70</td>
<td>0.51</td>
</tr>
<tr>
<td>5. WebCT or other course management</td>
<td>1</td>
<td>7</td>
<td>5.04</td>
<td>1.47</td>
</tr>
<tr>
<td>6. Website design</td>
<td>1</td>
<td>7</td>
<td>2.24</td>
<td>1.62</td>
</tr>
</tbody>
</table>

Most of the participants (93.3%) were between 18 and 25 years old, and 57.8% were in their first year of university. As could be expected, they rated themselves very high on the skills relating to emailing, web searching and word processing. While many students (37%) reported that they spent between 6 and 9 hours per week on the internet for personal activities, 45.7% stated that they used the internet for school-related activities between 3 and 5 hours per week. The ability to use the internet was demonstrated by some participants we observed in the lab who used the CONTROL + F function to scroll down the results that they had obtained from their original search (see below). Although most students reported to be experienced in searching the web, they demonstrated some degree of uneasiness when we immersed them in our system; both direct observations and the diary entries revealed that they experienced some frustration when the system would not answer exactly the way that a search engine such as Google would.

The second part of the questionnaire was meant to assess students’ reactions to the system, and we asked participants to rate different functions or outcomes of FLORE on a 7-point Likert scale after having used the system for 3 hours. Table 5 summarizes the results of this assessment.
Table 5
Students’ Evaluation of FLORE ($N = 45$)\(^a\)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Min.</th>
<th>Max.</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FLORE has an attractive interface.</td>
<td>1</td>
<td>7</td>
<td>4.47</td>
<td>1.41</td>
</tr>
<tr>
<td>2. I like working/searching in FLORE.</td>
<td>1</td>
<td>7</td>
<td>4.11</td>
<td>1.52</td>
</tr>
<tr>
<td>3. FLORE is more useful than Google or other search engine to look for</td>
<td>1</td>
<td>7</td>
<td>4.38</td>
<td>1.95</td>
</tr>
<tr>
<td>French resources.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. FLORE interface made my search easy.</td>
<td>1</td>
<td>7</td>
<td>4.41</td>
<td>1.66</td>
</tr>
<tr>
<td>5. I find it motivating to work with FLORE.</td>
<td>1</td>
<td>7</td>
<td>3.80</td>
<td>1.56</td>
</tr>
<tr>
<td>6. I believe that other students would like to use FLORE.</td>
<td>1</td>
<td>7</td>
<td>4.62</td>
<td>1.61</td>
</tr>
<tr>
<td>7. I believe FLORE can help me with my study of the French language.</td>
<td>1</td>
<td>7</td>
<td>5.00</td>
<td>1.48</td>
</tr>
<tr>
<td>8. I like the fact that I can evaluate the resources I found.</td>
<td>2</td>
<td>7</td>
<td>4.69</td>
<td>1.56</td>
</tr>
<tr>
<td>9. I like the bookmark function.</td>
<td>3</td>
<td>7</td>
<td>5.41</td>
<td>1.03</td>
</tr>
<tr>
<td>10. The quality of the resources I found were high.</td>
<td>2</td>
<td>7</td>
<td>4.56</td>
<td>1.18</td>
</tr>
<tr>
<td>11. There was a good variety of resources.</td>
<td>1</td>
<td>7</td>
<td>4.84</td>
<td>1.44</td>
</tr>
<tr>
<td>12. I found exactly the resources that I was looking for.</td>
<td>1</td>
<td>7</td>
<td>3.76</td>
<td>1.69</td>
</tr>
<tr>
<td>13. The evaluation that users can provide is appropriate.</td>
<td>1</td>
<td>7</td>
<td>4.69</td>
<td>1.26</td>
</tr>
<tr>
<td>14. The description of the resources are accurate.</td>
<td>1</td>
<td>7</td>
<td>4.53</td>
<td>1.28</td>
</tr>
<tr>
<td>15. The description of the resources are useful.</td>
<td>2</td>
<td>7</td>
<td>4.80</td>
<td>1.29</td>
</tr>
<tr>
<td>16. The level assigned to each resource is appropriate.</td>
<td>2</td>
<td>7</td>
<td>4.76</td>
<td>1.20</td>
</tr>
</tbody>
</table>

\(^a\) One student did not answer questions 4 and 9. For these two items, $N = 44$.

