

## Do Gender and Learning Style Play a Role in How Online Courses Should Be Designed?

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### *Abstract*

*The Kolb Learning Style Inventory was used to identify differences between the learning styles of 168 students in traditional face-to-face courses and students in matched courses taught online. Additionally, the data for the online courses were divided by gender to determine if gender was a factor. Results of the analysis found that there was a difference in the learning style of the online student and the student in the face-to-face course and that gender was a factor in the relationship between learning style and student engagement. The implications for online course designers are significant. When designing online courses the learning style and gender of all students must be considered.*

Willis (2001) contended that “at its most basic level, distance education takes place when a teacher and student(s) are separated by physical distance and technology (i.e., voice, video, data, and print), often in concert with face-to-face communications, is used to bridge the instructional gap” (p. 1). Internet learning, particularly asynchronous learning as a form of distance learning, is growing by leaps and bounds. Knowlton (2000) noted, “Although students determine the direction of a course through their active engagement with course materials, professors must react to the direction that students provide” (p. 13). And distance educators must ensure the issue of gender equity in building and designing courses and programs (Garland & Martin, 2003).

Does the learning style of the students in Internet-based courses affect how engaged a student is in a course? Does the learning style and gender affect how the students utilize material the instructor has provided on the web? Phipps and Merisotis (1999) noted that there is only a limited understanding of the interaction among the learner, the technology and the learning task. Learner characteristics such as a student’s preferred learning style are a major factor in achievement and satisfaction levels of the distance learner and should influence how the technology is used and how the course is designed.

According to Grasha and Yangarber-Hicks (2000), “the literature on the connections of technology to teaching and learning styles is not well developed” (p. 7). Valenta, Therriault, Dieter, and Mrtek (2001) concurred by stating, “Further research is necessary to understand how learning styles contribute to the experience of online education” (p. 120). And, although gender has been frequently mentioned in literature, there remains limited research relating to online learning, learning styles, and learner engagement, to any issue of gender (Santovec, 2002; Waldeck, Kearney, & Plax, 2001; Yu, Kim, & Roh, 2001). Thus the research questions investigated in this inquiry were:

(1) Are there differences in learning styles between students in online classes and students in traditional face-to-face classes? If so, what are the differences? (2) Is there a relationship between a student's learning style and the level of engagement? (3) Is gender a factor in the relationship between learning style and the level of engagement?

## **Conceptual Underpinnings**

### ***Online Learning***

Knowlton (2000) noted, "The online classroom is dynamic; it develops a life of its own based on the course content, student personalities, and the professor's ability to monitor and guide the course and make adjustments based on students' needs, interests, and goals" (p. 13). Phipps and Merisotis (1999) contended, "The research does not take into consideration how different learning styles of students relate to the use of particular technologies" (p. 26). Learner characteristics such as a student's preferred learning style are a major factor in achievement and satisfaction levels of the distance learner and should influence how the technology is used and how the course is designed (Kearsley, 2000). Draves (2001) asserted that information transfer and cognitive learning could be accomplished better and faster online than through traditional delivery methods. According to Palloff and Pratt (1999), many workplace skills are gained through participation in the online learning community and are transferable to the world of work. Dede (1996) concurred with the link between the work world and online course skills. Activities such as consensus building and group projects often incorporated into online courses, engage students in activities through which learners can develop skills at collaborating with distant colleagues and cooperating with diverse individuals. And according to Kearsley (2000), a high degree of interactivity and participation was the most important role of the instructor in an online class. Moreover, "dazzling technology has no value unless it supports content that meets the needs of the learners" (Web-Based Education Commission, 2000, p. iv). Additionally, McLoughlin (1999) contended that learning materials need to be evaluated in terms of learner responses and preferences so that instructional designers can learn about the needs and cognitive styles of learners and become more responsive to those needs in the design of materials.

