

Do Learning & Teaching Styles Affect Students' Performance? An Empirical Study

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ABSTRACT

The ways in which students normally obtain, retain, and get back information are defined as the students' learning style. Mismatches often occur between the learning styles of students in a Basic Statistics class and the teaching style of the instructor, with adverse effects on the quality of the students' learning and on their attitudes toward the class and the subject. The purpose of this study was to determine whether or not congruency of learning and teaching styles improve students' performance in my Basic Statistics class.

INTRODUCTION

Students have different learning styles in the ways they take in and process information, for example, by seeing and hearing; reflecting and acting; reasoning logically and intuitively; memorizing and visualizing. Teaching styles also vary. For example, some instructors lecture, others demonstrate or discuss, some focus on rules and others on examples, some emphasize memory and others understanding. How much a given student learns in a class is managed in part by that student's ability and prior preparation; by the compatibility of his or her characteristic approach to learning; and the instructor's characteristic approach to teaching (Felder and Henriques, 1995; Felder and Spurlin, 2005).

The ways in which an individual normally acquires, retains, and retrieves information are defined as the individual's learning style. The topic of learning styles and its effect on student performance have been extensively researched time and again in the educational research literature (Felder and Henriques, 1995: 21), specifically in the context of differences in student learning styles by Felder and Brent (2005). Many learning style assessment instruments have been developed in the past five decades (Felder and Henriques, 1995: 22).

When the learning styles of students in a class and the teaching style of the instructor are incompatible, with adverse potential effects, the students may be bored and become inattentive in class, do poorly on tests, get discouraged about the course, the curriculum and themselves, and in numerous cases change to another program or drop out from school (Felder and Spurlin 2005: 103). Instructors, confronted by low-test grades, unresponsive or hostile classes, poor attendance, and dropouts, may become overly critical of their students "making things even worse" or begin to doubt if they are in the right profession (Felder and Henriques, 1995: 21). The purpose of this study is to determine whether or not congruency of learning and teaching styles improve students' performance in Basic Statistics class. To address these issues the following literature review and theoretical framework were utilized.

LITERATURE REVIEW AND THE THEORETICAL FRAMEWORK FOR THE STUDY

In the last five decades, the topic of learning and teaching styles has been of considerable interest in the administrative and organizational sciences, as well as academic community. Since its inception, several hundred articles, chapters, and books have been written on the subject of learning and teaching styles (Dunn et al, 1986, 1990; Stevenson and Dunn, 2001; Grasha, 1996; and Kamuche, 2005a). Each researcher begins his or her work by indicating the conceptual dilemma and methodological problem surrounding this construct and almost all indicate that little agreement exists about what learning and teaching styles means or how to adequately measure it. Authors writing on the subject are so disillusioned that they often cause more confusion than enlightenment. Despite this shortcoming, the study of learning and teaching styles remains an important issue.

Learning and teaching styles are an important issue in the study of any institution. Many researchers (Dunn and Dunn 1993; Felder, 1993, 1995, 1996; Zhang 2004) have expertly investigated this issue with little success at reaching an agreed-upon standard for measuring student-learning performance. This is because there is no singular measure of student learning performance. For example, study of literature has shown several definitions of learning styles, as well as several instruments to measure them. Of the different learning style tools, the Gregore learning style inventory (Gregore 1985) seems ideal for assessing student-learning preferences in statistics class. The Gregore was chosen among other competing instruments based on how widely it was used, the reliability, the ease of interpretation in the learning and teaching context, the availability, and cost. This instrument provides an organized way to consider how the human mind works. For example, the Gregore Learning Style Inventory (Gregore 1985) uses perceptual qualities and ordering abilities. The perceptual qualities are: concrete and abstract. The ordering abilities are: sequential and random. Gregore describes these qualities and abilities in the following paragraphs (Gregore 1985).

The concrete quality enables a person to register information directly through a person's five senses of sight, smell, touch, taste, and hearing. When a person is using the concrete quality, he or she is dealing with the obvious. He or she is not looking for hidden meanings, or making relationships between the ideas or concepts. The abstract quality enables a person to visualize and conceive ideas, and to understand or believe that which you cannot actually see. This quality involves using intuition, imagination, and looking beyond what is the more subtle implications. Thus, the idea is not what it obviously seems to be.

The sequential ability is the ability that enables an individual's mind to organize information in a linear manner, or step-by-step manner. The individual follows a logical train of thought or a traditional approach for dealing with information. The individual may also have a plan that he or she follows rather than relying on impulse. The random ability is the ability that enables a person to organize information by chunks without following a particular order. The individual is often able to skip steps in a procedure and still produce the desired result. The individual can start any where in the procedure such as the end and work backwards. The individual who has the random ability is more likely to be impulsive and may not have any plan he or she follows.

