

Evaluating Course Website Utilization By Students Using Web Tracking Software: A Constructivist Approach

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This case study describes the use of a web usage tracking tool (WebTrends™) to determine levels of student utilization of web pages in a web-enhanced course. Web usage tracking or mining is defined as "automatic discovery of user access patterns from Web servers" (Cooley, Mobashar, & Srivastava, 1997). A web-enhanced course is defined as one that meets face-to-face in addition to being enhanced by assignments, resources, and other information provided through a website. References to online learning and to the web-enhanced course used in this case study use this definition. The pedagogy described is based upon the theoretical framework of constructivism, which uses experiences to "reflect an underlying conception of what it means to learn, to understand, and to instruct" (Duffy & Jonassen, 1992, p. 1).

Constructivist teaching practice has been described in the literature as a way to help students construct their own learning from activities and experiences that foster exploration and critical thinking (Jonassen, 1992; Savery & Duffey, 1996; Beal, 2000). Constructivist approaches have gained support in science education (Edelson, Pea, & Gomez, 1996; Jofili, Geraldo, & Watts, 1999; Leonard, 2000). Flowers and Reeve noted that "There seems to be an assumption that, of itself, the presence of the Web

somehow enhances a student's ability to construct their own meaning and learning" (2000, p. 141). They pointed out that use of the Web could be effective in this endeavor if linked to activities that help students learn how to learn. To evaluate the effectiveness of resources and information presented through a website, it is first necessary to determine whether or not, how often, and when students have accessed the website.

A paucity of literature was found related to the evaluation of web site utilization in educational settings (Xiaodong, 1999) and readings tended to fall into the prescriptive rather than the descriptive category. Cheryl Twigg, of the Pew Learning and Technology Program, states that "The Internet offers unprecedented opportunities to collect, organize, and analyze large, real-time research" including "tracking of learner behavior on site" (2001, p. 17). Nichols (1997) encourages use of the Web in evaluation and offers e-mail and other strategies to provide formative evaluation. It is surprising to note that Nielsen (2000), who has written extensively on website design and usability, does not mention web usage tracking as an evaluative method for educators. Markwell and Brooks (2002) report the findings of a study on the decay of website resource links over time, noting that government

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links were generally found to suffer less from link rot. Web usage tracking tools appear to be used, for the most part, in e-commerce.

The development of quality web-based courses requires a significant investment of time and a team approach that involves collaboration with instructional designers, media-support professionals, and often extends to other professional (Zhu & McKnight, 2001). Given this significant investment of time and effort, faculty and developers wish to know if students are using their web pages. One way to measure web usage is through software designed for this purpose. In this case study, a web usage tracking tool (WebTrends™) was used to evaluate the level of student utilization of a web-enhanced course, Issues in Science and Technology. There is no intention on the part of the authors to endorse or evaluate the merits of *WebTrends™* relative to other web usage tracking tools.

The purpose of the website used in the case study was to enhance course content, focus access to resources, and provide guidelines for assignments in a concise format that allows flexible access at student's convenience. Evidence does not exist that educators are using web usage tracking applications as a tool to refine course development. The fact that technology enables the retrieval of these data opens the door to untapped information about how students use online courses. As is true of constructivist teaching, we utilized the constructivist approach to revise the course in light of the data provided.

METHODOLOGY

A web usage tracking tool, *WebTrends™*, was used to evaluate student participation in a science and technology course. Web reports provided information about the number of hits to each page, the number of visits to each page, the most-to-least visited page, the path that students used to move from page to page, the time of day that students visited each page, the dates of usage, and the length of time that students visited each page. Data were collected during the first four months of the fall, 2001 and spring, 2002 semesters for the same course.

These data were used to revise the course. Active learning and constructivist approaches to science education have appeared with greater frequency in the literature (Jofili, Geraldo, & Watts, 1999; Leonard, 2000; Johnson, 2002). The revisions from semester one to semester two used an approach that relied upon emerging information in semester one to determine the design of the website in semester two. In addition, a constructivist approach was used to help students improve technological and information

literacy skills by exploring a current issue of their choice regarding science and technology. The students were expected to build their own understanding about an issue in science and technology and thereby improve their information and technological literacy.

