Learning Style and Learner Satisfaction in a Course Delivery Context

Paul David Henry

Abstract—This paper describes the results and implications of a correlational study of learning styles and learner satisfaction. The relationship of these empirical concepts was examined in the context of traditional versus e-blended modes of course delivery in an introductory graduate research course. Significant results indicated that the visual side of the visual-verbal dimension of students' learning style(s) was positively correlated to satisfaction with themselves as learners in an e-blended course delivery mode and negatively correlated to satisfaction with the classroom environment in the context of a traditional classroom course delivery mode.

Keywords—Course delivery mode, e-blended, hybrid, learner satisfaction, learning style.

I. INTRODUCTION

FOR an instructional designer and a teacher of online and onsite graduate research courses, improving the learning environment is an on-going effort. One of the most useful paths of enquiry has been gaining understanding of the individual differences present in adult student populations with the goal of accommodating them in the instructional environment. To achieve this goal, research was conducted with graduate students in the research courses.

The goals of this study were exploratory and practical in nature: to identify any strong relationships between learning styles and learner satisfaction within the context of varied modes of classroom course delivery. The understanding about these empirical concepts gained from this study could be used to improve instruction through providing traditional or e-blending course delivery strategies tailored to these preferences. Any generalizations that might arise from the results could be considered for further study and application with the limitations of this study in mind.

The research objectives were to identify which (if any) of the cognitive learning style dimensions on the Felder and Soloman Learning Style Inventory (used as a pre-test data collection instrument) would be related to any of several types of post-test learner satisfaction measures in a given course delivery mode.

This research report describes the results and implications of a correlational study of learning styles (preferences) and learner satisfaction. The relationship of these empirical

Paul David Henry, Ph.D., is an adjunct assistant professor in the Programs for Business at New York University, New York, NY 10012 USA phone: 212-992-3600 email: paul.henry@nyu.edu. He also serves as online faculty at University of Phoenix and University of Maryland University College.

concepts was examined in the context of traditional versus e-blended modes of course delivery in an introductory graduate research course. This design was chosen because it offered a means to explore how learning style and satisfaction are situated in the context of an actual learning environment.

The results indicated that the visual side of the visual-verbal dimension of students' learning style(s) was positively correlated to satisfaction with "themselves as learners" in an e-blended course delivery mode and negatively correlated to satisfaction with "the classroom environment" in the context of a traditional classroom course delivery mode. Both of these results were statistically significant. The results and additional comments also suggest how students as subjects interpret the visual-verbal dimension in a wider framework than how it is described and deployed in the Felder and Soloman Learning Style Inventory – available at: http://www.engr.ncsu.edu/learningstyles/ilsweb.html

II. REVIEW OF THE LITERATURE

Learning style is an individual difference that is most related to a learner's preferences. These preferences are varied and can be adapted by the learner to adjust to divergent teaching and instructional settings as well as accommodated by teachers in their style of presentation. [1] An implicit instructional goal in applying learning style research is to match a learner's preferences to the type of instruction to improve the learners' satisfaction and other outcomes such as performance.

The recent research literature provides some support for the empirical nature of this relationship, especially when studied as determinant and outcome in the context of instructional setting. Where there is a relationship, there seems to be added context such as a course delivery mode that is compatible with a given learning style. In one study, students' reflector learning styles that might be realized as introverted behavior in a traditional classroom are observed as more extraverted in the asynchronous online discussions of an online course where they have time to reflect on what they are learning. [2]

In reviewing the relevant research literature and in observations as a teacher of onsite and online courses, the contexts in which this relationship might take place have risen in importance – not only as an integral part of the conceptual framework under which research should be conducted, but also for its contribution to instructional application. One context that may be important in this relationship are diverse modes of course delivery such as Internet and Web-based

instruction and traditional classroom delivery, especially if they are offered in an e-blended or hybrid format where diverse learning styles can be accommodated by them. In a study of student perceived learning outcomes and satisfaction, a primarily visual and read/write learning style was a significant predictor of learner satisfaction in an online mode of course delivery. Of added relevance was that the results also indicated that learner satisfaction was a significant predictor of learning outcomes. [3].

Just as there are many types of learner preferences, there are many distinct models by which these preferences are understood and assessed. The cognitive or information processing perspective of the Felder and Silverman model was developed in 1988 to address the needs of teaching engineering at the college level and science education in general. This model was subsequently used by Felder and Soloman in 1991 to develop a questionnaire-based assessment known as the Felder-Soloman Index of Learning Styles (ILS).

