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Student Learning Styles and Online Course Performance: An Empirical Examination of Student Success in Web-Based Management Courses

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ABSTRACT

This paper reports a study exploring the performance of students in undergraduate online management principle courses and the moderating effect of student learning style on performance. In particular, we explore four core learning styles based on the Myers-Briggs personality test, and relate these to performance outcomes. Specific questions are developed around the presumption that learning styles have a moderating effect on performance outcomes in online courses. These are tested in a series of online management principles courses over a three year period with 193 students participating. The findings are presented with regard to the learning preferences of students and their performance in online courses. A discussion of these findings and how they may be useful for effectively designing web-based management courses that address varying student learning styles is offered.

Introduction

The use of the internet for delivery of web-based coursework has become a preferred method of instruction in distance education, particularly in higher education. The number of students enrolled in online courses, and the increasing availability of distance education reveal the growing importance of this method of instruction.

In the U.S. enrollment in online courses is growing exponentially. A recent study estimates that there are approximately 350,000 students currently enrolled in online degree programs or about 2% of the postsecondary education market in the United States. Many other programs provide a portion

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of their course delivery through online coursework. The same study forecasts the future growth of web-based courses over the next decade to average around forty % annually (Dolezalek, 2003). Moreover, distance delivery of curriculum is now becoming a standard medium for supplementing or replacing traditional classroom teaching (Drago, Peltier & Sorensen, 2002).

This growth in distance education offerings has been rooted in the development of the internet and technologies that support online learning. Online education appears to have the potential to dramatically alter the education landscape. However, while innovative technologies are necessary to the development of online course delivery, they are not sufficient to assure that distance education is effective. Online course delivery poses a whole set of new problems that must be properly addressed. Moreover, despite the increased growth and interest in online management education, research surrounding its effectiveness is significantly sparse (Hay et al., 2004a; Martins & Kellermanns, 2004; Zapalska & Brozik, 2006). Continued growth of online education will depend on the ability of educators and administrators to assure that this type of education delivery system will prepare students to meet today's competitive challenges (Dolezalek, 2003; Hay et al., 2004b). Regrettably, little is understood about how to best plan, implement, and evaluate online courses (Peltier et al., 2003). Clearly pedagogical theories and approaches to effective teaching in online learning environments are needed (Arbaugh, 2002).

Purpose of the Study

This study seeks to add to a growing base of literature that is focused on online course development for greater student success. Specifically an examination of student learning styles and their effect on online course performance is provided.

Learning Styles

Most educators who have taught for any length of time have come to understand that students have different learning styles. Courses are often designed to address a variety of student learning styles by incorporating a variety of delivery methods. Some students learn best through lecture while others from group work and still others by the case method. Consequently, it is imperative that a student's learning style be considered while developing any course. Research suggests that student success can often be directly linked to the relationship between a student's learning style and the chosen method(s) of delivery of course content (Gregorc, 1985; Messick, 1976.)

Online courses by their very nature are a unique form of course delivery. Many of the traditional methods of delivery in a brick and mortar classroom do not transfer well to the web-based environment. Therefore, online course delivery may have unique issues regarding student success. One such issue may be how well a student's learning style fits with online course content and

delivery. Considerable thought should be applied in the design of distance-learning courses, with particular attention paid to student learning styles. This paper examines student success in online management principles courses and how that success may be linked to student learning style. Instructors are interested in knowing whether a student's learning style will be a partial determinant of their success in online courses. This information in turn can be used in course planning and teaching strategies for online course development.

The next section of this paper provides a literature review followed by conceptualizations of learning styles, personality types and learning. The remainder of the paper details the hypotheses, methodology, and results and concludes with a discussion.

Literature review

Early work in learning styles determined that there were definitive style differences among learners (Dunn *et al.*, 1981). Early researchers explored the relationship between memory and oral or visual teaching methods. There were few consistencies in the conclusions these studies reported, with differing methodologies the probable reason (Keefe, 1987).