### ***Learning Styles and Online Courses***

Ehrman (1990) stated, "Various learning style models are cited, but seldom defined in works on distance education" (p.10). He discussed five models including the Kolb (1984) model, and how each model can be applied to distance education. Kolb's model is an extension of the cognitive view of learning (Kolb, 2000; Kolb, Boyatzis, & Mainemelis, 1999). This view focused on the cognitive processes of learning, knowledge learning, and what to do with it or how to apply it (Sims & Sims, 1995). The issue of whether a learner should be encouraged or discouraged from enrolling in the online course based on their learning style has continued to be debated throughout the literature as researchers have suggested that learners have a preferred style. However, others argued that being taught through the various styles encourages the learner to mentally

develop areas that might otherwise lay underdeveloped (Claxton & Murrell, 1987; Robotham, 1999).

The Kolb Learning Style Inventory (LSI), used for the Kolb model, identifies two separate learning activities: processing and perception. The way an individual perceives new information can be viewed on a continuum from concrete to abstract, while how an individual processes what is perceived can be viewed on a continuum from active to reflective (Kolb, 2000).

The four learning modes included in the Kolb Learning Style Inventory are: concrete experience (CE, feeling), reflective observation (RO, watching), abstract conceptualization (AC, thinking) and active experimentation (AC, doing) (Kolb, 2000). Each student receives a raw score for each of the four learning modes. It is the combination of these four scores that form an individual's preferred learning style. Each score could range from a minimum of 12 to a maximum of 48. The four raw scores for each student were used in the data analysis. This allowed the researcher to compare the online students as a group to the traditional students as a group. The Kolb model enables students to identify themselves as one of the four types of learners (Loo, 1996). While the Kolb model has undergone scrutiny by researchers debating the LSI's validity and reliability, it is still, however, viewed as a valuable framework for learning activities (De Ciantis & Kirton, 1996).

Sharp (1999) used the Kolb LSI in traditionally taught classes and found that students were better able to learn the course material because the Kolb LSI made the individual student aware of individual learning styles and thinking processes. Additionally, students were aware of the fact that others had various styles and were able to prepare short persuasive oral presentations that appeal in some way to each of the four styles.

According to Dede (1996), the construction of knowledge can be enhanced by the design of the course. Knowledge was more easily constructed if the students are shown the relationships among the individual pieces of information and the individual learning styles of students are supported by the course design. While learner analysis such as knowing the learning styles of students is important, equally significant is "matching the language and design of the site to the skills and needs of its intended audience" (King, 1998, p. 30).

### ***Gender Issues and Online Courses***

Currently more women than men are enrolling in online courses (Kramarae, 2001; Thompson, 1998; University Continuing Education Association, 2002). To avoid gender discrimination, Brunner (1992) suggested that the real danger of ignoring gender in the discourse about distance learning is the likelihood that policy makers will neglect to take into consideration that (1) there are alternative points of view, and (2) the best course of action is generally based on some kind of consensus of or collaboration among people with a variety of perspectives.

Burge (1998) contended that many female learners need psychological safety that cannot be satisfied with online chats and required self-postings. Gender differences according to Burge, particularly for distance learners, need to be recognized. The American Association of University Women (2001) found that nontraditional students,

who were women, have noted that the virtual classroom reduced the discomfort and alienation women have often experienced on the college campus populated by students 18 to 22 years of age. Coombs (2000) noted that online tools are actually beneficial for all students. According to Coombs, the web allows students to think more about what is being discussed and allows more time for a student to compose thoughts. “For technology to change knowledge, it must modify the way humans learn. Thus the challenge presented to teachers in the new millennium will be to help facilitate students to learn effectively with technology” (Hooper & Hokanson, 2000, p. 31). Dede (1996) further pointed out that, “The most significant influence on the evolution of distance education will be not the technical development of more powerful devices, but rather the professional development of wise designers, educators, and learners” (p. 34).

While there is an abundance of research relating to each of the three construct areas independently, no study was found that combines the construct areas selected for study in this project, specifically online learning, learning style, and gender. Additionally, no investigations were found that assessed learning styles using the Kolb LSI and Blackboard course component usage.

