

**INVESTIGATION OF LEARNING STYLE PREFERENCES
OF BUSINESS STUDENTS**

Chen Y. Wu

Assistant Professor of Finance
The University of Texas at Tyler

Dominick E. Fazarro

Associate Professor of Industrial Technology and Industrial Management
The University of Texas at Tyler

Introduction

The need to understand college student learning styles is growing rapidly because they are becoming more diverse (Dunn, 1981 & 1989) as the population of the United States becomes more ethnically and culturally diverse. The aim of learning style research is to find common ways in which students perceive, process and interpret course material and to see whether this knowledge can be applied to improve the quality of instruction and to empower individuals to utilize their learning style effectively in a classroom environment. According to Sims and Sims (2006), “Understanding the role of learning style in the learning process is an important concept from those committed to meeting the demands being placed on education and their own personal commitment to learning excellence” (p. xiv). To this end, instructors must be prepared to be creative in designing a variety of instructional methods that cater to students’ different learning style preferences. Burris, Kitchel, Molina, Vincent, & Warner (2008) stresses, “Student learning styles can impact a variety of areas in the classroom, such as environment, student praise or reinforcement, class structure, and teaching methods” (p.44). Hickox (2006) indicates that “researchers use learning styles as a byword to reflect that their field is seeking to meet the needs of their students or population” (p. 8).

Adapting university curriculum and instructor teaching styles may prevent the loss of struggling students who are intellectually capable of succeeding (Fazarro & Stevens, 2004). The hope is that instructors modify their teaching styles based on awareness of differences in students’ learning styles to help improve their academic achievement. It is then necessary to assess the effect of changes in instructional styles and techniques on student learning outcomes. As business practices evolve ever more rapidly as a result of globalization and greater ease of communications, it is crucial for university faculty to build learning environments that will allow

their students to achieve their educational objectives so they can compete successfully in the 21st century job market.

Literature Review

Theories of Learning Styles

Thelen (1954) first used the term learning style to describe changes in how individuals learn and interact in a group setting. Humans have innate cognitive tendencies and, as Scarr (1992) suggests, natural occurrences such as environments and experiences occur, can either positively or negatively reinforce such tendencies. This theory has common elements with that of Guilford (1965) which utilizes cognitive operations to divide individuals into those with convergent and divergent thinking. Hudson (1968) also suggested that divergent thinking is a style of thinking and tested this theory with science and art majors. He concluded that science students generally preferred a convergent style of thinking but arts students were more likely to prefer a divergent style of thinking (Lovell, 1980). Hudson's work is important because it provides the link between cognitive science and learning style theory.

Many learning style theories have been developed including the Dunn and Dunn Learning Style Model (1978) which is based on the classification of individuals as visual, auditory or kinesthetic (or tactile) learners. Kolb's Experiential Learning (1984) classifies individuals as convergers, divergers, assimilators and accommodators. Canfield (1988) devises a learning style inventory which categorizes individuals along four dimensions: conditions of learning, area of interest, mode of learning and expectation for course grade. Grasha (1990) defines learning styles as preferences students have for thinking, relating to others, and particular types of classroom environments and experiences. But Keefe (1979) provides the most commonly used definition of learning styles as a set of cognitive, affective and physiological

behaviors that serve as stable indicators of how learners perceive learning experiences and respond to learning environments.

Studies of Learning Styles of College Business Students

Buckley (2007) investigated the learning style differences of cadets majoring in engineering and business at the California Maritime Academy using the Group Embedded Figure Test (GEFT). The study revealed that business majors were less likely to be field-independent learners than engineering majors. Loo (2002) used the Kolb Learning Style Instrument to ascertain differences in the preferred learning styles of business majors. The study found students in accounting, finance, marketing and management information system preferred the assimilator learning style. Rupasinghe (2008) employed the Learning Style Orientation Inventory (LSOI) and discovered significant differences in learning even among students majoring in marketing and entrepreneurship in Sri Lanka across all learning styles (Discovery Based Learning (DBL), Group Based Learning (GBL), Experiential Learning (EL), Structured Learning (SL) & Observational Learning (OL).

Zapalska (2002) asserted that as the post-secondary student population becomes more diverse, the differences in learning styles are likely to become more pronounced but they did not report statistically significant differences in learning styles between male and female students. Said and Ghani (2009) suggested the divergence in learning styles could be the result of students with certain innate learning styles self-select to choose majors with courses more likely to be taught in their preferred learning styles. This can also explain why Stitt-Godhes (2001) uncovered a high degree of similarity between learning styles of business school instructors and students and even when they differ, the difference is not substantial.

