Learning style, learning patterns, and learning performance in a WebCT-based MIS course

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Abstract

Web-based learning has been suggested to be the future of all types of distance learning. This study was undertaken to identify the impact of student learning styles, learning patterns, and other selected factors on their learning performance in a Web Course Tools (WebCT) MIS graduate course. Six specific research questions were developed and 76 graduate students participated in this study. It found that none of the factors, except ethnic groups, showed any significant impact on students’ learning performance. The results suggest that, at the graduate level, students are able to learn equally well in WebCT online courses despite their different learning styles, WebCT learning patterns, and background in terms of gender, age, job status, year of admission, previous Web-based learning experiences, and MIS preparation.

Keywords: WebCT; Learning style; Learning pattern; Distance learning; Online education

1. Introduction

Management Information Systems (MIS) in an MBA program is often an introductory course in one of the most popular fields at many university campuses. The MIS is also generally regarded as a core course in many US programs. Graduate students in this class are usually required to establish a basic understanding of a number of information systems (IS) applied in various business situations at different managerial levels. The application of Web-based IS in business environments is a new trend. Another innovation is using various kinds of online learning systems for corporate training [50].

It therefore is important for MIS faculty to satisfy the increasing demand from MBA students for better understanding of the concepts of Web-based IS and their potential uses, and the demand for their conducting corporate online training later in their career.

Web-based learning has been predicted to be the future of all types of distance learning [12]. Graduate students with their mental maturity, rich experience, and higher reading level are commonly believed more qualified than undergraduates to pursue learning in an impersonal environment created by various online study tools. By 1997, 195 accredited institutions offered graduate degrees via distance learning in the US [22]. Meanwhile, a growing number of business schools are offering online MBA courses. A number of proposed advantages include a high level of interactivity, a greater learner enthusiasm, a higher rate of retention, and a high level of satisfaction [43,57].
Web Course Tools (WebCT) are, in fact, becoming important IS applications for higher education. The nature of the technical components and their use are similar to the Web-based IS of business. Since 1998, favorable faculty and student perception of WebCT in educational settings have been reported [36,52]. WebCT is believed to support development of problem-solving and critical thinking. However, the literature indicates that there has not been much research to explore the learning effectiveness of using WebCT.

Learning effectiveness has been measured in terms of students’ performance and satisfaction. A higher student performance represents a lower number of errors on an achievement test after instruction [39]. On the other hand, satisfaction has also been widely used as a parameter to evaluate learning effectiveness in both academic and business settings [1]. Satisfaction can be measured through observation of variables such as drop rate, anxiety, and/or frustration during the learning process [45]. Higher student satisfaction can also be seen as the result of good learning. Since the purpose of the study was to explore the effectiveness of using WebCT as a learning tool in teaching graduate level MIS courses, we measure learning effectiveness based on students’ test scores for this.

Literature on learning styles suggests that field-independent persons are more flexible, less gregarious, and work best in an impersonal learning environment of distance education. The absence of adequate opportunities for personal contacts and clarifying discussions in this environment may, however, contribute to learning difficulties of field-dependent students who are more socially oriented, prefer collaboration, and are extrinsically motivated [40,47].

The term “learning patterns” has been used in online learning environments to identify how often the students access different functions in a hypermedia environment, and how long students use the courseware [51]. It was proved that using hypermedia to manage or maintain Web documents is extremely useful for online learning [21]. Some even found that different learning style groups employed different patterns of learning in completing the same task [31].

The literature already reveals that a number of student factors influence their learning effectiveness in Web-based classes—learning styles, learning patterns, employment status, ethnic groups, etc. [32]. However, while those factors appeared to be important in distance education courses, do they remain as important in a Web-based MIS graduate level course using WebCT, which spurs interaction and is seen as a new tool in distance education? Also, can students with different learning styles really learn using it? And do students’ learning patterns influence their learning performance on WebCT? These questions remain unanswered.

2. Literature review

A number of studies have been conducted to identify the effectiveness of WebCT as a learning tool, the impact of different styles and patterns in online settings, and the impact of student demographics.