Using the two perceptual qualities and the two ordering abilities, Gregore (1985) developed four combinations of learning styles. These four styles are: Concrete Sequential (CS) learners that favor a step-by-step-orderly approach to organize sensory information; Abstract Sequential (AS) learners are strongly analytic and logical, favor verbal form of instruction; Abstract Random (AR) learners who prefer an unstructured environment and organize information by chunks without following a particular order; and Concrete Random (CR) learners who learn mostly by trial and error. The Gregore Learning Style Inventory has been tested for reliability. The correlation between first and second test on the same population yielded a correlation coefficient of 0.87, which is significant at a p level of < 0.001 (Gregore, 1985). Gregore's word matrix instrument was used to identify students' and a teacher's learning styles.

The question is, would a student whose learning styles are similar to the instructor's teaching style perform better in that instructor's class than a student whose learning style is different to the instructor's teaching styles?

As noted by Beets and Lobingier (2001), pedagogical research needs to begin to assess learning. Such evaluation needs to go beyond grades and test scores to assess understanding (Kamuche, 2005b; Ledman and Kamuche, 2003). Several studies have suggested the need for a meaningful assessment (Figlio and Lucas, 2004; Filbeck and Webb, 2000; Fritz et al, 2004; Krohn et al, 2005; Ladd and Ruby, 1999; Loo, 2002; Lu et al, 2003; Morrison et al, 2003; Smith et al, 2005; Wyrick, 2003; Zhang, 2004). These studies indicate that, for the specific case studied, the change in learning styles did have a positive effect on performance. Most education research has confirmed that knowledge of student learning preferences do yield benefits, for example, Diaz and Cartnal (1999) compared the student learning styles of two online health education classes (N = 68) with an equivalent on-campus class (N = 40). They found significantly difference in learning preferences for both group of students and concluded that knowledge of student learning preferences influence learning performance. The mean scores for these students were significant as well.

In one of the published studies of learning and teaching styles, Felder and Henriques (1995) reported on a study of foreign and second language students. They concluded that knowledge of student learning preferences had a beneficial and significant influence on student performance. They further found that the positive effects on performance increased as the mismatch of common learning styles of students and traditional teaching styles of instructors was decreased. Felder and Silverman (1988) and Felder and Dietz (2002) also examined effects of learning and teaching styles in engineering education. They found that knowledge of students learning preferences were a determinant of student success. Both of these studies, Tom and Calvert (1984); Felder and Brent (2005) examined effects of the students' learning styles on the students' performance, as measured by grades, they found that students with learning styles that fit well with the emphasis of the instructor perform better than those students whose learning styles were not as well matched. These studies clearly suggest there is added value to the students whose learning styles match the instructor's teaching styles. If students whose learning styles are similar to the instructor's teaching style outperform those whose learning styles are different, it seems reasonable to conclude that when they match, the students perform better. Therefore, the investigator hypothesized that students whose learning style matches the instructor's teaching style, not only perform better on tests but also understand the subject matter better. Thus, these conclusions lead to the primary objective of this study. If the ultimate goal is to increase student learning, the question is, can student performance in the Basic Statistics course be improved as a result of the student's learning preference?

Thus, the hypotheses for the study include:

- H1:** Students whose learning styles are similar to instructor's teaching style will perform significantly better on tests.
- H2:** Students whose learning styles are similar to instructor's teaching style will earn higher grade in the course and understand the subject matter better.
- H3:** Students' test performance will correlate with the grade earned in the course.

RESEARCH METHOD

Sample

The sample in this study is the students in the investigator's classes over three academic years from fall 2002 to spring 2005. The typical enrollment in the classes was thirty-five students per section with two or more section being taught each semester. The total enrollments in the Basic Statistics courses each year ranged from 105 in the third year to 165 in the first year. The enrollment in the second year was 130. The total enrollment for the Morehouse College was approximately 3000 students during the years of this study.

Procedures

Students' tests records were maintained during the study years, from fall 2002 to spring 2005. To test student performance, the students in the course were given the same treatments (faculty, syllabi, texts, course preparation materials, and tests) for all years of the study. By using the same instructor for all sections, the author control variation in instruction, lecture material, and topic coverage; also accounts for variation in student abilities. Since multiple choice is an objective test especially in a quantitative subject such as Basic Statistics, the possibility of grading bias was minimized. The Gregore Learning Styles Inventory was administered in a group setting during the second week of classes to assess the initial learning styles of the students. The inventory was self scored by the students and raw scores were obtained for each of the learning style categories. Inventories were reviewed by the investigator for compliance with directions and for accuracy of scoring. The Learning Styles Inventory develops a learning-style profile based on four categories: conditions for learning which is CS, area of interest which is AS, mode of learning which is AR, and expectation for course grade which is CR.

Data Collection

Complete and accurate students' tests records served as the data sources for this study. The final year of data

collection was the end of spring semester 2005. The sample size was 400 students.

