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What Will Make Primary Educators Use LORs: A Better Interface or More Free Time?

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Abstract

Learning object repositories (LORs) have the potential to improve education at the primary school level. However, for various reasons, primary educators are not effectively using LORs. Two of the most common reasons are interface design and time. The goal of this research was to learn more about what will make primary educators use LORs: a better interface or more free time. Data were collected from 37 participants divided into two groups (control and experimental). Data were assessed for significance using Multivariate Analysis of Variance, resulting in a significant main effect indicating that primary educators need additional time more than a better interface.

Problem Statement and Goal

Learning Object Repositories (LORs) have the potential of improving education at the primary school level but, particularly due to interface usability issues and/or time, LORs have not been effectively used by primary school teachers (Duncan, 2002; Greer & Thomas, 2004). Several studies have suggested that primary educators tend not to use LORs because of usability difficulties such as screen design and navigation (Caris, 2004; Fitzgerald, Lovin & Branch, 2003; Fox et al., 1993; Najjar, Ternier, & Duval, 2004; Roberston, 1999; Rowand, 2000; Thong, Hong, & Yan Tam, 2004; Voorbij, 1999). Meanwhile several other studies suggest that primary educators do not use technology heavily because of the shortage of preparation or training time.

The goal of this research study was to conduct an experimental study to learn more about what educators want: a better interface or more time. The research question that underlies this study is the following:

- Will a LOR be more likely to be used by primary educator users, if they are given a better interface or more time?

Brief Review of Literature

Interface Design

Some of the greatest user difficulties with LORs have been related to interface design. Fitzgerald et al. (2003) conducted a study of 229 survey participants that assessed the usability of the Gateway to Education Material (GEM). GEM is a computerized LOR for educators. The goal of GEM was to enhance educators' means to access Internet-based lesson plans, curriculum units, other learning object resources, and pedagogy resources to improve or enhance learning activities in the classroom. GEM was developed with various types of educational resources readily found on the Internet for pre-Kindergarten through 12th grade. It contains over 7,000 educational materials including lesson plans, educational web books, and educational web pages.

Fitzgerald et al.'s (2003) study revealed that only 36% of the novice users found the information that they needed. Fitzgerald et al. suggested that the excessive terminology, complicated screen design, and complex navigation structure used in LORs have resulted in novice users spending an excessive amount of time trying to learn how to use the LOR.
A similar study of 111 participants was conducted by Ceaparu, Lazar, Bessiere, Robinson, and Shneiderman (2003) to explain user frustrations with technology. Ceaparu et al. revealed that the

majority of the frustration was related to missing or hard-to-find features on the interface. They suggested that a better interface design can assist in helping users find features that are not immediately obvious.

Shneiderman (2003) suggests that one possible way to improve the usability of an interface is to separate functions and features into various layers or disclose more advanced features under specific user labels. By separating the features and functions into different layers, the effectiveness of the interface may increase (Shneiderman, 2003). The user will be able to learn the layers in a meaningful way and understand how both the functions and features are performed step by step. Novice users can start at the first layer and then move to higher layers or more detailed layers when they are ready. This type of interface is often referred to as a layered or progressive disclosure interface.

Layered interfaces can be found in gaming software, word processing applications, and medical repositories. Currently, it has proven to be useful in medical repositories because of its terminology usage, screen design, and navigation (Arnold, 2005; Gustavsson et al., 2004; McGrenere, Baecker & Booth, 2002; Shneiderman, 2003). The Cancer Institute's web site (http://cancer.gov/), MedView, and The National Library of Medicine's PubMed interfaces are good examples of layered interfaces. These layered interfaces provide simplified terminology searches, screen designs, and navigation for patients while offering more detailed terminology searches, screen designs, and navigation for physicians (Shneiderman, 2003).