Naik (2003) administered the Index of Learning Styles to about 150 business students and found a majority of them prefer a visual and sequential style of learning. Dunn (2009) reported results from numerous institutions that knowledge about their own learning styles improved student performance, especially among at-risk students, and many even described it as being useful beyond the classroom. Terregrossa (2009) also used the Productivity Environmental Preference Survey (PEPS) based on the Dunn and Dunn Learning Style Model (1978) employed in this study. They observed that students with a learning style congruent with the instructor's style of teaching have stronger academic performance but students with incongruent learning styles do not have significantly poorer academic performance.

While a person's dominant learning styles may change over a lifetime, they are generally quite stable (Dunn 1993). Furthermore, students are more likely to have high academic achievement when instructional methods and strategies are compatible with their dominant learning styles (Galloway 1984; Dunn 1993). Overall, the research presented in the literature, indicated knowledge of student learning styles can be effective in improving the learning environment and is key to instructors helping students achieving course objectives.

Purpose of Study

The purpose of this study is to determine if modification of instructional methods and strategies to match students' learning style preferences can raise their grades in the course titled Principles of Finance. Methods and strategies designed to suit the learning style of the largest of number of students are applied in the experimental section while both remain unchanged in the control section. Student achievement in the experimental section, as measured by the course

grade point average (GPA), is expected to be significantly higher than that of the control section.

The research question addressed by the study is:

- (1) Is there a difference in the students' final course grade average (FCGA) in Finance 3311-*Principles of Finance* when the experimental section is taught according to its preferred learning style when compared with that of the control section?

A corresponding pair of null and alternative research hypotheses is created to test the statistical significance of the difference of the FCGA between the experimental and control groups, based on the conventional alpha level of .05.

H₀: There is a significant difference in the students' course grade averages (FCGA) of the treatment and control groups, when the former is taught according to its preferred learning style and the latter is not.

H_a: There is no significant difference in the students' course grade average (FCGA) of the treatment and control groups, when the former is taught according to its preferred learning style and the latter is not.

Methodology

Research Design

The research design for this study is a quasi-experiment requiring a group subject to modified instructional methods and a comparison group taught using methods employed by the same instructor prior to the study. One instructor taught two sections of Finance 3311 (Principles of Finance or Introduction to Finance) in the Spring 2012 semester. The treatment group consisted of 44 students enrolled in section 003 which met twice a week for one hour and fifteen

minutes each. The control group had 28 students enrolled in section 004 which met once a week for two hours and forty minutes. See Figure 1 for research design layout.

Figure 1

Research design layout for determining the effectiveness of learning style preferences for Spring 2012 Semester

Group	Sample Size	Final Course Grade Average (FCGA)
Treatment Group	44	FCGA ₁
Control Group	28	FCGA ₂

Adapted from Campbell, D.T. & Stanley, J.C. (1966). *Experimental and quasi-experimental designs for research*. Chicago, IL: Rand McNally & Co.

The instructor has ten years of experience in finance and has been a tenure-track professor for three years. He had no prior knowledge of learning styles and taught according to the objectives and learning outcomes as explained in his course syllabus.

One weakness in the research design is the use of the same instructor for both experimental and control sections. The authors are aware of this internal threat to validity and applied necessary safeguards by providing the instructor with a mini-workshop on learning style and on the learning style instrument for the study. Many other confounding factors can adversely impact the significance of the results of the study. There could be a difference in teaching effectiveness from the difference in length and frequency with which the subjects met the instructor. The proportion of students working full-time in the section that meets once a week in the evening is probably higher, although this is not known with certainty because the researchers excluded this variable from the survey of the subjects. Another confounding factor is the inherent

differences in ability and motivation of the students in the two groups. Instructor bias in favor of the group receiving modified instruction is also possible. We shall explain our efforts to control for these variables near the end of the paper.

Population of Subjects

The subjects for the study are business majors who are required to take Finance 3311 as one of seven Business Core courses. There are approximately 1,200 students in the College of Business and Technology at a university located in the southwestern United States.