This student-driven inquiry process required critical thinking that was directed by the scientific method (Demers, 2003). While reading and discussing a brief text on scientific principles and practice (Lee, 2000), students selected a current issue, explored the history of science & technology, and examined the cultural, political, economic, and social aspects influencing that issue. Students participated in an advanced library training session with a faculty librarian who facilitated their exploration of library resources (Demers & Malenfant 2001; Bhatt, Demers, & Malenfant 2001; Demers and Malenfant, submitted for publication). Finally, students provided oral and written presentations to generate class discussion of the issues presented.

Thirty students began the class and were provided an abbreviated two-page syllabus. All other information was maintained on the website. This was intended to assist students in gaining technological literacy by requiring them to use the course web pages. The website also provided time flexibility and concise expanded information about course requirements and content. Outcomes for the course were explicitly stated so students were aware of what was expected. Grading rubrics provided detailed guidelines. A schedule outlined the entire semester, showing the scaffolded assignments that culminated in a study presentation. Extensive resources were arranged by type to facilitate student research. The URL used in spring, 2002 was: <http://ruby.fgcu.edu/courses/ndemers/10363>.

Classes met on Tuesday and Thursday from 11:00 AM to 12:15 PM during semester one in the fall of 2001. During semester two in the spring of 2002, classes met on Monday and Wednesday from 11:00 AM to 12:15 PM. During semester one, reports were obtained to see if students were using the website. Data were extracted and this information was used to revise the course design and content of the web pages.

Online learning has been noted to use innovative approaches to assessment (Carnevale, 2001). In this case, web usage tracking was used as a form of assessment. Since students were expected to use rubrics, assignment guidelines, and resource links, their use or failure to use these resources provided additional evaluative data.

Web usage information was used to provide details about when students used website resources, an average of how long they visited

the website, and how they navigated through the website. Web usage tracking of the website, coupled with completion of student projects, research, and discussion or presentation of thoughts and ideas, was used to determine whether students were actively engaged in constructing their learning process.

RESULTS

Evaluation of *WebTrends*TM tracking data showed that students accessed particular web pages more often and spent more time at web pages related to particular assignments when that assignment was due. It is important to note, however, that some students report that they printed all webpages at the beginning of the semester for reference during the semester. Nevertheless, the information is available to them at all times through the website. The assignment page was accessed most often, second only to the home page of the website. Based upon this information, the assignment page for semester two was revised into incremental pages for particular assignments. Assessment rubrics were also formulated into webpages. This allowed for closer tracking of student visits to particular assignment and rubric pages in relation to the assignment due dates.

By comparing assignment due dates to the *WebTrends*TM reports, student usage of the website was correlated with the assignment due dates for semester two (Figure 1).

It was noted that students used the website most, just prior to and following the face-to-face classes (Figure 2). Since Figure 2 is a summary of both semesters, and class met at the same time on Monday and Wednesday one semester and Tuesday, Thursday the next, there are some apparent "hits" noted for class time. Students accessed the website at late hours and on weekends. During spring semester, 60% of the hits to the pages were made during regular business hours. Of those students accessing the pages after regular working hours, nearly 20% used the website between 10:00 PM and 4:00 AM.

Web tracking during semester one in fall, 2001 indicated that some pages, such as the resources, were seldom accessed. In addition, student assignments showed that they were not citing scientifically rigorous sources and research studies. Nor were they providing supporting data on the various sides of issues. Changes were made to the grading criteria for semester two in an attempt to improve student's attention to research, critical thought, and reflection on all aspects of the issue they chose to examine. During semester two, the website was revised to provide more resources for the students. An

additional assignment was included that required that data and information be included in their oral presentation. Additionally, because we were able to see that students appeared to be most interested in the class immediately before or after the class, and just near the due date, we rearranged the timing of assignment due dates to prevent them from backing up their work at the last minute.