## Methods

### *Participants*

The population for the study consisted of 168 students enrolled in seven upper division or graduate level online courses at a Midwest university. While all courses were not offered both face-to-face and online during the semester of data collection, students were able to self select into the courses. The non-probability sample consisted of students enrolled in five online sections and five face-to-face sections. The online courses were matched with the traditional face-to-face classes based on the course subject matter and were considered at or near the same level of difficulty. This level of difficulty was based on whether the course was a junior, senior, or graduate level course. Two courses were considered junior level, two were considered senior level, four were considered to be either senior or graduate student level, and two were considered graduate level only.

The specific online courses included in the study were: (1) “Advanced Tax Accounting;” (2) “The Causes of Crime and Delinquency;” (3) “Technology Administration and Management;” (4) “Strategic Management and Policy;” and (5) “Administration, Organizational and Operations Concepts for Managers.”

The traditional face-to-face courses selected for comparison to the online courses were: (1) “Tax Accounting II;” (2) “Going Grey Behind Bars: Social Economic and Personal Implications of Getting Tough on Crime;” (3) “Selection and Utilization of Educational Media;” (4) “Strategic Management and Policy;” and (5) “Marketing Management.” These courses represented students in programs offered by the College of Business Administration, the College of Humanities, Public Affairs, the College of Education, and University College.

This was considered a non-probability sample rather than random. This purposive sampling method, however, is appropriate for this investigation because one research question only involved students in matched courses while the other two research questions only addressed students in the online courses (Aiken, 1997). The purposive

sample was selected because in the researcher's opinion the student participants "possess the necessary information about the population" (Fraenkel & Wallen, 1996, p. 100) and provided the data needed for this study. Students in the online classes and the traditional classes were similar in age. The mean age of the online student was 28.75 years, while the mean age of the student in the traditional course was 27.97 years,  $t(166) = .583$ ,  $p = .561$  (two-tailed). A total of 102 females participated in the research study and a total of 66 males participated. There were more female participants than males in both the online class and the face-to-face course. The demographic data gathered from university records for the student participants are shown in Table 1.

**Table 1**

***Demographic Data (N=168)***

| Demographic         | Online | Face-to-face |
|---------------------|--------|--------------|
| Mean age of student | 28.75  | 27.97        |
| Gender              |        |              |
| Female              | 35     | 67           |
| Male                | 26     | 40           |

***Data Collection and Instrumentation***

Two research instruments were used to gather the learning style data. The two instruments were the Kolb Learning Style Inventory IIa and the Kolb Learning Style Inventory 3. The 1993 paper version, the Kolb Learning Style Inventory IIa, was administered to the students in the traditional face-to-face course; while the newer 1999 online version, the Kolb Learning Style Inventory 3, was administered to the online students. The questions on the two instruments were identical. Additional data were gathered from the course statistics page in Blackboard 5.5 for each online student to analyze student utilization of the class content. Lastly the demographic information (gender and age) on these student participants was gathered from university records.

***Kolb Experiential Learning Model.*** The learning cycle described by Kolb consists of four stages that relate to an individual's experience: (a) immediate or concrete experience, (b) this concrete experience is the basis for observations and reflections, (c) these observations and reflections are assimilated and distilled into an abstract concept, from which new implications for action can be drawn, and (d) these implications can be tested and serve as guides in creating new experiences through active experimentation (Kolb, 2000). These stages result in the four learning modes: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC) and active experimentation (AC) (Kolb, 2000).

***Blackboard Course Statistics.*** Blackboard is considered to be a robust course management system. The software platform revolves around teaching, learning and the ability to create a community of teachers and learners (*Blackboard Instructors Manual*,

2001). The Blackboard system has many resources to assist an instructor with the delivery of a course online. One such resource is the course statistics page. This page can be accessed for an individual student, and the instructor may review how many times the student accessed each area. The four areas are communication areas, main content areas, group areas, and student areas. Additional information available through the course statistics page, but not included in this study, are the number of hits per hour of the day and number of hits per day of the week. By reviewing this page, an instructor can determine how engaged a student is in the online course. It is important to note, however, that while the Blackboard system does count the number of hits, it cannot determine if a student is “learning” in the process.

Asynchronous and synchronous dialogue and the use of collaboration tools are displayed in the main communication area. Tools may include threaded discussion boards, shared documents as discussion board attachments, or virtual office hours through real time chat.