Study Instrument

The instrument used in the study was the Productivity Environmental Preference Survey (PEPS), which is based on the Dunn and Dunn Learning Style Model (1978). PEPS is a comprehensive questionnaire designed to identify how adults prefer to learn and concentrate in work or educational settings (Price, 1996). The researchers selected PEPS because of its proven record to ascertain how students learn in a classroom environment (Terregrossa 2009). See Figure 2.

Figure 2

Dunn and Dunn Learning Style Model

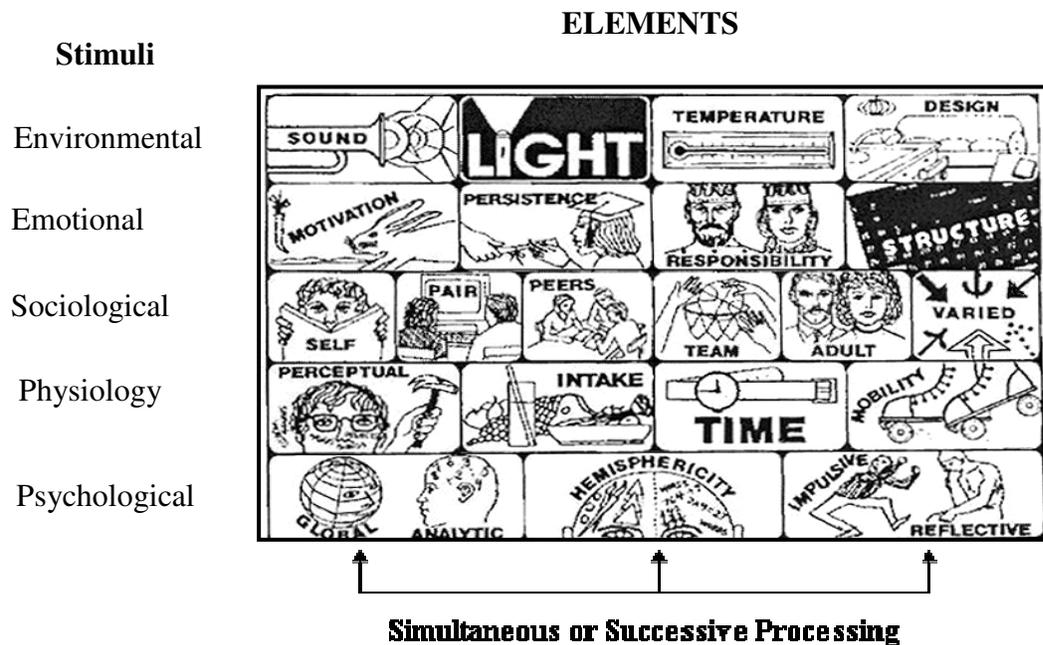


Figure 2. Learning Styles Model (from *Teaching Secondary Students Through Their Individual Learning Styles: Practical Approaches for Grades 7-12* (p.4), by R. Dunn and K. Dunn, 1993, Boston: Allyn and Bacon. (Copyright 1993 by Allyn and Bacon.)

The Dunn and Dunn Learning Style Model (1978) has been applied in post-secondary classrooms with the support of validity data from a large number of empirical studies (Lovelace, 2005). PEPS has been used by researchers in college disciplines including agriculture, physics, industrial technology, and education (Fazarro & Martin, 2004; Fazarro & Stevens, 2004; Gordon & Yocke, 2005; Larkin-Hein & Bundy, 2001; Terregrossa, Englander, Wang, 2009).

PEPS uses 20 learning elements to assess students’ learning style preferences. There are 100 items to be completed by the respondent using a scantron form. This instrument uses a Likert-Scale to assess *how students like to learn* (Price, 1996). Each of the 20 elements functions as a mini-scale for a preference related to the cognitive, environmental, or affective domains.

For example, a student with a high score on the tactile element has a preference for learning information using objects such as the ball-and-stick model of a molecule.

Scores for the PEPS elements range from 20 to 80. For any element, a score of 40 or less means it is a student's "least preferred" element while a score of 60 or higher means it is a student's "most preferred" element. The PEPS instrument has reliability scores of .60 or higher in past research studies (Price, 1996; Bevard College, 2003).

Statistical Analyses

The mean scores of the experimental and treatment groups for each of the 20 PEPS learning elements are used to identify the students' "most preferred" element. The Wilcoxon signed-rank test is used to determine whether the difference in mean FCGA's from the experimental and control groups are statistically significant. This technique is chosen because of unequal sample sizes and more importantly, because it makes no assumptions about the underlying distribution of the FCGA's of the experimental and control groups.