2.1. WebCT

WebCT was formed in 1997 by Murray Goldberg. In 1999, it was acquired by Universal Learning Technology, based in Peabody, MA, which adopted the name [23]. Known as one of the best course management systems, WebCT provides a number of learning tools, including an online Discussion Board, course content searches, a course calendar, electronic mail, auto-marked quizzes, navigation tools, access control, grade maintenance and distribution, student progress tracking, etc. [33]. Like some other learning systems, it provides a standard way to organize course materials and integrate multimedia presentations in course delivery. More important, it is designed to support collaborative learning, knowledge building, and multiple representations of ideas and knowledge structure [8,30,42]. The literature indicates that cooperation, coordination, and collective approaches are all desirable characteristics. Learners in a cooperative environment have been found to outperform other work groups. There is a positive relationship between cooperative learning and learning effectiveness [27]. In addition, student learning and satisfaction can be significantly enhanced when a collaborative assessment approach is taken [29].

LaMaster and Morley [30] investigated the use of a WebCT Bulletin Board for collaboration among pre-service teachers, mentor physical educators, and university professors. The research recognized WebCT as both meaningful and enjoyable. Carey [8] described how WebCT was used to provide a highly interactive
Internet seminar for international graduate students. The ability to promote student participation was confirmed by examination of its Bulletin Board and the enhanced interactivity it allows. Mende [36] and Morss [42] surveyed the student perspectives on Web-based learning at the post-secondary and undergraduate level. Students’ positive learning experience was reported in both studies. Flexibility, interaction, and ease of use were among the few obvious advantages perceived by the students. Similar findings were also reported in other studies [25,41].

### 2.2. Learning styles

Review of the related literature since 1996 reveals a lack of attention to different learning styles in online education research [38]. A few studies are, however, similar to ours.

Luk [32] conducted two studies among Bachelor of Health Science students in Hong Kong to examine the relationship between cognitive style and academic learning in distance learning. Two styles, field independence and dependence, were examined. The field-independent students were believed to be more analytical, logical, and better able to abstract and restructure subtle aspects of a problem. Previous literature [5,17] suggests that field-independent students are less gregarious and tend to have better academic achievement in an impersonal learning environment. Field-dependent students rely on others for information, guidance, and maintenance of attitudes. The absence of adequate opportunities for personal contacts and for clarifying discussions may contribute to the learning difficulties of field-dependent students [34,35]. Luk’s research supported this literature. In both studies, the field-independent subjects performed significantly better than field-dependent ones. However, no data were collected on students’ demographics. Therefore, there were no bases for determining how demographics might relate to field dependence in the program.

Day et al. [14] examined the effects of World Wide Web (WWW) instruction and learning styles on student achievement at the undergraduate level in technical writing classes. Twenty-nine students were given traditional instruction, and 29 were instructed via the WWW. The Group Embedded Figures Test (GEFT) was used to categorize students into field-independent and field-dependent groups. Examination scores were used as a major indicator of student achievement.

The study showed that the Web class had significantly higher achievement and more positive attitudes toward writing. However, no effect of learning styles was found on student achievement or attitudes.

Shih et al. [51] reported on their study to examine how students with different learning styles functioned in Web-based courses. Their purpose was to determine what factors influenced students’ online learning. The GEFT was used to identify learning styles. Total data were collected on 74 undergraduate students. Results indicated that learning styles, patterns of learning in Web-based instruction, and students’ characteristics did not have an effect on Web-based learning achievement. WebCT was not the major course management and delivery tool however.

The one segment of the online education market that seems to be moving rapidly is in corporate training programs. A majority of Fortune 500 companies use some form of distance learning for their employees. Recently, the business trainers started to pay more attention to learning styles. To provide effective online training, they believe that a trainee’s learning style needs to be assessed even before Web-based asynchronous learning takes place [24]. There were also a few studies involving learning styles in online business courses [44,56]. However, the volume and depth of research cannot be compared to those on education courses.