Cognitive styles

Researchers began to recognize that learners had different cognitive styles and embedded information-processing strategies that helped determine a learner's perception, memory, thinking and problem solving (Messick, 1976). This research revealed the potential for using learning style measurements to match instruction to individual students' styles (Galloway, 1984). Gregorc (1985a&b) argued that students have such a strong preference for the manner in which new material is presented that; it is difficult for them to learn when instructors do not present material in their preferred way. Research into affective and physiological aspects of learning has identified and isolated specific learner traits that help to describe the unique processes of learning (Keefe, 1987; Messick, 1976). This research supports contention of this paper that variations in student learning styles have important implications for online course development.

Research into the learning styles of college students in various disciplines has also been reported in literature. Canfield (1988) reports significant differences among groups of students enrolled in various majors in collegiate settings. Moreover, Biberman and Buchanan (1986) examined learning styles of business students and found that the styles of majors in accounting and economics/finance vary considerably from majors in marketing and management. Some researchers have argued that the success of college students could be improved by providing instruction consistent with each student's learning style (Dunn *et al.*, 1981, 1989). Additionally, learning style

research has generated a number of assessment tools that can be used to categorize learners (Keefe, 1987).

In sum, a review of the literature appears to argue for online education which considers the learning styles of students. The efficacy of online education seems to demand that instructors recognize differences in learning and somehow address the variety of learning styles found in the classroom. Instructors who know about differences in learning styles are better able to modify their teaching strategies and techniques in online education. This may help ensure that chosen methods, materials, and resources fit how students learn, and more importantly, will most likely create a learning environment that will maximize the learning potential of each student.

Theoretical Construct

The concept of learning style has been studied in various ways. Dunn et al., (1981) described learning style as a way in which the individual takes in new information and develops new skills. Campbell et al., (1996) described a “certain specified pattern of behavior according to which the individual approaches learning experience”. Kolb, (1984) suggested that the process of acquisition was key, defining learning as “the process by which the individual retains new information or new skills. For the purposes of this paper, a learning style is defined as consistent preferences for gathering and understanding information (Messick, 1984; Riding&Rayner, 1997). This approach to learning emphasizes the fact that individuals perceive and process information in very different ways. Learning style theory implies that how much individuals learn has to do with whether the educational experience is geared toward their particular style of learning.

In their exhaustive review of cognitive style research, Riding and Rayner (1997) described more than ten different conceptualizations of learning/cognitive style, each model differing in its characterization of the learning process. Despite this plethora of models, psychologists agree that individual differences in style are relatively stable over time (Sadler-Smith, 1999) and automatic in nature, separate from intelligence, and often linked to personality (Riding & Pearson, 1994).

Many learning style theories are based on the concept that there are two qualitatively different ways of thinking. One type is analytic, sequential, structured, and detail oriented (Nickerson, Perkins, & Smith, 1985). The other type, in contrast, is intuitive, divergent, diffuse, and global in approach (Allinson & Hayes, 1996). Some relate this dichotomy to left-brain and right-brain dominance (Entwistle, 1981). Left-brain orientation is similar to the analytic and sequential way of thinking, whereas right-brain orientation relates to intuitiveness and global perspectives (Allinson & Hayes, 1996).

Personality Types and Learning

As suggested earlier, personality models also often incorporate similar distinctions in their dimensions. Moreover, some personality models have been used to link personality dimensions with learning styles (Keirsey, 1998; Silver & Hanson, 1995). This study is particularly interested in previous research that has indicated specific learning styles associated with the widely used Myers Briggs Type Indicator – MBTI. MBTI has been selected for the current study based on its parsimony and the strong internal reliability (MBTI manual, 1998; Harvey, 1996; Wheeler, 2001).