Data Collection

The researchers obtained prior approval of the Institutional Review Board (IRB) at the participating university and the participating department for the use of human survey subjects in the study. Steps were taken to ensure the data for the study was not contaminated and to monitor any internal threat to validity. The distribution of the PEPS instrument for each group was carefully devised for students as a voluntary assignment to help the instructor to become more "student-friendly."

Treatment Group

The duration of the study was approximately 15 weeks. The instructor had been briefed on the purpose of the study and its procedures prior to data collection and was asked to participate in a three-hour mini-workshop to receive basic information about learning styles theory and the design and uses of the PEPS instrument. The instructor had little prior knowledge of learning styles and its application in an education setting. After the instructor completed the mini-workshop, the principal research investigator established a time and date to disburse the PEPS to the students in the designated experimental and control sections.

On February 2, 2012, students were administered the PEPS instrument. The survey was completed on a voluntary basis but no student refused to participate. Students who wished to view their learning style preference profile could request the results of the survey from the instructor. The investigator mailed the completed PEPS to Price Systems in Lawrence, Kansas to be scanned. The data was then returned to the instructor and its descriptive statistics were generated using the Statistical Package for the Social Sciences (SPSS) to determine the “most preferred” learning style/element for the treatment group.

About two weeks after the administration of the surveys, the SPSS output of the students’ preferred learning styles was discussed with the instructor. The learning style with the highest mean score from the 20 elements was chosen as the target learning style. The instructor then modified his instructional techniques and methods to enhance his lessons in accordance with the identified target learning style for the remainder of the semester. The instructor was asked to maintain a bi-weekly journal to record any changes in the students’ grades and attitudes toward the course throughout the semester. On May 15th, the Final Course Grade Averages (FCGA) for

the section was provided by the instructor. All journal entries were collected and reviewed for the study.

Control Group

For the control group, the instructor made no changes in his usual instruction techniques. At the end of the semester, the instructor provided the FCGA for this section so a comparison between the experimental and control groups can be made. Only student grades are used in the study as student names and identification numbers are removed to ensure anonymity.

Results

Determining Learning Style Preferences

Table 1 shows the mean and standard deviation for each of the 20 learning style preferences of the 44 students in the treatment group.

Table 1
Summary of Preferred Learning Style Preferences

Learning Style/Element	M	SD
Noise Level	52.80	8.177
Light	48.76	9.186
Temperature	47.07	6.758
Design	50.39	8.300
Motivation	51.98	6.459
Persistence	54.44	4.550
Responsible (Conforming)	47.37	8.746
Structure	61.02	6.887
Learning Alone/Peer-Oriented Learner	53.44	10.092
Authority-Oriented Learner	55.32	6.669
Several Ways	46.41	6.887
Auditory	51.29	8.821
Visual	48.32	8.202
Tactile	52.73	6.936
Kinesthetic	54.98	4.022
Requires Intake	56.80	7.065
Time of Day	45.37	8.820
Late Morning	47.93	7.904
Afternoon	57.66	10.439
Mobility	54.22	6.898

Note. Bold type signifies the learning Style preference preferred by students for the course

Table 1 shows the learning style/element *Structure* was the most preferred among the treatment group although there were several others such as *Requires Intake* and *Afternoon* came close.

Incidentally, the *Structure* element was also the most preferred for the control group. According to Price (1996), the element/learning style ‘Structure’ is described as follows:

“For standard score of 60 or more, be precise about every aspect of the assignment; permit no options; use clearly stated objectives in a simple form; list and itemize as many things as possible, leave nothing for interpretation; clearly indicate time requirements and the resources that may be used; required tasks should be indicated as successful completion is evidenced, gradually lengthen the assignment and provide some choices from among approved alternative procedures; gradually increase the number of options; establish specific working and reporting patterns and criteria as each task is completed.

For standard score of 40 or less, establish clearly stated objectives but permit choice of resources, procedures, time lines, reporting, checking, etc.; permit choice of environmental, sociological and physical elements; provide creative options and opportunities to grow and to stretch talents and abilities; review work at regular intervals but permit latitude for completion if progress is evident. Some employees may not prefer structure but require close supervision (p. 9).”

The main researcher recommended some changes and designed a new instructional prescription for the rest of the course which were readily accepted by the instructor. See Figure 3.