### 2.3. Patterns of learning

While research on the effect of field-independent/dependent learning styles on achievement is not always consistent, numerous studies seem to agree that learners with different styles pursue quite different ways of learning [37,54]. In Liu and Reed’s [31] study, patterns of learning were measured by how often the students accessed different functions in a hypermedia environment and how long students used the courseware. Liu and Reed found that different learning style groups employed different patterns of learning in completing the same task. They found that field-dependent learners spent more time on the courseware and used it more often. Shih et al. developed a scale to measure the frequency of courseware use in a Web-based class ranging from none of the time to all of the time along 15 statements representing the patterns of learning. Their research found that the field-dependent students
indicated spending more time in Web-based courses. However, no significant difference was found between the field-dependent and field-independent students. This result seemed to suggest that different types of students with different patterns of learning could learn equally well in Web-based courses.

2.4. Demographic factors

Various student demographic factors have been used to analyze the relationship between students’ characteristics and their online learning effectiveness. In general, age and gender have been identified as two of the factors that cause learning effectiveness and persistence [28]. Carr [9], Digilio [15], and Tucker [56] found that adult learners (age 25 and up) did better in Web-based classes. They believed that adult learners experience different constraints, motivations, and learning styles than do traditional college students and that distance learning technologies can overcome many of these.

Literature also indicates that females tend to be more persistent in distance education than males [46]. In the early 1990s, Brunner [6] found that men and women were different in their technological expectations; this might have real implications for the future of distance learning. A qualitative research study [3] on the use of computer-mediated communication suggested that men and women took distinctively different roles in the online learning environment. Therefore, to optimize the online learning opportunities, the gender factor needs to be further explored.

Besides age and gender, a number of research studies also assessed the effects of ethnic groups, educational level, and employment diversity [26]. Distance learning has been identified as favoring the non-traditional students with work or family constraints [16,18]. Non-traditional students were defined by Eastmond [18] as those over 25, working, and residing off campus. Such students were recognized as the new majority involved in using Internet for education, because of its tremendous convenience and flexibility. The literature on how well those adult learners learn is contradictory. Astin [2] reported that full-time or part-time employment was negatively associated with persistence. However, other research revealed different circumstances: distance learning students who were adults in full-time employment could be persistent and achieve levels of attainment the same as or higher than those of their peers who studied full-time on campus [4,13].

A learner’s educational background has long been recognized as a factor influencing his or her educational achievement; it is apparently also an important factor influencing students’ views on Web-based learning [7]. Academic major and levels of knowledge about the course subject matter are the two factors often used in online learning research studies as identifying students’ educational background [48]. The number of distance courses completed has especially been recognized as important; they seemed to relate significantly to future success in distance learning. This hypothesis was supported by a few studies which found that first-time students often lacked the necessary independence and time-management skills for persistence and effectiveness [19,20].

Web-based courses have been offered on a number of university campuses either to train special education teachers or to help students with disabilities [10,53]. Students with disabilities are very often home schooled and distance learning should provide them an opportunity for a formal education.

The ethnicity of a student has been examined as a factor related to the effectiveness of distance learning. The Web is being embraced by every ethnic group. Ethnicity seems to play a minor role in determining who is online and who is not.

The literature review revealed that despite the spread of distance education, research on its effectiveness is inadequate: very few studies focused on using WebCT as a distance learning tool; none of the studies was designed to contribute to the field of MIS at the MBA level.

3. Research hypotheses

This study was undertaken to identify the impact of student learning styles, learning patterns, and some selected demographic factors on learning performance in a WebCT-based MIS course at the graduate level. Six null hypotheses were developed for testing at the two-tailed $\alpha$ priori level of 0.05.

**H0$_1$.** There are no statistically significant differences in the mean WebCT MIS class achievement scores among the online graduate students when grouped by
different learning styles based on the Group Embedded Figures Test (GEFT).

**H02.** There are no statistically significant differences in the mean WebCT MIS class achievement scores among online graduate students when grouped by their demographic data.

**H03.** There are no statistically significant interactions between learning styles and student demographic data in terms of gender, major, disability status, ethnic group, age level, number of Web-based courses taken, job status, year of admission, and number of MIS courses taken.