Silver et. al., (1995) suggested that there are four core learning styles associated with the MBTI. The eight traits from the MBTI are arranged in four continuums or preference scales:

- 1) Extravert(E)..... Introvert(I)
- 2) Sensing(S).....Intuitive(N)
- 3) Thinking(T).....Feeling(F)
- 4) Perceiving(P).....Judging (J)

Extravert - Introvert (E-I) explains where people tend to focus their attention and get their energy. Extraverts (E) tend to focus on the outer world of people, things, and activity and are energized by interaction with others. They love to talk, participate, organize, and socialize. Introverts (I) are energized by the inner world of reflection, thought, and contemplation. They direct their energy and attention inward and receive energy from reflecting on their thoughts, memories and feelings. They can be sociable but need space and time alone to recharge their batteries.

Sensing-Intuitive (S-N) explains how people take in information and ways that they become aware of things, people, events, or ideas. It has the biggest impact on how people learn. Sensing (S) people rely heavily on their five senses to take in information. They take in information that is real and tangible – what is actually happening. They are observant about the specifics of what is going on around them and are especially attuned to practical realities, and therefore they are practical and realistic. They focus on details and may ignore the big picture. Intuitive (N) people seek out patterns and relationships among the facts they have gathered. They trust their hunches and intuition and look for the “big picture.” Their focus is on conceptual information. Since they see the big picture, they often ignore the details. They strive to grasp patterns and are attuned to seeing new possibilities. Their focus is on the future. They would rather think than do.

Thinking-Feeling (T-F) explains the ways people evaluate and come to conclusions about information and how they make decisions. Thinking (T) people look at the logical consequences of a choice or action and decide on the basis of logic, analysis, and reason. They critique and analyze to identify what's wrong with something so they can solve the problem. They strive to find a standard or principle that will apply in similar situations. Feeling (F) people, when making decisions, like to consider what is important to them and to others involved. Appreciating and supporting others and looking for qualities to praise energize them. They strive to create harmony and treat each person as a unique individual. They decide on the basis of their feelings, personal likes and dislikes.

Judging-Perceiving (J-P) suggests the type of life style and work habits people prefer. Judging (J) people like to live in a planned, orderly way, seeking to regulate and manage their lives. They want to make decisions, come to closure, and move on. They tend to be structured and organized and like to have things settled. Getting things done energizes them. They focus on completing the task, only want to know the essentials, and take action quickly. Perceiving (P) types are spontaneous and do not like to be boxed in by deadlines or plans. They like to postpone action and seek more data, gathering more information before making a decision. Detailed plans and final decisions feel confining to them. They prefer to stay open to new information and last-minute options.

Both Keirse (1998) and Silver et. al. (1995) have suggested each of the sixteen Myers-Briggs types has a core learning style that can be described as one of four combinations of the eight traits listed above. These combinations are Sensing/Feeling (SF), Sensing/Thinking (ST), Intuitive/Feeling (NF) and Intuitive/Thinking (NT). SF's are empathetic and people oriented, while NF's are imaginative and creative. ST's are realistic, practical and efficiency-oriented, while NT's are theoretical and intellectual. Table 1 indicates the critical differences between the four types with regards to learning style.

Table 1. Learning Styles

ST	SF	NT	NF
<u>They like:</u>	<u>They like:</u>	<u>They like:</u>	<u>They like:</u>
practical	serving	logic	enthusiasm
facts	people	theory	insight
hard work	approval	possibilities	creativity
true/false	teamwork	independence	innovation
achievement	relationships		
structure	flexibility		
<u>Learn best from:</u>	<u>Learn best from:</u>	<u>Learn best from:</u>	<u>Learn best from:</u>
drill, practice,	participation with	reading, books,	non-conformity,

structure, programmed instruction, specific tasks, projects	others, imitation, attention, role playing, praise	planning, time flexibility, research, theory, analysis	divergent expression, pondering, creative, problem-solving, self-expression
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Hypotheses

It can be seen from the information in Table I that the learning styles of each of the four types are distinctly different. ST's are very structured and analytical in their approach to learning. They would clearly like the structured, organized and programmed approach to learning that is the core of most web-based courses. NT's similarly like analysis, structure and a planned environment. They thrive in an environment of self-study, books and reading. Both ST's and NT's particularly like working independently, especially NT's. A web-based environment offers an environment that appears conducive to their success.