Second semester web-tracking data and class presentations demonstrated that students were still lacking in these criteria. Based upon this evidence, the grading scheme and more explicit rubrics have been provided for the fall, 2002 course. Additionally, two revisions of the final written report are now required, and the final due date for the written report has been moved up by several weeks. Since data demonstrated that student work is deadline driven, this teaching strategy is intend-

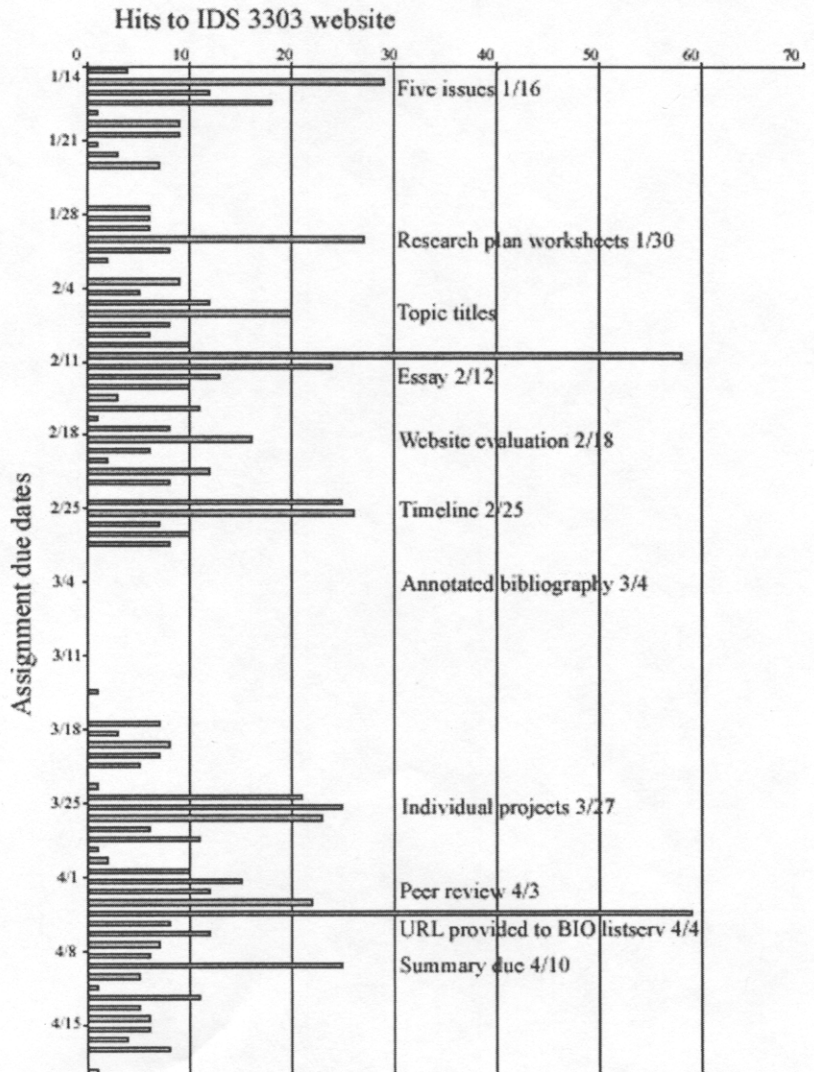


Figure 1. Website hits in relation to assignment due dates for spring, 2002

ed to prevent procrastination and improve student performance in all classes by eliminating at least one major assignment from the end-of-term rush.

CONCLUSION

Results showed that students in the spring semester used the website more extensively than did students in the fall semester. Since the website and approaches to teaching were modified in the spring based upon data from the fall semester, a conclusion could be made that teaching approaches and changes in the website may have resulted in greater use of the website in the spring. The tragic bombing of the World Trade Center, however, can be viewed as an event that certainly drew our attention away from activities that would normally occur in our daily lives. This event has complicated the comparison of data between semesters. In addition, this approach is also context specific and therefore, not generalizable to other courses.

