

# The Effect of Student Choice of Online Discussion Format on Tiered Achievement and Student Satisfaction

ShinYi Lin

*Ching Kuo Institute of Management and Health*

Richard C. Overbaugh

*Old Dominion University*

## Abstract

*This study investigated whether providing students with the choice of chat versus threaded discussion boards for online discourse is an effective instructional strategy in terms of student learning and satisfaction. The sample was teacher education students enrolled in face-to-face (FTF) and online sections of one undergraduate foundations course. Both sections required participation in online text-based discussion. Comparison groups included course format (FTF vs. online), discussion format (chat vs. discussion board) and discussion format option (choice vs. no choice). Results reveal that students' choice of discussion format was influenced by the trait of academic introversion-extraversion but not by the instructional environment (FTF or online) in which they enrolled. In addition, providing the choice of discussion format to students enhanced course satisfaction and, while some differences were found in cognitive achievement, the results were weak. (Keywords: media choice, cognitive achievement, online discussion forum, student satisfaction, learning styles.)*

## INTRODUCTION

Generally, adult students, who learn differently than children and adolescents (e.g., Swan, 2001; Wynd & Bozman, 1996), should be given as many choices as possible with regard to the availability and organization of learning opportunities (Cross, 1981). Adult students are typically self-directed and are expected to be responsible for planning and evaluating their own learning (Knowles, 1988). Concomitantly, instructional technology allegedly has the potential to accommodate some of the various learning needs of these students via multiple instructional delivery modalities (Irons, Keel, & Bielema, 2002) and educators have an obligation to be cognizant of their students' styles and choices in order to choose the most effective teaching strategies, rather than sustaining a predetermined view of what all students want or need (Beyth-Marom, Saporta, & Caspi, 2005). Thus, it is our intent to investigate how varied implementations of a particular instructional event—online discussion—affects student achievement and learning satisfaction.

## Online Discussion

Web-based learning often utilizes online discussions, which are typically threaded asynchronous forums or synchronous chats (Lee, MacKendree, Dineen, & Mayes, 1999), to help learners organize and process course content (Jolliffe, Ritter, & Stevens, 2001). Jolliffe et al. defined an asynchronous

learning environment as “one where communication between learners and the facilitator is done via a computer forum of some description at different times,” whereas a synchronous learning environment “takes place in real time where those involved in the communication process are present all at the same time, but not necessarily in the same place” (p. 9). Both synchronous and asynchronous conferencing modes promote more frank discussion and equality among students than traditional classroom instruction (Sproull & Kiesler, 1993) but students seem to prefer asynchronous discussion because they have enough time to reflect and draft careful responses to others’ postings (Poole, 2000; Zafeiriou, Nunes, & Ford, 2001). Conversely, synchronous online communication tools—chat forums—are usually subjected to the norms of business and academic discourse (Murphy & Collins, 1997). Synchronous dialogue not only allows continuous, structural modifications of course content, pace, and activities to accommodate students’ individual needs, but also allows students’ concerns to be addressed instantaneously which can be an important factor in the reduction of transactional distance (Murphy & Collins). Moore (1989) recognized that higher structure and little dialog between instructor and learner increases transactional distance. However, synchronous text-based discussion has a number of disadvantages. First, chat forums are not conducive for effective communication among large numbers of participants (Murphy & Collins, 1997) because of “coordination problems and stability of technology using a low band-width” (Jolliffe et al., 2001, p. 57); however, the problems can be reduced if regular meetings are arranged. Another problem can be the substantial keyboarding skills needed for effective participation. Finally, participants for whom English is a second language may be at a disadvantage if the conversation flows so quickly that some participants don’t have sufficient time to reflect, frame questions, and compose responses (Aoki, 1995).

## Learning Styles

Numerous instruments have been developed to identify or measure individual student differences such as the Myers-Briggs Type Indicator (Myers & McCaulley, 1985), Index of Learning Style (Felder & Soloman, 2004), Gregorc’s Style Delineator (Gregorc, 1984), Learning Style Inventory (Kolb, 1984), and the Keirsey Temperament Sorter (Keirsey, 1998). With numerous instruments available, the practical use of learning styles in online learning contexts warrants study (Beyth-Marom, Saporta, & Caspi, 2005).