This test measures learning style on four bi-polar dimensions related to the preference for the type of information perceived (sensory to intuitive), the modality by which that sensory information is most effectively perceived (visual to verbal), the manner in which it is processed (active to reflective), and the manner in which a learner progresses toward understanding (sequential to global). Of special note in Felder's description of the development of this model and the LSI is that he suggests a student's preference on a given scale may vary from one learning environment to another. [4]

Studies of validity and/or reliability of the Felder and Soloman Learning Style Inventory are mixed and on-going. In a study by Van Zwanenberg [5], potential limitations were indicated in its low internal reliability and construct validity. A later study by Zywno [6] provides support for its reliability for its intended purpose of identifying learning styles. Zywno also explains the low reliability identified by Van Zwanenberg as attributed to an hypothesis to predict academic performance and failure rates – something for which it was not intended. The presence and use of this instrument on the Web is a mechanism for its own reliability studies. With these issues still under study, the use of this instrument was deemed appropriate for use in teaching (to evaluate individual preferences for types of course material) and for this study due to its ease of use, the free Web-based questionnaire and its automatic reporting feature, and the accompanying descriptive and prescriptive information provided by its authors.

However, its use has raised certain issues with regard to its interpretation by subjects (and potentially to its construct validity). During several years of using and discussing the Felder and Soloman LSI in graduate research, many students claimed that they should be rated differently by this instrument in the visual side of the visual-verbal dimension. This was not only due to their preference for pictorial or diagrammatic representation of information, but also because they consider written text as being more visual than verbal. They interpreted the visual-verbal dichotomy as being equivalent to the corresponding actions of being "seen" or "heard."

This view contrasts Felder and Soloman's description of this distinction: "Visual learners remember best what they see–pictures, diagrams, flow charts, time lines, films, and demonstrations. Verbal learners get more out of words—written and spoken explanations." [7] Nonetheless, many of these students intuitively extend Felder's concept of "visual learners remember what they see" to the presence of written information, including formatted text found on Web pages.

III. METHOD

The research design chosen was quasi-experimental, using a nonequivalent control group format in which the sampling frame consisted of two intact class sections of the same introductory research course that were assigned to the instructor (researcher). The student subjects were drawn from a population of graduate students within a university. They self-selected to take this required introductory research course. These two course sections were conducted during the same semester and in the same classroom on the same day of week, but at two successive time periods (separated by a reasonable time break). These two course sections were randomly chosen as separate treatment groups by the instructor-researcher (rather than the subjects within each group).

Subjects within each group were selected through voluntary participation (with respect to providing research data) while taking the course. The instructor-researcher informed all students at the beginning of the semester that a research study would be conducted during the semester based on course activities and questionnaires that measured attitudes and behaviors associated with those activities. They were informed that at any time prior to submission of completed tests or questionnaires (not normally used for course assessment), they could decide not to participate by indicating that on the returned instrument.

The participating size of each group was roughly equivalent (24 vs. 21) and pre-test questionnaires revealed that these groups were also close in aggregate of characteristics such as age, gender, and prior knowledge of the research subject domain.

The "course delivery mode" chosen for one group consisted of traditional classroom instruction with lecture, in-class discussion, and some demonstrations of research practice or tools. Course materials and weekly homework assignments consisted of printed materials and hand-written responses. The class session for this group ended 15 minutes earlier to compensate for the required "homework" assignments during the week. This added time delay between course sections inhibited subject interaction between groups.

The "course delivery mode" indicated for the other group consisted of the same traditional classroom instruction with lecture, in-class discussion, and some demonstrations of research practice or tools. The students in this group were also allowed to leave 15 minutes before the official end of each class session, but in this case with the understanding that the

equivalent amount of time would be required during the week for asynchronous online discussion that was monitored and assessed by the instructor.

Also, instead of course materials and weekly homework assignments consisting of printed materials and hand-written responses, the "e-blended" treatment provided required Web-based materials activities designed by the instructor-researcher. Online versions of course materials (syllabus, course plan, and assignments) were available on Web pages. The instructor and students would send email messages about reading and discussion to the group via a course mailing list and post evolving ideas about the individual project assignment on the Web-based bulletin board. Optional elements included online learning resources such as links to Web sites with relevant sources of information and online communication with other students in the group via one-to-one email and Web-based chat.

Data collection consisted of two instruments. A printed version of the Felder and Soloman Learning Style Inventory (questionnaire) was administered in the first class session. An 8 item scale measuring degrees of different types of learner satisfaction was administered in the last class session on a post-test printed questionnaire created by the instructor-researcher. Validity testing was performed with three experts in educational research. Clarification of wording for several question items were made on the original questionnaire. Reliability testing of the post-test questionnaire was conducted over a two month interval with a reliability coefficient of 0.90.