Student use of the website was confirmed

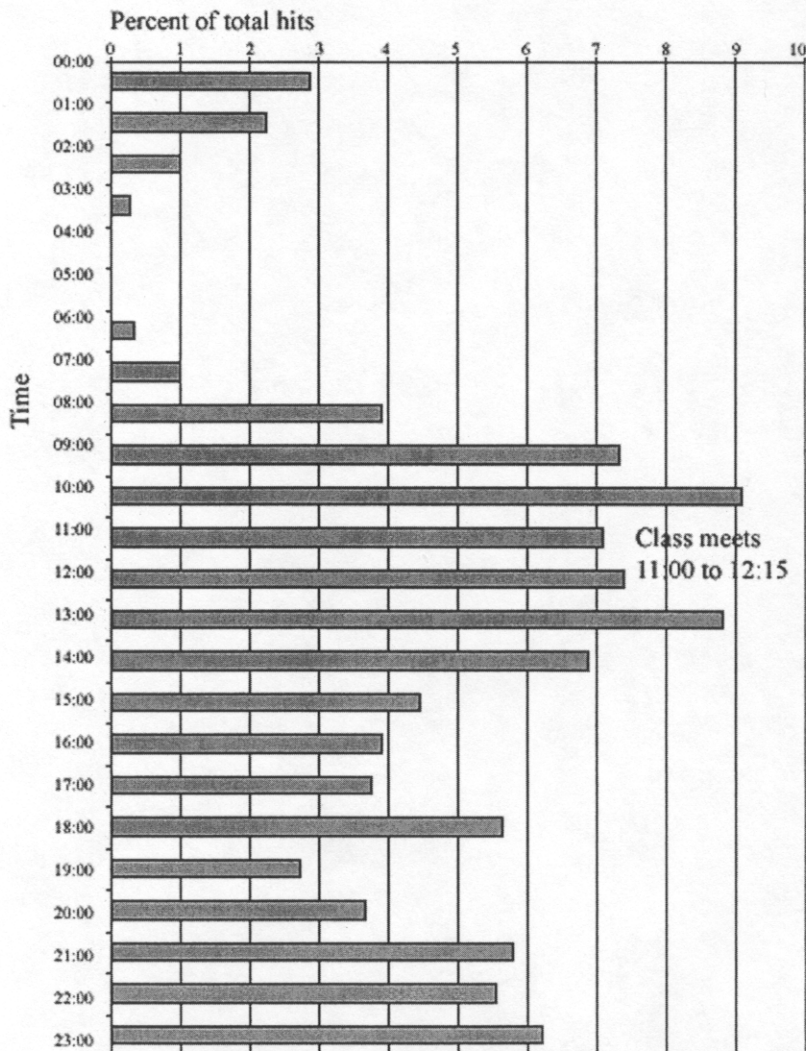


Figure 2. Two semester summary of website hits in relation to student use by hour of day

through web tracking data. In addition, students used the website with greater frequency just prior to the date assignments were due. Information gained from web tracking helped to focus revision of the course. Through this approach more information has been provided to guide students as they proceed through the building process of completing individual and group projects. It is clear that students are using the available resources and additional planning and redesign are proceeding in this constructivist approach to teaching and student learning.

The availability of data regarding how students use these resources has helped to revise assignments and due dates. Rubrics have been expanded to clarify student-learning expectations. The usefulness of the availability of these tools at any hour of the day and at the student's convenience is supported by web usage tracking data. Many of the rubrics and assignment guideline details have been further broken down into separate web pages from word documents. This method allows for more specific and incremental tracking of course content utilization by students since web pages are counted while document files are not.

Since the purpose of the website is to provide course content, resources, and assignment guidelines at the convenience of students, web usage tracking data provides concrete evidence that these goals have been achieved. This approach to teaching and student learning tells us not only that students are using the website, but also when they use the website. The faculty and designer used a constructivist approach to modify the course using the useful data generated by the software. The ongoing revision of website and course content is an organic process that requires feedback from students, attention to detail, and concern for student needs. In this case, the use of web usage tracking data not only facilitated a constructivist approach to the revision of the course, but also allowed for evaluation of the utilization of the course content, resources, and assignment guidelines. 🌐

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