Figure 3

Sample-modification of instruction used for the preferred learning style *Structure*

February 6, 2012-Allow for more complex problems and check for understanding by varying problem parameters.

February 7, 2012-Begin evaluating results of survey and develop a strategy of implementation
Create PowerPoint for recap and review for 3-5 minutes before dismissing class.

February 9, 2012-Review session for each quiz (2/7/12 and 3/6/12) and each exam (2/21/12, 4/3/12 and 5/3/12) in a Q&A format where students are expected to respond to queries about topic covered in quiz/exam and then open discussion to student questions.

February 13, 2012-Create PowerPoint slides for announcements, recap of previous lecture, new session agenda.

February 14, 2012-Explain problems in non-finance language and start by carefully selecting simple ones to start.

Simple descriptive statistics were calculated to determine the difference in FCGA between treatment and control groups for the courses. Table 2 shows the treatment group-FCGA is significantly higher than that of the control group. Since the number of students in the control group is less than 30, the number generally required for the central limit theorem to apply, the distribution of student grades in the control group cannot be assumed to follow the normal distribution. This is confirmed by an application of the Kolmogorov-Smirnov test which strongly rejects the normality assumption.

Table 2

FCGA Mean Score Comparison of Treatment and Control Groups -Finance 3311 (Spring 2012)

Course/Section	Treatment		Control	
	M	SD	M	SD
Finance 3311 (003) n=44	2.79	1.2497	-----	-----
Finance 3311 (004) n=28	-----	-----	2.32	1.3348

Therefore, to test the research hypotheses, the researchers employ the Wilcoxon signed-rank test, a non-parametric statistical technique, at the traditional alpha level of .05. Doing so reveals a difference in the FCGA between the treatment and control groups that is very nearly statistically significant. The treatment group's FCGA (2.79) is higher than the control groups' FCGA (2.32) ($Z = -1.5813$, $P = 0.0569$). The researchers believe that the marginal statistical significance can be attributed to the small sample size, especially that of the control group. Therefore, these results suggest that the alternative hypothesis of instruction modification in

favor of students' preferred learning style of having no benefit to student learning and achievement can be rejected.

In order to control for the inherent differences in the ability and motivation of the two groups, we measure the ratio of the difference of the two groups' course GPA to the difference in their pre-study GPA. The larger this ratio is, the less likely that the observed difference in the course GPA of the two groups can be solely attributed to the innate difference in ability and motivation between the two groups. This is especially true in light of the slight difference in the mean GPA of 0.20 of the two sections prior to the start of the course which has only a t-statistic of 1.067 with a p-value of 0.143. Furthermore, the ratio of the difference between the mean GPA of the two sections in the course and the difference in mean GPA prior to the course is 2.4 which suggests the difference in performance between the two sections is far greater than the difference in mean GPA of the two sections prior to the start of the course alone would indicate. The instructor also conscientiously avoided bias in favor of the section receiving modified instruction by using identical course material such as textbooks, exercises, projects as well as instruments of assessment such as quizzes and examinations. The pace of the course was kept uniform in both sections by employing the same course calendar which allotted equal amount of time devoted to each topic for both groups. This alleviates somewhat but by no means removes all doubts about the significance of the results of the study in light of the many confounding variables that could have contributed to the noted difference in achievement between the two groups.

Conclusion

The study reveals a marginally significant improvement in the learning outcomes of students in the experimental group who were subject to instructional techniques geared towards their most preferred learning style. However, the authors would recommend readers to approach

their findings with caution. They may not be applicable to a greater population due to the small sample size and the use of convenience sampling method (McMillan & Schumacher, 2001). In addition, there are numerous uncontrollable confounding external variables (e.g. differences in levels of self-motivation and age) discussed earlier as well as the withdrawal of two poorly-performing students from the control group which makes the difference in FCGA between the treatment and control groups even more robust.

While the instructor enhanced the learning environment for 44 students in the course, it required persistence and dedication to achieve positive results for students' learning outcomes. An excerpt from the journal entry of the instructor teaching Finance 3311 addresses changes in learning attitude is shown in Figure 4.

Figure 4

Excerpt of instructor's journal entry



The researchers believe there is value in acquainting other business faculty of the importance of learning styles in enhancing student learning and achievement. This can only lead

to an expanded repertoire of teaching methods in their perpetual quest to improve the learning environment and student performance.

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