As easily as one can see the fit web-based environments have for the two types above, one can also see that SF's and NF's are less likely to thrive in this environment. SF's prefer participation and team work. Relationships with both classmates and the instructor facilitate learning. They like attention, role-playing and praise, all of which are not often part of online course delivery. NF's find more misfit with online instruction as well. They prefer opportunities for creative and innovative thought. They thrive in environments that allow for feedback, banter and debate regarding divergent ideas. Although not impossible to produce in online courses, this type of classroom environment is often not replicated online. Most difficult for the NF student may be the lack of opportunity for self-expression in many online courses. The following hypotheses are suggested:

Hypothesis 1a: Students with an ST learning style will perform significantly better than students with a SF or NF learning style in an online course environment.

Hypothesis 1b: Students with an NT learning style will perform significantly better than students with a SF or NF learning style in an online course environment.

Methodology

Sample

The sample for the current study consisted of undergraduate students attending a comprehensive college on the east coast. Participants were enrolled in one of 5 online management concepts courses offered between 2002- 2006 and taught by the same instructor. Of the 193 participants, 42% were male, and 100% were juniors or seniors. Respondents were distributed across many

majors, with the majority (39%) being business majors. The course was design to offer a variety of content delivery methods including text readings, articles, videos, teamwork, power points, recorded audio of the professor’s lectures and several discussion boards. Students could interact with the professor by phone, email, office hours, or during weekly online “instant message” sessions.

Data

Students in each class were asked to complete a short MBTI instrument developed from the Keirseey Temperament Sorter (see Keirseey, 1998). The instrument is shown in Appendix 1. Students reported their four letter type to the instructor. As a measure of the accuracy of the four letter type produced, students were asked to read a description of their type and rank its accuracy as 90-100% accurate, 60-89% accurate, 40-59% accurate, or <40% accurate. Ninety-two (92%) % of the enrolled students rated their four letter type as 90-100% accurate. The remaining eight (8%) percent ranked their four letter type as 60-89% accurate. It appeared that the four-letter MBTI type produced was rather robust and representative of the student’s personality. In addition to the personality data, we gathered from archival means the overall grade point averages and majors of each student in the study.

Measures

The four letter personality types of each student were used to produce their two letter learning style as described above – ST, SF, NT, or NF. The final grade was determined based on the assessment of learning using multiple methods, including graded homework, article research and analysis, article discussions, a term paper, four exams and a comprehensive final exam. Table 2 shows the number of students with each learning style as well as the mean performance given for the course grade. An initial examination of the table reveals that both ST and NT group means are higher than the group means for SF and NF types. Given the unequal number of each learning style [i.e. ST(n=60) SF(n=84) NT(n=21) NF(n=28)], Levene’s test of homogeneity was applied and the assumption of equal variance was supported.

Table II: Descriptive Statistics

Learning Style	N	Mean*	Std Dev	Std Error	Min/Max
ST	60	76.64	8.13	1.05	54/92
SF	84	70.55	12.99	1.42	22/89
NT	21	79.33	9.69	2.12	65/98
NF	28	70.55	14.43	2.73	21/83
TOTAL	193	73.41	12.00	.86	21/98

* “Mean” indicates mean of grade for the course

Results

Table 3 indicates the results of the comparison of mean performance across the four learning styles. The model indicates that there were significant differences in performance across the learning styles. Before proceeding to multiple-comparisons, an examination of both overall student GPA and the student's college major as controls was performed. There was no significant difference in the overall GPA across the four learning styles. Since the classes were a mixture of both business students and students from a variety of other majors, a concern that business students might perform better in general than other majors was addressed. Although business students did perform slightly better overall than non-business students, there were no statistically significant differences.