Choosing an appropriate assessment for a specific learning situation is important. As Davison, Bryan, and Griffiths (1999) delineated, the Introvert-Extrovert dimension of the Myers-Briggs Type Indicator is concerned with an individual’s attitude toward others. Specifically, academic extroverts think most effectively when interacting with others because they become aware of what they are thinking when they are verbalizing. On the contrary, academic introverts focus their energy on reflection of ideas without the need for interaction with others (Quenk, 1999). There is, therefore, an intuitive match between online communication mode—asynchronous versus synchronous, and the academic dimension of introversion versus extroversion. That is,

Performance Dimension	Find Generality	NA			
	Use Generality				
	Remember Generality				
	Remember Instance				
		Fact	Concept	Procedure	Principle
	Content Dimension				

Figure 1: Merrill's (1994) Performance Content Matrix

synchronous chat sessions necessitate immediate responses so, theoretically, extroverts in chat sessions would be matched to the mode that complements their energy attitude and, because asynchronous discussion boards are time independent, the energy attitude of introverts would be satisfied. Investigating the introvert-extrovert dimension separately from the Myers-Briggs Type Indicator is adequate for educational purposes (Duck & Ogden, 1990).

### Cognitive Achievement

The cognitive perspective of learning emphasizes the learning process rather than products produced as a result of learning. This perspective is characterized by knowledge generation via a series of cognitive engagements such as deductive reasoning and inductive reasoning, which should result in deeper levels of understanding. In order to study levels of cognitive learning, a classification scheme, often called a taxonomy or hierarchy, is useful; Merrill (1994) proposed the Performance Content Matrix, which is a descriptive theory of knowledge consisting of a two-dimensional classification matrix based on a performance dimension and a content dimension. The content dimension (x-axis) consists of (a) Facts, (b) Concepts, (c) Procedures, and (d) Principles, and the performance dimension (y-axis) consists of four levels: (a) Remember Instance, (b) Remember Generality, (c) Use Generality, and (d) Find Generality (See Figure 1).

To elucidate further, within the content dimension, *Fact* is any piece of information such as a particular name, date, or object. *Concept* refers to common characteristics shared by a group of events or objects. *Procedure* refers to any knowledge that involves the application of sequential steps in order to solve problems. *Principle* refers to causal effects or correlations that are used to interpret events or processes. In the performance dimension, which can be thought of as a reference to the curriculum, or more specifically, the given learning tasks and strategies, *Remember Instance* refers to the recall of discrete information. *Remember Generality* is the demonstration of sufficient understanding of previously known information. *Use Generality* is to apply previously known information to a specific case or scenario usually with new components or parameters. *Find Generality* is to derive an original abstraction