Data Analysis

Regression and correlation analysis were used to measure the strength of the linear relationships between instructor's teaching style and student's performance. The t-tests were used to determine if there was a difference in the mean test performance between and within treatments. Hypotheses were tested using regression and correlation analysis to measure the strength of the linear relationships. In the analysis of students in the Basic Statistics course 46 percent of students were Concrete Sequential, 13 percent Abstract Sequential, 24 percent Abstract Random and 17 percent Concrete Random.

Results

The results of correlation analysis are shown below. H1: Relationship between students whose learning style matches the instructor's teaching styles and test performance was .89. H2: Relationship between students whose learning style matches the instructor's teaching styles and grade earned in the course was .78. Relationship between test performance and grade earned in the course was .75. The results of this study were significant for all the hypotheses questions at the .01 level. The correlation between knowledge of students learning styles and student test performance was 0.89. That correlation suggests a very strong linear relationship between students whose learning style matches the instructor's teaching styles and student test performance. The correlation between knowledge of students learning preferences and grade earned in the course was 0.78; again suggesting a strong linear relationship between students whose learning style matches the instructor's teaching styles and their ability to demonstrate learning of the course material. The correlation between test performance and learning, as determine by the grade earned in the course was 0.75, again suggesting a strong linear relationship between student test performance and grade earned in the course. Thus, the relationship between the two hypothesis were significance and very relevant for this study. The t-tests were used to compare mean test performance between and within treatments showed no significant differences. These findings are important because they lend strong support to those of earlier studies in this area (Felder, 1995, 1996; Felder and Brent 2005; Felder and Dietz 2002; Felder and Silverman 1988).

Discussion

This study provides clear evidence that faculty can use learning styles data to help them design creative matches with students learning preferences. The extremely high correlation between students whose learning styles are similar to the instructor's teaching style in Basic Statistics class is well founded. The tremendously high correlation between students whose learning styles are similar to the instructor's teaching style and test performance clearly suggests that learning and teaching styles are quite relevant to student performance in Basic Statistics education. Clearly, the author can say students learned better when instruction was geared toward their learning style.

Further studies are needed in different institutions and disciplines, especially in light of the findings for this study. Figure 1 below is an illustration of the relationship between the effects of learning and teaching styles, test performance, and grades earned in the course based on this study. The figure illustrates that both test performance and grades earned in the course are improved when instruction was geared toward student learning styles in Basic Statistics classes.

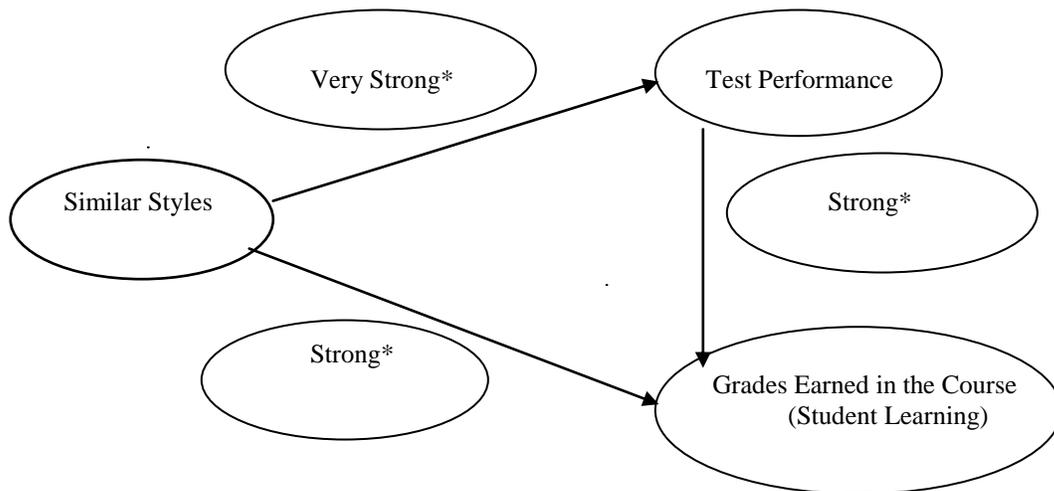
It should be noted again that findings of this study were based on a sample of students in statistics courses. The quantitative nature of these courses is such that they lend themselves to objective tests with precise answers. Such studies could present substantial challenges when the subjects in question are more abstract and tests are more subjective. Issues such as consistency in grading of subjective tests and measuring learning will need to be carefully considered in the research design (Kamucho, 2005b; Ledman and Kamucho, 2003).

CONCLUSIONS

The goal of any instruction is to produce effective learning. Learning and teaching styles assessment

provides us the opportunity to produce effective learning. Instructors should be sensitive to the students learning preferences. Knowledge of students learning styles can give the instructor some insight into the characteristics of the student. This means that instructors must incorporate in their class material enough material, methods of delivery to address the need of each and all students. Students can also learn ways to adapt to the different teaching styles of an instructor. If students and teachers are aware of their differences in learning and teaching styles, and try to make adjustments for their differences, they will all benefit.

Figure 1
Kamucho's Model of Student Learning



*Strength of linear relationship

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