Table 3: ANOVA for Course Grade

		Sum of Squares	Df	Mean square	Fvalue
Course	Between groups	2259.073	3	753.024	5.6*
Grade	Within groups	25400.833	189	134.369	
	TOTAL	27659.906	192		

* $p < .001$

A multiple-comparison test of means was used to uncover greater detail regarding where the differences are. Scheffe's multi-comparison test of mean differences was administered, partly due to its conservative nature (see Huck et. al., 1974, p 69).

Table 4: Scheffe's Multiple Comparison test of means

Learning Type	Comparison Type	Sig	Differences
ST	SF*	.024	ST Different from SF
	NT	.839	
	NF	.171	
SF	ST*	.024	SF different from ST
	NT*	.024	SF different from NT
	NF	.922	
NT	ST	.839	
	SF*	.024	NT different from SF
	NF**	.086	NT different from NF
NF	ST	.171	
	SF	.922	
	NT**	.086	NF different from NT

* $p < .05$

** $p < .01$

It is clear from the ANOVA model that there are significant differences in performance across the four learning styles. The multiple comparisons of means shed some interesting light on the details of the differences. First, the descriptive statistics clearly show NT types to be the highest performing students and the mean comparison test reveals that NT's are significantly higher performers than both SF's and NF's. Therefore, hypothesis 1b was fully supported ($p < .05$ and $p < .01$ respectively). However, ST's were only significantly higher performers than SF's ($p < .05$). ST's were higher performers than NF's, however they did not reach a level of statistical significance ($p = .171$). Consequently, hypothesis 1a was partially supported.

Discussion

This study began with an interest in whether individual student learning styles mattered regarding academic performance in online courses. Findings suggest that learning styles do matter. ST and NT learners appear to be cognitively built to find more success in online courses. They are more analytical, organized and task oriented. They also have a preference for individual, self-paced work. SF's learn best in groups, through participation and by interacting with the instructor, none of which are, in general, hallmarks of online courses. NF's may be at the greatest disadvantage as they need opportunities for creative thought and divergent expression. This kind of thought can be bounced off of both classmates and the instructor in the traditional classroom environment, but it is more difficult to do so in the online course.

Even though one learning style may be more conducive to learning in an online class, this should not suggest that all students cannot be successful in these courses. Two things are imperative. First, in order to help students succeed in online education, instructors must understand how they learn, how they perceive, and how they process information. Each online course should strive to accommodate all types of learners. It is necessary to provide a number of different learning options that take into account different learning styles. Combining a mixture of approaches and teaching methods allows online students to choose the instructional style that best fits their individual learning styles.

For example, greater use of collaboration, discussion boards, and even team work could make the online course environment more conducive to success for the SF or NF learner. It is clear that online technology is improving to the point where more options are available to the instructor for building more variety into the online course environment. Consequently, the advantages of the brick and mortar classroom for different learning styles can be replicated in online courses.

Second, students should have an opportunity to better understand their own learning styles and, accordingly what kind of curriculum delivery best fits their style. It could be considered whether it would be appropriate to test

students for learning style early in their college careers and help them to use this information to make better informed decisions in course selection. For example, the findings of this study might imply that a student with an SF learning style should consider whether online courses are a best choice for them? Likewise, a student with an NT learning style could thrive in the online course environment. Academic advisors may find this information helpful as they advise students on which section of a course to take as well.