The non-interactive course material posted by the instructor is presented in the main content area. This area might include such things as course information, course documents, assignments, books, and external links.

Group pages are areas set up by the instructor and only accessible to specific groups of students. Groups may have individual group discussion boards, virtual classroom and accessibility to file exchange.

The student areas include tools to help the student manage class work. These tools may include a digital drop box, a homepage editing screen, personal information, a calendar, information on the student’s personal course grade, tasks, and an address book.

### ***Data Analysis***

A one-way MANOVA was used to determine differences between the two groups of students. A second focus concentrated on the students in the online courses and examined if there was a relationship between the students perceived learning style and the utilization of the class content. To determine if there was a relationship a bivariate analysis was performed resulting in a Pearson correlation coefficient matrix. Additionally, the data for the online courses were divided by gender and two bivariate analyses were performed to determine if gender was a factor. A critical value of .05 was used to determine statistical significance.

## **Discussion of Findings**

### ***Research Question 1***

*Are there differences in learning styles between students in online classes and students in traditional face-to-face classes? If so, what are the differences?*

Analysis of the data using one-way MANOVA returned a Wilks’ Lambda value of .913, F of 3.903 and a significance level of .005. This level of significance required the researcher to examine the origin of the differences. Of the four dependent variables

only one, Abstract Conceptualization ( $p=.001$ ), returned a significance level less than the critical value of .05. The remaining four variables, Concrete Experience ( $p=.08$ ), Active Experimentation ( $p=.345$ ) and Reflective Observation ( $p=.124$ ) returned a significance level greater than the critical value of .05. Levels of significance for the between-subjects effects are shown in Table 2.

**Table 2***Test of Between-Subjects Effects*

| Dependent Variable | Df | F      | P     |
|--------------------|----|--------|-------|
| CE                 | 1  | 3.111  | .080  |
| RO                 | 1  | 2.392  | .124  |
| AE                 | 1  | .897   | .345  |
| AC                 | 1  | 12.278 | .001* |

Note. \* $p<0.05$

The dependent variable, Abstract Conceptualization, had a mean value of 32.66 for the online student and a mean value of 28.79 for the face-to-face student. In Table 3 the total means and standard deviation for the sample as well as the means and standard deviation for the students in the online and face-to-face courses are reported. When the learning mode means were plotted on the Learning-Style Type Grid, the learning style of the online student as a group was assimilating, while the learning style of the face-to-face student as a group was diverging.

**Table 3***Means of Learning Mode by Format*

| Class Format |                    | CE    | RO    | AE    | AC    |
|--------------|--------------------|-------|-------|-------|-------|
| Online       | Mean               | 23.49 | 28.92 | 34.43 | 32.66 |
|              | N                  | 61    | 61    | 61    | 61    |
|              | Standard Deviation | 5.21  | 6.13  | 6.43  | 7.06  |
| Face-to-face | Mean               | 25.08 | 30.58 | 35.46 | 28.79 |
|              | N                  | 107   | 107   | 107   | 107   |
|              | Standard Deviation | 5.85  | 7.00  | 6.98  | 6.78  |

|       |                    |       |       |       |       |
|-------|--------------------|-------|-------|-------|-------|
| Total | Mean               | 24.51 | 29.98 | 35.08 | 30.19 |
|       | N                  | 168   | 168   | 168   | 168   |
|       | Standard Deviation | 5.66  | 6.72  | 6.79  | 7.11  |

### **Research Question 2**

*Is there a relationship between a student's learning style and the level of engagement?*

Bivariate analysis was performed to determine if there was a relationship between a student's learning style, as measured by the Kolb Learning Style Inventory, and the level of engagement, as measured by the utilization of class content areas, in the online courses administered through Blackboard. There were no significant correlations, however there were three strong correlations noted. The strongest correlations were between Abstract Conceptualization and communication ( $r = .225$ ,  $p = .081$ ), Reflective Observation and group ( $r = .248$ ,  $p = .054$ ) and Abstract Conceptualization and group ( $r = -.220$ ,  $p = .089$ ). The positive relationship between Abstract Conceptualization and communication and Reflective Observation and group indicated that, as the score in the Abstract Conceptualization mode of learning and the Reflective Observation mode of learning increased or decreased, the number of times the student accessed the communication and group areas of Blackboard moved in the same direction. The negative relationship between the Abstract Conceptualization and group indicated that, as the score for the Abstract Conceptualization mode of learning increased or decreased the number of times the student accessed the group pages of Blackboard moved in the opposite direction (see Table 4). Statistical significance was determined at the .05 level of confidence.