Data was confidential in that subject ID codes were assigned. No master list was created so that personal identifying information was not associated with the ID codes. Completed questionnaires were collected by a student volunteer while the instructor was not physically present to minimize researcher interaction or pose any bias to student evaluation. Results are reported in the aggregate.

Data preparation included entering each student's responses into the Felder and Soloman's Web-based LSI instrument and saving/printing the scoring automatically provided by this online software. Each of the subject's scores on each of the four bi-polar LSI scales were then re-coded so that scores ranged on an equivalent scale from +11 to -11 (instead of the original bipolar range of positive odd numbers on each side of a zeroed center).

IV. FINDINGS

Data analysis included univariate frequency distributions and bivariate Pearson's correlations. Results indicated a statistically significant positive correlation (0.6311 with p=0.003) between the (more) visual side of the visual-verbal learning style dimension and the degree of learner satisfaction measured as "yourself as learner" in the e-blended course delivery mode. This positive relationship can be expressed as the more visual the students' learning style, the more satisfied the students are with themselves as learners in an e-blended course delivery mode.

The post-test questionnaire response item "yourself as learner" was considered during field studies as equivalent to "your learning performance" or a degree of self-efficacy in the context of an instructional treatment, such as e-blending. The corresponding question and the seven other contrasting response items as measures of learner satisfaction helped to support this interpretation.

The interpretation by many students of the visual learning style as including printed text on Web pages, email, bulletin boards, or chat can help clarify the meaning of these results. It may explain why a preference for "visual" representation is associated with greater learner satisfaction (with themselves as learners) in a course where the Web was used to provide course information and discussion in an e-blended mode of delivery.

This may represent a limitation in this study that suggests further study of this problem area. Although preliminary, it may also suggest implications for the how students as subjects interpret this dimension in a wider framework than it is described and deployed in the Felder and Soloman Learning Style Inventory.

Results also indicated a statistically significant negative correlation (-0.7915 with p=0.001) between the (more) visual side of the visual-verbal learning style dimension and the degree of learner satisfaction with "the classroom environment" in the traditional course delivery mode.

This negative relationship can be expressed as the more visual the students' learning style, the less satisfied the students are with the classroom environment in a traditional course delivery mode.

In the visual-verbal section of the learning style descriptions and strategies provided by Felder and Soloman on their Web site, they characterize what this study defines as a traditional mode of course delivery in their example of a typical college classroom. "In most college classes, very little visual information is presented: students mainly listen to lectures and read material written on chalkboards and in textbooks and handouts. Unfortunately, most people are visual learners, which means that most students do not get nearly as much as they would if more visual presentation were used in class." [7].

V. CONCLUSION

When the context of the traditional mode of course delivery is taken into account in this result, the negative relationship between a (more) visual learning style and (less) learner satisfaction with the classroom environment finds support.

When the context of an e-blended mode of course delivery is taken into account in the previously discussed result, the positive relationship between a (more) visual learning style and (greater) learner satisfaction with themselves as learners also finds support.

Due to the relatively small sample sizes for each treatment group and the design of this study, this support has to be understood within the limitations of this study as being

correlational, but not necessarily causal. Nonetheless, when these statistically significant results are considered together, they suggest a trend with regard to the visual-verbal dimension and its relation to online versus traditional modes of course delivery.

If adjustments such as the degree and type of e-blending are made to accommodate these preferences, these results suggest greater learner satisfaction may result. However, further testing is needed to support these results. Additional studies of this type conducted with varied e-blending strategies can explore what other relationships may exist between learning styles and learner satisfaction. Studies using other models and measurement instruments for learning styles and learner satisfaction could be useful in testing these relationships.

As for practical considerations, a free Web-based instrument like the Felder and Soloman LSI can be useful for identifying learning styles and accommodating them with the appropriate instructional strategy in a manner that promotes learner satisfaction. Measuring learning style at the beginning of a course can be a useful way of getting acquainted with students and getting them more engaged and reflective in their learning.

However, accommodating learning styles through adjustments in the course delivery can be time-consuming and difficult when establishing a platform for e-blended support. With assistance from instructional support groups, the Web-based software tools and techniques of e-blending can be established with reasonable time and effort. Once established, refinements to course delivery and adjustments to accommodate learner preferences on the basis of learning style measurements can be achieved with less effort.

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