In summary, there is much work to be done regarding online course development. As shown above, there is great growth in the number of course now using this method of curriculum delivery. It will surely continue to grow. Yet both its quality and efficacy will be enhanced by further investigation into the factors that impact student success. There would be added validity to this study if similar research was done using a different instrument for measuring learning style. Future researchers could replicate this study using instruments such as Felder's, Jester's, Kolb's or the VARK Learning Style Inventory. Each has both similarities and differences with each other and with the MBTI used in this study. Moreover, a study comparing the success of students with different learning styles in both brick and mortar courses and online courses seems intriguing.

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APPENDIX I

WHAT'S MY PERSONALITY TYPE?

(Choose either column A1 or B1 etc and complete the form to determine your type.
Then go to the Personality Type Description link on my site to find out about your type.)

Column A1

Tolerate noise and crowds.
Talk more than listen.
Communicate with enthusiasm.
Be distracted easily.
Meet people readily and participate
in many activities.
Blurt things out w/o thinking.
Hates to do nothing.
Likes working or talking in groups
Likes to be center of attention.

OR

Column B1

Avoid crowds and seek quiet.
Listen more than talk.
Keep enthusiasm to self.
Concentrate well.
Proceed cautiously in meeting people
& participate in selected activities.
Think carefully before speaking.
On the go. Time alone to recharge batteries.
Would prefer to socialize in small
groups or just do job "by myself."
Content being on the sidelines.

Column A2

Learn new things by imitation
and observation.
Value solid, recognizable methods
achieved in step-by-step manner.
Focus on actual experience
Tend to be specific and literal;
give detailed descriptions.
Behave practically.
Rely on past experiences.
Likes predictable relationships.
Appreciates standard ways to solve
problems
Methodical.
Value realism and common sense.

OR

Column B2

Learns new things through general concepts
Value different or unusual methods
achieved via inspiration.
Focus on possibilities
Tend to be general and figurative;
use metaphors and analogies.
Behave imaginatively.
Rely on hunches.
Values change in relationships.
Use new and different ways to solve problems
Leap around in a roundabout way.
Value imagination and innovation.

Column A3

Have truth as an objective.
Decide more with my head.
Question others' findings,
'cause they might be wrong.,
Notice ineffective reasoning.
Choose truthfulness over tactfulness.
Deal with people firmly, as needed

OR

Column B3

Have harmony as a goal.
Decide more with my heart.
Agree more with others' findings
'cause people are worth listening to.
Notice when people need support.
Choose tactfulness over truthfulness.
Deal with people compassionately.

Expect world to run on logical principles.
differences.

Notice pros & cons of each option.

See others' flaws... critical.

Feelings valid if they're logical.

Tolerate occasional queries as
to my emotional state in rel'ships

Expect the world to recognize individual

Note how an option has value and it affects people.

Like to please others; show appreciation.

ANY feeling is valid.

Appreciate frequent queries as
to my emotional state

Column A4

OR

Column B4

Prefer my life to be decisive,
imposing my will on it

Prefer knowing what they're
getting themselves into

Feel better after making decisions

Enjoy finishing things.

Work for a settled life, with my
plans in order.

Dislike surprises & want warnings.

See time as a finite resource,
and take deadlines seriously.

Like checking off "to do" list.

Feel better with things planned.

Settled. Organized.

Seek to adapt my life and experience
to what comes along.

Like adapting to new situations.

Prefer to keep things open.

Enjoy starting things.

Keep my life as flexible as
possible so that nothing's missed.

Enjoy surprises and like adapting

See time as a renewable resource,
and see deadlines as elastic.

Ignore "to do" list, even if made one.

Would rather do whatever comes along.

Tentative. Flexible. Spontaneous.

CIRCLE THE COLUMN CHOSEN

A1 E

A2 S

A3 T

A4 J

B1 I

B2 N

B3 F

B4 P

FILL IN YOUR LETTERS:

MY TYPE IS: (A1orB1) ____ (A2orB2)____ (A3orB3)____ (A4orB4)____

EXAMPLE: (A1orB1) E (A2orB2) N (A3orB3) F (A4orB4) J
Type = **ENFJ**