**H04.** There are no statistically significant differences in the mean WebCT MIS class achievement scores among online graduate students when grouped by their learning patterns in terms of site hits.

**H05.** There are no statistically significant interactions between patterns of learning and students’ demographic data in terms of gender, major, disability status, ethnic group, age level, number of Web-based courses taken, job status, year of admission, and number of MIS courses taken.

**H06.** There are no statistically significant relationships between patterns of learning and students’ learning styles.

### 4. Methodology

The design of the study was empirical and exploratory. In order to collect data on the demographic variables, the first author posted a questionnaire on the WebCT course site. This questionnaire was designed to get input on 15 questions from each student registered in the Web-based MIS classes (see Appendix A). The students in the classes were administered the GEFT offline by their proctors at the beginning of the tests. The achievement scores were obtained from two separate tests that subjects had completed during the academic year of 2000–2001.

The Statistical Package for Social Science (SPSS) was used for data analysis, which included computation of frequencies, means, standard deviations, t-tests, Pearson correlations, and univariate General Linear Models. The alpha was established a priori at the 0.05 level, as suggested in the literature.

#### 4.1. Participants

The population of the study consisted of 96 graduate students in two graduate WebCT-based MIS classes during the academic year 2000–2001. Each class was taught by the same instructor, provided with the same teaching materials and learning environment, and given the same test. At the beginning of the academic semesters, consent was obtained from the student subjects to gain access to their data. The 2000–2001 academic year was the third year that Web-based courses were offered, and the first year that WebCT was adopted as the major online learning tool.

#### 4.2. Treatment

The WebCT MIS course was designed and developed by the first author. The entire online course consisted of 10 sections: Syllabus, Lecture Notes, Assignments, Readings, PowerPoint Slides, Exams/Quizzes, Discussion Board, e-mail, Student Profile, and Glossary. Each section was represented by an icon on the front page of the course. The valid learning tools included: a Page tool for the Syllabus, Content (paths, links) tools for the teaching notes and external study resources, Bulletin Board for discussion of articles, e-mail for class-related communication, online quizzes for the material (chapters) covered, online PowerPoint Slides with audio effect, Page tools for readings, assignments and help files, and course management tools (Calendar, Student Management, My Record). This was a stand-alone Web-based course in which all the course materials and resources were accessed and delivered by the Internet. With a student could access any sections or tools within this learning environment. Each semester, a proctored test was given to the online students to evaluate their learning achievement. The test items included true or false, multiple-choice, and essay questions.

#### 4.3. Measurement variables

The independent variables in this study were students’ learning style scores on the GEFT test, their study
patterns as recorded by student tracking functions of WebCT, and some selected student demographic. The students’ proctored test scores in the academic year 2000–2001 were used as the dependent variable, as an indicator of their academic achievement (learning effectiveness) in Web-based classes.

4.3.1. Learning styles

The GEFT was used to classify the participants into four learning style groups. This is a commonly used learning styles test. Its reported reliability coefficient is 0.82 [58]. The GEFT has been adopted in a number of research studies concerning Web-based distance education.

4.3.2. Learning patterns

Patterns of learning were measured by patterns of using the WebCT course site recorded by the student track function of the WebCT program. These patterns were based on the total number of hits on the course Web site; this consisted of the number of hits on the homepage, on the content page (teaching notes), on the tool pages (access to readings and other course resources), on classmates’ postings, the number of posts on the Discussion Board, and the number of WebCT e-mail messages. Although number of hits is an objective indicator for measuring learning patterns in terms of the frequency of visits in a Web-based learning environment, it has its limitations, as discussed later. The method assumes that a student spent more time on the WebCT class if she/he hit the course site more often than the other students. Based on this, we divided the subjects into four percentile groups according to their total number of hits: infrequent (207–386), less frequent (387–483), frequent (484–633), and most frequent visitors (634–955).