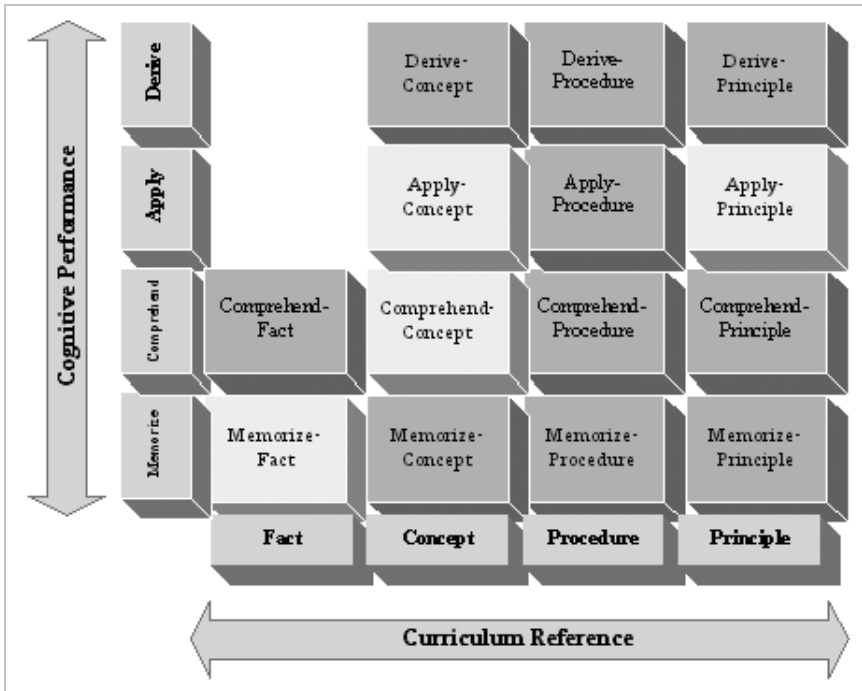


Figure 2: Modified Merril's Performance Content Matrix (Overbaugh & Lin, 2003). The light grey squares represent an example of the cognitive tiers of subordinate assessment items mapped to a particular Apply-Principle learning objective.

or evaluation, which requires sophisticated cognitive processing for deductive and/or inductive reasoning.

For this study, the authors have modified the performance dimension terminology; the highest stage—Find—was renamed Derive because Overbaugh and Lin (2003; 2005) found the term derive to be more easily understood to mean knowledge construction by teachers. Likewise, Apply has been substituted for Use, Comprehend for Remember Generality, and Memorize for Remember Instance. The modified version is depicted in Figure 2. Like the original matrix, the modified Performance Content Matrix is useful as a tool to identify the cognitive level of learning objectives and their relationship to the curriculum and, consequently, to help match assessment items to the cognitive level of the learning objective. In addition, the matrix then serves as a guide to create and map the lower level knowledge components that support or contribute to the learning objectives that should also be assessed.

### Student Satisfaction

Factors contributing to student satisfaction become more complex when the focus moves from conventional face-to-face classrooms to online teaching/learning environments. It has been long argued whether higher student satisfaction results in better academic success or better academic success results

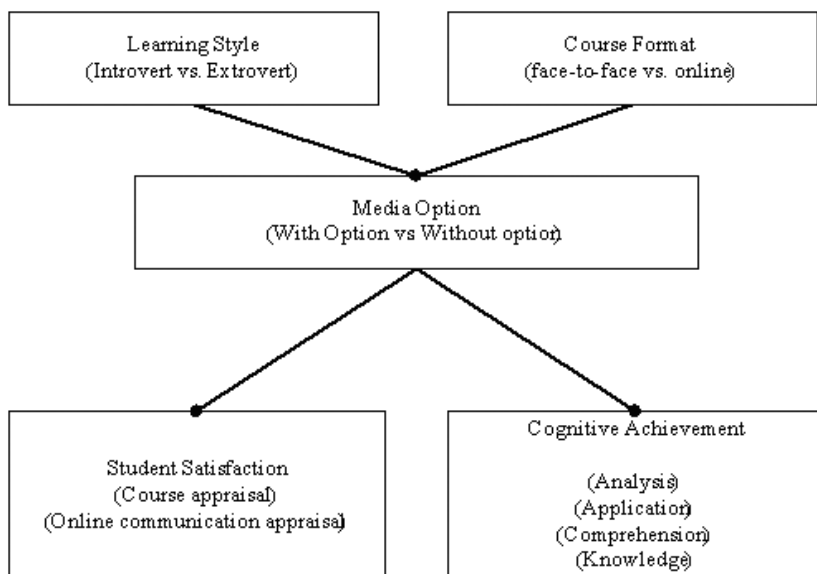


Figure 3. Schematic diagram of the study design.

in higher student satisfaction (Bean & Bradley, 1986; Pascarella, Whitt, Edison, Hagedorn, & Terezini, 1996). Along the same line, Irons *et al.* (2002) confirmed that providing students with a choice of communication tools greatly increases student satisfaction. When students have alternatives, student characteristics such as learning styles and life characteristics tend to influence the decision as to whether and how the use of computer technology assists the learning process (Wilson & Weiser, 2001). However, whether greater student satisfaction results from environmental attributes or from personal preferences toward the learning process remains a viable question. Bear in mind that student satisfaction might differ due to different attributes of the two learning environments—FTF and online. For example, Thurmond, Wambach, Connors, and Frey (2002) concluded that student satisfaction was influenced by the online environment rather than by student characteristics and, therefore, controlling for student characteristics would be crucial to minimize experimental bias and chances of incorrectly attributing outcomes to the online environment.