Time

Research has also suggested that more free or preparation time is needed for educators to use LORs. Marcinkiewicz (1994) and Fitzgerald et al. (2003) state that primary educators are reluctant to spend the necessary time to figure out how the technology works or attend training sessions). Swaim and Swaim (1999) also reported that educators' time is so limited that they are not willing to try anything new that will require more time. More specifically, primary educators are reluctant to spend the necessary time to figure out how the technology works or attend training sessions (Marcinkiewicz, 1994; Fitzgerald et al., 2003). The United States Department of Education's (USDE) National Center for Education Statistics (NECES) (2000) reported that in 1999, the greatest barrier to the use of technology, in general, was lack of time. The average amount of time a teacher spends searching a LOR for a specific topic is 33.5 minutes, which is especially significant in that the average time of an elementary planning period is 30 minutes. An overwhelming 82% of primary educators do not utilize technology because there is not enough time to effectively learn how to use the technology (USDE NECES, 2000).

Methodology

This study was conducted over a five month period on primary educators at public schools throughout Northeastern Pennsylvania. Elementary educators were asked to assess their skills based upon the International Society for Technology in Education (ISTE) technology literacy standards for all teachers via the North Central Regional Educational Laboratory (NCREL) Technology Proficiency and Levels of Use Chart (Appendix F). The ISTE's (2005) standards are organized around levels of technology literacy skills that are necessary for teacher certification through the National Council for the Accreditation of Teacher Education (NCATE). The ISTE standards at the foundation level consist of the following technology literacy competencies:

- Basic Computer/Technology Operations and Concepts - Knowing how to operate a multimedia computer, implement basic troubleshooting, and use imaging devices.
- Personal and Professional Use of Technology - Using productivity tools for word processing, database management, and spreadsheet applications; and using computers to support problem solving, data collection, and information management.

NCREL created the technology literacy competency chart (Appendix F) as an instrument to categorize educators' skill levels. The chart placed the ISTE standards into meaningful proficiency criteria for measuring an educator's skill level as a novice, intermediate, or advanced user. McNabb, Valdez, Nowakowski, and Hawkes (2002) support and promote the use of NCREL's Technology Proficiency and

Levels of Use Chart for school districts. McNabb et al. believed that the chart should serve as an excellent resource for all school districts to benchmark educator proficiency levels.

The NCREL Technology Proficiency and Levels of Use Chart was used in this study to assess the participants' skill levels. One minor modification to this chart was needed to specifically target this study's population. Educators were asked to describe themselves by assessing their skills based upon the International Society for Technology in Education (ISTE) technology literacy standards for all teachers via the North Central Regional Educational Laboratory (NCREL) Technology Proficiency and Levels of Use Chart. The chart placed the ISTE standards into meaningful proficiency criteria for measuring an educator's skill level as a novice, intermediate, or advanced user.

Only 37 primary educators were eligible to participate. To be eligible to participate in this study, participants had to describe themselves as novice or intermediate users, based upon the NCREL Technology Proficiency and Levels of Use Chart. Novice users were defined as having some knowledge and some usage skills regarding word processing, instructional software, database, and the Internet. Intermediate users were defined as having a basic understanding and everyday basic usage skills with word processing, instructional software, database, and the Internet.

This study did not use advanced users or non technology users for two reasons. First, among elementary educators there is a small cohort of early adopters or advanced users and non-user or computer-resistant users of technology (Backer & Saltmarch, 2000; NASNAE, 1995). According to the National Academy of Sciences and National Academy of Engineering (NASNAE) (1995), the majority of elementary educators are either novice or intermediate users. Unfortunately, much of the existing in-service group training in general has been focused on advanced users and non-users of technology (Caris, 2004; Lin & Lin, 2000; NASNAE, 1995).

Second, research has shown that advanced users or non technology users might not value experimental research regarding usability issues (Gustavsson, 2005). Advanced users are accustomed to carrying out complicated tasks. As such, they tend to utilize the technology regardless of its design or usability issues. Additionally, non users tend to be resistant to technology regardless of design (Fitzgerald et al., 2003).

A total of 37 eligible participants were eligible to participate. The 37 participants were randomly assigned into two groups: experimental and control. The experimental group contained 19 primary educators and the control group contained 18 primary educators. The number of participants per group was acceptable for this study since the expected minimum number per group was five primary educators (Caulton, 2001; Hertzum & Jacobsen, 2001; Lewis, 1994; Nielsen & Landauer, 1993; Turner, Landauer, & Neilsen, 2006; Virzi, 1992).