**Table 4**

#### ***Correlations between Kolb Learning Modes and Blackboard Access***

| Learning Mode      |                         | CE    | RO    | AE    | AC   |
|--------------------|-------------------------|-------|-------|-------|------|
| Blackboard Area    |                         |       |       |       |      |
| Communication Area | Pearson Correlation     | -.035 | -.154 | -.064 | .225 |
|                    | Significance (2-tailed) | .790  | .236  | .624  | .081 |
|                    | N                       | 61    | 61    | 61    | 61   |
| Main Content Area  | Pearson Correlation     | .080  | -.196 | -.022 | .115 |
|                    | Significance (2-tailed) | .542  | .130  | .868  | .379 |



|              |                            |       |       |      |       |
|--------------|----------------------------|-------|-------|------|-------|
|              | N                          | 61    | 61    | 61   | 61    |
| Group Area   | Pearson                    | -.058 | .248  | .072 | -.220 |
|              | Correlation                |       |       |      |       |
|              | Significance<br>(2-tailed) | .657  | .054  | .581 | .089  |
|              | N                          | 61    | 61    | 61   | 61    |
| Student Area | Pearson                    | -.080 | -.073 | .058 | .038  |
|              | Correlation                |       |       |      |       |
|              | Significance<br>(2-tailed) | .542  | .578  | .655 | .769  |
|              | N                          | 61    | 61    | 61   | 61    |

Note. \*Correlation is significant at the 0.05 level (2-tailed).

### **Research Question 3**

*Is gender a factor in the relationship between learning style and the level of engagement, for students enrolled in Internet-based courses?*

The data set was divided by gender and two bivariate analysis matrices were performed to determine if gender was a factor in the relationship between learning style, as measured by the Kolb Learning Style Inventory, and the level of engagement, as measured by Blackboard usage, for students enrolled in online courses. The bivariate correlations are shown by gender in Tables 5 and 6.

Reported in Table 5 are the bivariate correlations for females. There were no significant correlations for the female students. There was a strong positive correlation between the Reflective Observation ( $r = .311$ ,  $p = .069$ ) mode of learning and the group area of Blackboard and a strong negative correlation between the Abstract Conceptualization ( $r = -.232$ ,  $p = .180$ ) mode of learning and the group area of Blackboard for females. Statistical significance was determined at the .05 level of confidence.

**Table 5**

#### ***Female Student-Correlations between Kolb Learning Modes and Blackboard Access***

| Learning Mode      |                            | CE    | RO    | AE   | AC   |
|--------------------|----------------------------|-------|-------|------|------|
| Blackboard Area    |                            |       |       |      |      |
| Communication Area | Pearson                    | -.103 | -.124 | .148 | .051 |
|                    | Correlation                |       |       |      |      |
|                    | Significance<br>(2-tailed) | .554  | .479  | .397 | .772 |
|                    | N                          | 35    | 35    | 35   | 35   |
| Main Content       | Pearson                    | -.142 | -.103 | .121 | .039 |

|              |  |       |      |      |       |
|--------------|--|-------|------|------|-------|
| Area         | Correlation<br>Significance<br>(2-tailed)            | .414  | .556 | .487 | .825  |
|              | N  | 35    | 35   | 35   | 35    |
| Group Area   | Pearson<br>Correlation<br>Significance<br>2-tailed)  | -.078 | .311 | .054 | -.232 |
|              | N  | 35    | 35   | 35   | 35    |
| Student Area | Pearson<br>Correlation<br>Significance<br>(2-tailed) | -.149 | .028 | .148 | -.093 |
|              | N  | 35    | 35   | 35   | 35    |

Note. \*Correlation is significant at the 0.05 level (2-tailed).