4.3.3. Students’ demographic data

The subjects’ demographic data, such as gender, age level, disability status, ethnic group, and job status were selected to investigate their impact on the students’ achievement and their interactions with the students’ learning styles and patterns of learning online. Academic major, number of Web-based courses taken, and number of MIS courses taken were used as indicators of the subjects’ educational background. Since all subjects but two were MBA students, and no subject was either physically or mentally disabled, major and disability status could not provide any meaningful data analysis results and were, therefore, removed from investigation.

4.3.4. Learning effectiveness

We measure learning effectiveness as students’ test scores as the indicator of their learning performance.

5. Results

Seventy-four out of 96 (77%) graduate students were included in the GEFT learning style experiment. Table 1 presents the distribution of the GEFT scores obtained from the subjects. On the basis of quartile distribution of actual test scores, the subjects were grouped into different learning styles. The scores on the test ranged from 0 to 18. A score of 18 indicated extreme field-independence while a score of 0 reflected extreme field-dependence. The subjects in the study were divided into four learning style groups: absolutely field-dependent (0–6), field-dependent (7–11), field-independent (12–16), and absolutely field-independent (17–18).

The achievement scores ranged from the lowest of 138 to the highest of 188 out of 200 possible points. The demographic data are displayed in Table 2.

To avoid a large family-wise error rate, null hypotheses (H0 1, H0 2, and H0 3) were tested using seven univariate General Linear Model tests on the subjects’ achievement scores in the class, with learning style identified by the GEFT test as the first grouping variable (H0 1); gender, age group, ethnic group, job status, number of Web-based classes taken, and the number of MIS classes taken as the second grouping variable (H0 2). F-ratios for testing the interactions between learning style and the selected student demographic factors were not statistically significant (H0 3). The

<table>
<thead>
<tr>
<th>Learning style group</th>
<th>GEFT scorea</th>
<th>Percentile</th>
<th>Number of subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolutely field-dependent</td>
<td>0–6</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>Field-dependent</td>
<td>7–11</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Field-independent</td>
<td>12–16</td>
<td>75</td>
<td>13</td>
</tr>
<tr>
<td>Absolutely field-independent</td>
<td>17–18</td>
<td>100</td>
<td>14</td>
</tr>
</tbody>
</table>

a Range from 0 to 18.
computed $F$-ratios were not statistically significant for $H_0_1$. In addition, a $t$-test was performed between the absolutely field-independent students and the absolutely field-dependent students. The obtained $t$-score was not statistically significant, either. Therefore, $H_0_1$ and $H_0_3$ were retained. $F$-ratio using ethnic group as the grouping variable revealed a statistical significance at the predetermined alpha level. A further post hoc Tukey

### Table 2

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male: 37 (50%)</th>
<th>Female: 37 (50%)</th>
<th>N = 74</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability</td>
<td>Without disability: 74 (100%)</td>
<td>With disability: 0 (0%)</td>
<td>N = 74</td>
</tr>
<tr>
<td>Job status</td>
<td>No job: 12 (16.2%)</td>
<td>Part-time: 3 (4.1%)</td>
<td>Full-time: 59 (79.7%)</td>
</tr>
<tr>
<td>Ethnic group</td>
<td>African American: 12 (16.4%)</td>
<td>Hispanic: 5 (6.8%)</td>
<td>Asian/Pacific islander: 18 (24.7%)</td>
</tr>
<tr>
<td>Age level</td>
<td>20 and below 21-30 31-40 41-50 51 and above</td>
<td>N = 74</td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>MBA 72 (97.2%)</td>
<td>Psychology 1 (1.4%)</td>
<td>Software Engineering 1 (1.4%)</td>
</tr>
<tr>
<td>Web classes taken</td>
<td>1 Class 30 (40.5%)</td>
<td>2 Classes 13 (17.6%)</td>
<td>3 Classes 6 (8.1%)</td>
</tr>
<tr>
<td>MIS classes taken</td>
<td>None 41 (55.4%)</td>
<td>1 Class 19 (25.7%)</td>
<td>2 Classes 6 (8.1%)</td>
</tr>
</tbody>
</table>