The control group used the non-layered interface called MERLOT (http://www.merlot.org) and was assigned an extra 30 minute preparation period in the morning. MERLOT was chosen as the LOR interface for the control group because research has shown that it is one of the most commonly used LORs (Beck, 2003). MERLOT is one of the most commonly known LORs in the United States of America (USA). It contains over 6,000 links to web sites that are relevant to education.

The experimental group used the layered interface called Education Network of Australia (EdNA) Online (http://www.edna.edu.au/) and they were not assigned any extra preparation time during the school day. EdNA was chosen as the LOR interface for the experimental group because it is a layered interface that can be configured to include the same content as MERLOT. EdNA is a LOR for public, private, and vocational schools as well as adult community education and higher education and training. It currently contains over 9,000 links to web sites that are relevant to education. It should be noted that over 3,000 of the links are specifically dedicated to Australian policy and curriculum. EdNA has the same library of LORs as MERLOT.

Research Procedures

To ensure that data are properly collected, multiple data collection tools were used. This research collected data via a demographic survey, time diary, and interviews. A demographic survey was used in order to control the individual intervening variables including computer-self efficacy, knowledge, and domain intelligence. This study adapted a demographic survey developed by Recker et al. (2004). The demographic survey collected data regarding the participants' ages, teaching areas, experience, and the usage of Web-based learning resources in teaching.

A preformatted time diary was utilized to measure the primary educator's usage of LORs, LO relevance, LO integration into lesson plans, and the time involved in searching and modifying LOs. This study modified a preformatted diary developed by Recker et al. (2004).

All participants attended a one hour training session. At the training session, participants were educated on how to use the LOR, and how to record their data into the time diary.

After the training session participants were ready to participate in this study. They were not given specific tasks to complete. Instead, they were asked to carry on with their normal tasks and record the data in their time diary. This approach to collecting data was used in this study because it was more likely to result in data that represent the actual tasks that users would perform (Ceaparu et al., 2002) and participants are more committed to using the LOR when the tasks are important to them (Locke, 1996).

Testing for Validity and Reliability

To evaluate the demographic survey, time diary, and interview questions for content reliability and validity an Expert Panel was utilized. The Expert Panel consisted of three educators with at least five years of experience and recent technology training. The Expert Panel employed the Delphi method to evaluate the content.

Once the eligible educators were identified and all materials were evaluated for content validity and reliability, the researcher randomly assigned participants into two groups—control and experimental. The control group was assigned the non-layered interface, MERLOT. The experimental group was assigned the layered interface, EdNA.

Analysis

The Shapiro-Wilk statistical test was used to test the normality of the data. A MANOVA was conducted to examine effectiveness of LOR interface by the following factors: number of times a LOR is used, and the number of times the LOs found were incorporated into the classroom lesson plans by primary educators. A reliability analysis of a two-way mixed model ICC was also used to test if there is a correlation between age, gender, experience, comfort level, skill level, and the number of times a primary educator uses the LOR for both the control and the experimental group. An alpha level of .05 was set for all statistical tests.

Results

There was a significant ($F(1, 37) = 62.860$, $p = .000$) for the number of times educators used LORs between the two groups. The mean score was 96.11 for the number of times the control group used LOR. The mean score was 43.22 for the number of times that the experimental group used the LOR. This result indicated that the control group (using the non-layered interface, MERLOT, combined with addition time) utilized the LOR more than the experimental group (using the layered-interface, EdNA, with no additional time).

There was a significant ($F(1, 37) = 6.39$, $p = .015$) main effect for the time usage (the time spent searching the LOR, the time spent modifying LOs, and the time spent incorporating LOs into the lesson plans). The mean score was 5.80 minutes for the experimental group using the layered interface called EdNA and not receiving any extra preparation time. The mean score was 14.43 minutes for the control group using the

non-layered interface and for receiving extra preparation time. This result indicated that the control group had greater success than the control group. Therefore, primary educators prefer additional time more than a better interface.