The analysis of the quantitative data was done in conjunction with the categories that we had extracted from the analysis of the qualitative research data (diaries, observations, notes, interviews, class artifacts and open-ended question in the questionnaire). Here we comment on these patterns as they appeared in the data and as we categorized them.

**Bookmarking and Evaluation**

The highest mean score (5.41) was for the bookmarking function, which, however, was used by only 34% of the participants as reported later in the questionnaire. (Responses to the bookmarking function also had the lowest SD and the highest minimum score.) Likewise,
during the observations and interviews and also in the diaries, several students expressed positive reactions towards being able to bookmark websites or learning objects within the system. The participants also appreciated the opportunity to provide their own evaluation of the resources they explored (\( M = 4.69, \ SD = 1.56 \)). These findings are congruent with those of studies in postsecondary research that show the value of students' feeling of empowerment when they are engaged in the process of learning (e.g., Kuh et al., 2005; Ramsden, 2003) and the critical aspect of interaction between the learner and the subject matter in order to enhance higher cognitive processes (e.g., Chapelle, 2000; Bates & Poole, 2003; Biggs, 2003). In addition, functions such as bookmarking (or backtracking) in computer learning systems have been shown to help avoid feelings of disorientation by users (Redon-Dilax, 2000). In other words, students need to feel a certain degree of independence towards their learning as long as they also understand explicitly the task they are being instructed to perform.

**Quality Versus Quantity**

The mean scores for questions 5, 10, and 16 in Table 5 and comments gathered in diaries and interviews reveal that participants paid particular attention to the quality of the resources they found in FLORE. The most common adjectives used to rate positively either the system itself (i.e. FLORE) or learning objects within the system, were: “useful,” “interactive,” “detailed,” “functional,” “interesting,” “good for learning,” “user friendly,” “good for practice,” and “good examples of language use.”

Frustrations regarding the system, or the sites within the system, revolved around the lack of specific resources, poor functionality, and the pedagogical limitation of some of the websites. These comments corroborate the fairly low score obtained for question 12 (3.36) and question 5 (3.80), both of which illustrate students’ frustration in not finding exactly the resources they were looking for; while at the same time recognizing the variety of resources contained within the system (mean of 4.84 for question 14).

In general, participants expressed a clear preference for quality over quantity and thus recognized the value of FLORE in concentrating specifically on resources for French learning and on providing detailed descriptions and a level for each resource (questions 14, 15, and 16 in Table 5). This observation appeared in all the qualitative data we analyzed and can be associated with the participants’ enthusiasm regarding the “top 10 websites” function. In the diaries, interviews, and observations, several students mentioned that the “top 10” was one of their favorite functions because it was fast and easy to use and because they could rely on the fact that these websites, being so often explored, must yield some interesting language features.

The “top 10” function was used by 68.2% of all the participants. In their notes and comments, participants also explained that what they looked for in a search engine such as FLORE was functionality, organization, and efficiency. Participants added that using the top 10 function was a quick and easy way to have access to what appeared to be quality websites. Lastly they expressed a clear preference for a quick search function to an advanced search function, and analysis of the data revealed that 75% of the participants used quick search compared to 63.6% for advanced search.

**Learning Through Interaction**

The second highest mean score (5.00) was for FLORE’s potential to help them with their studies. Class artifacts revealed that the students were very attentive to the system’s (or
resource’s) potential to be interactive, and they expressed frustration whenever their queries did not result in a specific learning opportunity. If a resource contained exercises, they expected to receive feedback in order to assess their success, hence demonstrating some degree of metacognitive engagement. This behavior is in agreement with several research findings in CALL showing that learners do use interactive strategies whenever they have the opportunity to do so (e.g. Chapelle, 2000; Redon-Dilax, 2000).