### Table 3

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Statistics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_0_1$: There are no statistically significant differences in the mean WebCT MIS class achievement scores among the online graduate students when grouped by different learning styles based on the Group Embedded Figures Test (GEFT)</td>
<td>$F = 0.922, P = 0.435, \text{d.f.} = 3$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_0_2$: There are no statistically significant differences in the mean WebCT MIS class achievement scores among online graduate students when grouped by their demographic data</td>
<td>( F_{\text{gender}} = 1.513, P = 0.235; F_{\text{ethnicity}} = 4.329, P = 0.007; F_{\text{age}} = 0.435, P = 0.781; F_{\text{webclass}} = 0.858, P = 0.508; F_{\text{job}} = 0.633, P = 0.543; F_{\text{misclass}} = 1.043, P = 0.437 )</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_0_3$: There are no statistically significant interactions between learning styles and student demographic data in terms of gender, major, disability status, ethnic group, age level, number of Web-based courses taken, job status, year of admission, and number of MIS courses taken</td>
<td>( F_{\text{gender}\times\text{geft}} = 1.390, P = 0.254; F_{\text{ethnicity}\times\text{geft}} = 1.669, P = 0.011; F_{\text{age}\times\text{geft}} = 0.301, P = 0.501; F_{\text{webclass}\times\text{geft}} = 0.911, P = 0.530; F_{\text{job}\times\text{geft}} = 0.905, P = 0.466; F_{\text{misclass}\times\text{geft}} = 0.835, P = 0.563 )</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_0_4$: There are no statistically significant differences in the mean WebCT MIS class achievement scores among online graduate students when grouped by their learning patterns in terms of site hits</td>
<td>$F = 1.632, P = 0.190, \text{d.f.} = 3$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_0_5$: There are no statistically significant interactions between patterns of learning and students’ demographic data in terms of gender, major, disability status, ethnic group, age level, number of Web-based courses taken, job status, year of admission, and number of MIS courses taken</td>
<td>( F_{\text{patterns}\times\text{gender}} = 1.149, P = 0.336; F_{\text{patterns}\times\text{ethnic}} = 1.659, P = 0.137; F_{\text{patterns}\times\text{age}} = 0.250, P = 0.958; F_{\text{patterns}\times\text{webclass}} = 1.102, P = 0.377; F_{\text{patterns}\times\text{job}} = 0.886, P = 0.496; F_{\text{patterns}\times\text{misclass}} = 0.257, P = 0.968 )</td>
<td>Supported</td>
</tr>
</tbody>
</table>
test revealed that the mean achievement test score of Caucasians was significantly higher than that of the African Americans. All the other F-ratios were not statistically significant.

To avoid a large family-wise error rate, null hypotheses (H04 and H05) were tested using seven univariate General Linear Model tests, with patterns of WebCT learning in terms of total site hits as the first grouping variable; and gender, age group, ethnic group, job status, number of Web-based classes taken, and number of MIS classes taken as the second grouping variable. A t-test between infrequent visitors and more frequent visitors was employed for verification. Neither the F-ratio nor the t-value revealed any statistically significant result. Therefore, null hypothesis H04 was retained. None of the computed F-ratios revealed any interaction between any of the selected demographic factors and the learning patterns. Therefore, null hypothesis H05 was also retained. Table 3 summarizes the test results of null hypotheses H01 to H05.

To test null hypothesis H06, four bivariate correlation Pearson tests were performed to identify any significant statistical relationships between GEFT learning style scores and total site hits, hits on teachings notes and other readings, hits on classmates’ postings, and the number of posts on the Discussion Board and e-mails, respectively. The computed Pearson correlation coefficients did not reveal any significant relationships. Therefore, this null hypothesis was retained. However, an interesting additional finding was that the absolutely field-independent subjects hit much less often on teaching notes and other class resources than other learning style groups did. Relevant frequency and percentage statistics are presented in Table 4. It seems obvious that field-dependent subjects hit more often on teaching notes and other class resources than field-independent subjects.