Interviews with the participants further elaborated upon their perceptions of time. All interviewees of the experimental group indicated that they were not willing to put forth an enormous amount of effort due to limited time. The following quotation presents one participant's response to the amount time spent retrieving, modifying and incorporating LOs into lesson plans:

> Time is of essence. If there were free time during the day, I would spend hours looking for LOs. However, the reality is that I never have enough time to eat lunch let alone search a LOR for LOs. I am busy grading papers, cleaning up, calling parents, or getting ready for the next assignment. It is a balancing act. I have to allocate my time to the places that need it. Should I be given an additional planning period, I would be more likely to spend more time looking for LOs and incorporating them into my class. But for now, I must focus on the immediate things that need to be completed. If there is time left, I use it for searching for new ideas or LOs.

Similar sentiments were expressed by all interviewees. These observations indicated that time was a significant factor affecting the usage of LORs.

Discussion

While the results of this study indicated that if educators had more time they would use the LOR, upon closer inspection of the data, several observations of interest were found. First, this study assumed that teachers would use their preparation period to search the LORs. However, the majority of date and times reported in the time diary searchers were done in the morning before school started. All of the interviewees reported that educators mostly used the LORs while they were waiting for the children to arrive or when their preparation period was in the morning. Furthermore the fact that the average amount of time the LOR was used to find a learning object was 2.5 minutes when educators had a planning period after 12:00 noon and 24.7 minutes when the educator's planning period was before 12:00 noon suggests that the idea of "more time" cannot be looked at simplistically. Simply put, educators seem to need more time in the morning.

Second, several misspelled words occurred within the time diaries. Specifically, 57% of the time diaries contained misspelled words. However, there is no way to distinguish if the misspelled words actually occurred in the LOR search, or just in the time diary. However, the misspelling may indicate that educators were in a hurry to complete the search or time diary and, as a result, they misspelled words.

Third, this study assumed that primary educators would gain an understanding of Boolean logic from this study's training session. However, this study indicated that the participants have limited or no understanding of Boolean logic. A review of the time diary data revealed that 87% of the participants only used two searching terms. Data collected from the interviews lead to one possible explanation that educators simply do not have the time to devote towards effectively searching LORs for LOs.

Fourth, this study assumed that primary educators spent their time searching for educational topics meeting the PDE standards. However, a review of the time diary data revealed that 77.7% of the LOR instructional searching objectives were classroom activities/games. Furthermore, a total of 73.46% of the search objectives were holiday topics. Of the holiday search objectives, 82.60% were from the experimental group.

Data collected from the interviews affirmed that participants wanted to use the LOR to find enjoyable games for holiday and events. A female interviewee from the control group, 21-25 years of age with 3-6.5 years of teaching experience as a gifted teacher stated the following about searching for LOs:

> It is hard to find or make up activities for holidays and events. My everyday teaching activities are simple; I use the prepackaged activities and follow the outlines in the book. But, when it comes to

holidays, the books don't provide you with fun ideas and resources. I need fun holiday LOs not traditional academic LOs.

Similar sentiments were expressed by all interviewees. These results suggested that educators had not perceived the LOR as a valuable educational resource that provides educational LOs meeting PDE's standards for educators in the classroom. This suggests that perhaps educators need to be educated about the benefits of LORs, and how to properly search LORs.

Conclusion

This research conducted an experimental study over five months to examine what factors will make primary educators use LORs. The results revealed that the most significant factor keeping educators from using LORs is lack of time. Should primary educators have more time to learn about and explore LORs they are more likely to use them.

Recommendations

Since less than half of the possible primary educators participated in this study, the findings are limited. Further research is necessary to determine whether the same results would be obtained with more possible participants.

Furthermore, this research was conducted during the third and fourth academic semesters. There were many holiday breaks and snow days. With school weeks shortened by time off, it was difficult for educators to search the LOR as well as incorporate LOs into their lesson plans. These factors also impact the data that were collected and may have altered the results. Further research is necessary to determine whether the same results would be obtained during the first and second academic semesters.

Finally, it is obvious that time is affecting LOR usage. While this study seemed to indicate that additional preparation in the morning would help educators use LORs, additional research is necessary. Specifically, additional research on when to add additional preparation time into an educator's schedule is necessary.

Research Notes

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