During the direct observations, we looked closely at how participants interacted with the system. We divided each session in three periods of 5 minutes each and made a note of which functions were used and how participants seemed to react to the system. Although we observed only 9 participants, we managed to find clear correlations between these findings and the other data collected. During the first 10 minutes of using the system, most students explored several functions such as quick search, bookmark, advanced search, and evaluation. The fact that the system was still a prototype created some frustration for users who asked us questions regarding this or that function. However 8 out of 9 participants managed to find a learning object after 10 minutes and choose to stay and explore it; 1 participant was a little taken aback by all the functions available in the system. When we compared this participant’s interaction to her/his diary and online survey, we noticed that she/he generally spent little time on the internet for learning purposes and at first felt a sense of disorientation but then expressed enthusiasm about the top 10 function a week after the observations and admitted feeling less frustrated with the system. Such behavior is actually in alignment with research in hypertext that reveals a clear correlation between feelings of disorientation and navigation problems reported by users (e.g. Redon-Dilax, 2000).

Direct observations also supported the other qualitative data in regard to users’ interest in participating in the evaluation of resources and sharing bookmarks with other users. Once we explained to students how to use the shared bookmark function, some participants expressed keen enthusiasm, a behavior that seems to support research showing that users’ motivation and attitude towards a system increases if the system offers prospects for creativity and/or flexibility of interaction (Meunier, 2000).

CONCLUSION

This study was designed to add to our understanding on how learners use learning objects and their associated infrastructures. It confirms the fact in particular that learners are keen internet explorers and are capable of assessing and selecting electronic resources to meet their learning needs. At the same time, a sense of disorientation can be directly related to the interface of the system and the functions the system offers. In order to better support learning, we found that a strong correlation needs to exist between the course goals and learners’ own goals. In other words, students need to understand clearly in what way accessing online resources will directly influence their progress. As a consequence, it appears that in order to work effectively, LORs such as FLORE should be used as an educational tool embedded specifically in the design of a course as an additional resource to perform a task with a clear outcome. This observation is congruent with current research in higher education (e.g., Biggs, 2003; Ramsden, 2003) as well as recent research in the use of learning objects in educational settings linking learning objects to learning theories (Nash, 2005).

As such, the multiplication of electronic resources and their use by learners has a direct impact on teaching and learning. Indeed, just because the web offers a vast array of resources does not mean that simply searching through these resources is equivalent to learning. In order to be effective, web searching must be directly related to a specific educational context,
and learners must be instructed on how to perform effective searches on the web (Colaric & Jonassen, 2001). In fact, some of the factors limiting more extensive use of learning objects are educational in nature, simply because “objects themselves are meaningless without an appropriate teaching or learning context” (Bates & Poole, 2003, p. 67). For this reason, the integration of technology into teaching and learning needs to address key pedagogical questions. Answers to these questions require researchers to engage in a process of reflective practice and collect and analyze users’ feedback, thus engaging in what Maki (2004) refers to as a “cycle of inquiry” (p. 153). Indeed, not only do we need to develop technologies that are functional, user friendly, and easily accessible, but we also need to develop technologies that address or help promote key teaching and learning strategies.

The present study focused mainly on design issues and students’ responses to elearning. However, it also addresses a research issue in the area of learning object metadata (LOM) raised by Vargo et al. (2003) who stated that

We believe that the development of tools and formats for quality evaluation of learning objects will be the next major advance in LOM, and one that will have a powerful impact on the design of interactive media for Web-based education and training. (p. 2)

Can learning objects offer new learning mechanisms? Vargo et al. (2003) describe a socioconstructivist view of learning, proposing that students could use learning objects to construct their own knowledge by finding and selecting resources, reworking them, and sharing them with peers.