### 6. Discussions

We found that graduate students’ learning styles, patterns of learning in a WebCT MIS environment, and demographic factors, such as gender, age group, job status, number of Web-based classes taken, and number of MIS classes taken, did not have any significant impact on learning performance in the class. Further, field-independent students did not differ significantly from field-dependent students in their learning patterns. In other words, graduate students with different learning styles, different WebCT learning patterns, and different backgrounds in terms of gender, age, job status, previous Web-based learning experiences, and MIS preparation are able to learn equally well in WebCT online courses.

The findings were different from those in a number of studies investigating the relationship between cognitive style and academic achievement (e.g. [11]). In others, field-independent students performed significantly better than field-dependent students. The different online learning tools and the level of study might contribute to the differences. The research results, however, support Shih’s study at the undergraduate level that learning styles, patterns of learning, and students’ demographic characteristics did not have an effect on Web-based learning achievement. Different learning styles were not statistically related to patterns of WebCT learning in terms of Web site hits, even though field-independent students may hit less often on teaching notes and other class resources than do field-dependent students.

It is interesting that the achievement of the graduate students was impacted by their ethnicity. According to literature on the digital divide, certain ethnic groups do not have the same level of technological knowledge and Internet access as others. This, in turn, may

### Table 4

<table>
<thead>
<tr>
<th>Hits</th>
<th>Absolutely field-independent</th>
<th>Field-independent</th>
<th>Field-dependent</th>
<th>Absolutely field-dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>More on notes and resources</td>
<td>2</td>
<td>14</td>
<td>5</td>
<td>38</td>
</tr>
<tr>
<td>More on postings</td>
<td>12</td>
<td>86</td>
<td>8</td>
<td>62</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100</td>
<td>13</td>
<td>100</td>
</tr>
</tbody>
</table>
influence their online learning achievement [49,55]. However, this finding is insufficient for any conclusion. Identification of factors affecting student success in Web-based distance learning generally assumes a potential value in recruiting students who are likely to stay and learn well in a Web-based learning environment. The results of the study provided some positive implications for MIS education online. Since graduate students are able to learn equally well in WebCT MIS classes despite their different learning styles, etc. WebCT MIS training can be provided to virtually all the MBA students. Confronting the rapid and constant changes in IT and IS applications in the business world, WebCT training also proves to be a strong option for corporate training.

For graduate schools, research of this nature may prove to be valuable in yielding practical information on how to enlarge the online student population and increase revenue for the institution, as well as make effective use of existing Web-based courses as learning tools.

7. Limitations

This study was restricted to graduate students taking MIS classes in a regional university. The sample size was relatively small.

Another limitation existed in measuring the patterns of learning in WebCT. With its present setting, there was no way to identify how many times an individual subject hit on the online PowerPoint Slides. Neither was any information provided on subject intercommunication.

Also, using the number of hits as a means to measure learning patterns might be objective, but may not be accurate. It is possible that some students enter often but do not concentrate on the subject, while others enter less but spend a substantive amount of time on the learning materials. In addition, we did not measure system idle time (a student may stay online while she/he is not studying the subject), etc.

Appendix A. Learner information survey (entry-level questions)

Your gender:
1. Male
2. Female

The student category you belong to:
1. No disability
2. With disability

The ethnic group you belong to:
1. Black
2. Hispanic
3. Asian/Pacific islander
4. Caucasian
5. Other

Your age level:
1. 20 and below
2. 21–30
3. 31–40
4. 41–50
5. 51 and above

How many Web-based courses have you taken?
1. None
2. One
3. Two
4. Three
5. Four or more

Your job status:
1. Unemployed
2. Part-time
3. Full-time

The major you are presently in:

Number of MIS courses you have taken:

Please specify your expectations from this class:

If you have any special needs, please specify:

Why do you take this online class instead of the regular classroom class? If you have any suggestions, comments, or feedback for the instructor, please specify here.
References

[5] F.M. Bernt, A.C. Bugbee, Study practices and attitudes related to academic success in a distance learning program, Distance Education 14 (1), 1993, pp. 97–112.


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