Reported in Table 6 are the bivariate correlations for males. One statistically significant relationship was found in the data for the male students. This significant relationship for the online male student was identified between male students who favored the Abstract Conceptualization ( $r = .390$ ,  $p=.049$ ) mode of learning and the number of times the student accessed the communication area of Blackboard. Although not significant, there were strong positive relationships for the male students between the Concrete Experience ( $r = .302$ ,  $p=.133$ ) mode of learning and the main content area of Blackboard, the Concrete Experience ( $r = .249$ ,  $p=.221$ ) mode of learning and the group area of Blackboard, and the Abstract Conceptualization ( $r = .307$ ,  $p=.128$ ) and the student area of Blackboard. Additionally, there were several strong negative correlations for the male students between the Reflective Observation ( $r = -.310$ ,  $p=.123$ ) learning mode and the student area of Blackboard, the Reflective Observation ( $r = -.273$ ,  $p=.178$ ) learning mode and the main content area of Blackboard, the Active Experimentation ( $r = -.314$ ,  $p=.119$ ) learning mode and the communication area, and finally the Abstract Conceptualization ( $r = -.231$ ,  $p=.257$ ) and the group area of Blackboard. Statistical significance was determined at the .05 level of confidence.

**Table 6**

***Male Student-Correlations between Kolb Learning Modes and Blackboard Access***

| Learning Mode         |  | CE   | RO    | AE    | AC    |
|-----------------------|--|------|-------|-------|-------|
| Blackboard<br>Area    |  |      |       |       |       |
| Communication<br>Area | Pearson<br>Correlation<br>Significance<br>(2-tailed) | .052 | -.189 | -.314 | .390* |
|                       |  | .800 | .356  | .119  | .049  |

|                   |                         |      |       |       |       |
|-------------------|-------------------------|------|-------|-------|-------|
|                   | N                       | 26   | 26    | 26    | 26    |
| Main Content Area | Pearson Correlation     | .302 | -.273 | -.122 | .154  |
|                   | Significance (2-tailed) | .133 | .178  | .554  | .452  |
|                   | N                       | 26   | 26    | 26    | 26    |
| Group Area        | Pearson Correlation     | .249 | .021  | .038  | -.231 |
|                   | Significance (2-tailed) | .221 | .920  | .855  | .257  |
|                   | N                       | 26   | 26    | 26    | 26    |
| Student Area      | Pearson Correlation     | .145 | -.310 | -.174 | .307  |
|                   | Significance (2-tailed) | .478 | .123  | .395  | .128  |
|                   | N                       | 26   | 26    | 26    | 26    |

Note. \*Correlation is significant at the 0.05 level (2-tailed).

### Implications for Practice

The results of this investigation support previous research that learning style characteristics of the online student are different from the learning style of the student enrolled in the traditional face-to-face course. If a reliable online learning style assessment were incorporated into the beginning of an online course or in an orientation to the online course, then faculty and course developers could create learning materials that would appeal to the predominant learning style for that course. However, this does not suggest that other styles be neglected; researchers disagree on whether one should teach to a style or force students to develop their less predominant learning style (Robotham, 1999). Researchers have reported students with any learning style can learn effectively online (Palloff & Pratt, 1999). Nevertheless, by faculty and students working together in identifying the student's learning style, they can both learn what is needed to develop an individual learning process and what course materials are more likely to engage students and facilitate learning in the online classroom. Consequently faculty should become more of a facilitator for learning in the online classroom. In addition, learning style assessments such as the Kolb LSI 3 and Blackboard online tools may be able to assist faculty with this challenging teaching method. The online instructor must also be aware of how discussions, chats, and groups are affected by gender, keeping in mind that required postings might be intimidating to some female students. Group assignments or chat-type assignments may be a welcome opportunity for others, both male and female. The finding that gender can be a factor in online learning supports the need for including gender equity in building and designing courses and programs.

By examining the learning style of the online student and the learner engagement by a student's learning style, an instructor can include the necessary components in the online course that facilitate student learning. Additionally, by investigating the relationship among online learning, learning style and gender, issues affecting the growing number of female online learners can be acknowledged.

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