Future research needs to focus more on specific exploitation of these electronic resources to better engage students into an educational environment where they become the active participants of a learning community and where knowledge is coconstructed by all users of these systems. Our first phase yielded positive feedback and students told us, “Yes, we need FLORE because it focuses on one area—French.” However, we also know that embedding this technology into a learning design will be the key to students’ success in using learning objects. In other words, we now need to look at which instructional strategies foster and support students’ learning within such an environment. Consequently in our next evaluation phase we will gather teachers’ comments and focus on defining the system requirements that trigger effective use of the technology.

NOTES
1 The present case study was based on the third prototype of FLORE. Based on the results of the case study described here, changes have been made to the database.

2 In the next evaluation project, the author will examine the variability among the groups of students to collect findings on the spread of behaviors in relation to the course level and requirements as well as curricular integration of the LOR.

REFERENCES


**APPENDIX**

Student Survey

1. Numéro d‘identification __________________________

2. Age (☑):

   □ 18-25  □ 26-30  □ 31-35  □ 36- +  □
3. What is your native language? (□)
   French  □   English  □   Other  □
If other, please specify? ________________________

4. What is your parents’ native language? (□)
   **Mother:**
   French  □   English  □   Other  □
If other, please specify? ________________________
   **Father:**
   French  □   English  □   Other  □
If other, please specify? ________________________

5. What language did/do you speak at home?
   French  □   English  □   Other  □
If other, please specify? ________________________

6. What year are you in?
   □ first year university
   □ second year university
   □ third year university
   □ fourth year university

7. What department/faculty is your program in?
   ________________________

8. At the beginning of the study, were you experienced with the following? 1 Not experienced at all and 7 Very experienced.

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<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
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9. If you are familiar with web searching, what is your favorite search engine?

- [ ] Yahoo
- [ ] Lycos
- [ ] Alta Vista
- [ ] Excite
- [ ] Info seek
- [ ] Google
- [ ] Other: ____________________________

10. How many hours per week do you spend on average on the Internet for personal activities?

- [ ] 0-2 hours
- [ ] 3-5 hours
- [ ] 6-9 hours
- [ ] more than 10 hours

11. How many hours per week do you spend on average on the Internet for school activities?

- [ ] 0-2 hours
- [ ] 3-5 hours
- [ ] 6-9 hours
- [ ] more than 10 hours

12. Please evaluate the interface and the content in FLORE. 1 Completely disagree 7 Completely agree.

<table>
<thead>
<tr>
<th>FLORE has an attractive interface.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
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<tbody>
<tr>
<td>I like working/searching in FLORE.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>FLORE is more useful than Google or other search engine to look for French resources.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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</tbody>
</table>
FLORE interface made my search easy. | 1 2 3 4 5 6 7 |
--- | --- |
I find it motivating to work in FLORE. | 1 2 3 4 5 6 7 |
I believe that other students would like to use FLORE. | 1 2 3 4 5 6 7 |
I believe FLORE can help me with my study of the French language. | 1 2 3 4 5 6 7 |
I like the fact that I can evaluate the resources I found. | 1 2 3 4 5 6 7 |
I like the bookmark functions | 1 2 3 4 5 6 7 |
The quality of the resources I found were high. | 1 2 3 4 5 6 7 |
There was a good variety of resources. | 1 2 3 4 5 6 7 |
I found exactly the resources that I was looking for. | 1 2 3 4 5 6 7 |
The evaluation that users can provide is appropriate. | 1 2 3 4 5 6 7 |
The description of the resources is accurate. | 1 2 3 4 5 6 7 |
The description of the resources is useful. | 1 2 3 4 5 6 7 |
The level assigned to each resource is appropriate. | 1 2 3 4 5 6 7 |

13. When you were exploring and working in FLORE which tools did you use?

- recherche
- recherche avancée
- top 10
- suggérer
- aide
- évaluation
- mes signets
- signets partagés
- mes dernières recherches
- sites les plus visités
- other (please justify)
14. Would you recommend FLORE as a French learning tool to your friends or fellow students?
   yes □  no □  undecided □

15. Would you like to continue using FLORE in the future for your own personal use?
   yes □  no □  undecided □

16. Do you have any further comment or suggestion that might help our development of FLORE.

Thank you for your participation.

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