## RESEARCH FOCUS

The purpose of this study was to investigate whether the instructional strategy of providing students a media choice—the option of two types of online text-based discussion (chat vs. threaded discussion forum), had any effects on student satisfaction and cognitive achievement. To identify differential effects associated with student characteristics, learning style was used as a blocking variable. The schematic diagram of the research design is depicted as in Figure 3. To guide the study, four research questions were posed:

RQ1: Do students make a media choice of synchronous or asynchronous online discussion based on their learning styles?

RQ2: Does instructional environment (online vs. face-to-face) influence students' choice of discussion format?

RQ3: Does the choice of chat versus threaded discussion collaboration option have a differential impact on student satisfaction?

RQ4: Does the choice of chat versus threaded discussion collaboration option have a differential impact on student cognitive achievement?

## METHOD

### Participants and Procedures

The participants were 252 teacher education students enrolled in a total of 13 sections of the same class, with 74.6% ( $n = 188$ ) students enrolled in 10 face-to-face sections and 25.4% ( $n = 64$ ) enrolled in three online sections. All sections are essentially identical because the instructors use the same syllabus, identical readings, assignments, and calendar. Each course section was randomly assigned to either a “w/ option” condition in which the students had the option to choose between asynchronous threaded and synchronous chat discussion forums or a “w/o option” condition in which the students did not have the option. The w/ option condition included 48% of the students ( $n = 121$ ). Blocked by learning style, 62.6% ( $n = 137$ ) of the students were academic introverts and 37.4% ( $n = 82$ ) were academic extroverts.

### Measures

The study utilized three measures: (a) an Introversion–Extroversion Index, (b) a cognitive achievement assessment, and (c) a student satisfaction survey.

#### (a) Introversion–Extroversion Index

Based on the characteristics that distinguish introverts and extroverts, the *Introversion–Extroversion Index* (I-E Index) was developed by the researchers to concentrate on the sources of seeking energy and application in learning situations. The nine-item instrument is a dichotomous, forced-choice questionnaire specifically designed to examine the attitude preference of how respondents direct and retrieve their energy, either inward to self or outward to other people. The I-E index includes items such as “To work effectively, you usually (a) prefer to work quietly and independently; (b) prefer to work collaboratively” (See appendix for the complete instrument). Because the questionnaire contains dichotomous responses, having an odd number of items avoids an evenly divided score, which would result in a “draw” between introversion and extroversion. The I-E index was administered online at the beginning of the academic semester. The reliability coefficient of Cronbach's alpha was .70. A coefficient of .70 or higher is considered acceptable for attitude scales (Forbes & Ross, 2003).

#### (b) Cognitive achievement assessment

Four of the project-based course modules throughout the semester included a major online discussion component: (a) Learning Theories/Educational

Psychology, (b) Problem-based learning (PBL) and Cooperative Learning, (c) Social and Ethical Issues, and (d) Information Literacy. Each discussion session covered one of the four topics. The discussion topics provided the content for the assessment, but the actual assessment items were guided by the revised Merrill performance-content matrix in the following manner: Each learning objective was analyzed for its place on the matrix (the upper right area of the matrix reflects the highest levels of learning) and then questions were designed to reflect the lower cognitive levels that support the learning objective. The purpose of mapping the questions is that if a student is unable to answer correctly at the highest level (the learning objective), the lower level questions can be examined to determine the point at which the learner was unable to proceed. The assessments were developed by the researchers and were reviewed for content validity by selected course instructors who were suitable subject-matter experts.

The assessment included 32 items in both open-ended and closed-ended formats and, for any given objective, ranged from low level (memorize-fact) to high level (apply-principle). Example questions are provided in Table 1 (p. 406). The weight of each multiple-choice question was based on its cognitive level (e.g., 1 point (Memorize-Fact), 2 points (Comprehend-Concept), 3 points (Apply-Concept), and 4 points (Apply-Principle). Open-ended questions were assigned values based on the quality and level of the responses.

#### (c) Student satisfaction survey

A 27-item Likert-type questionnaire was designed to rate students' level of satisfaction in two domains—course appraisal and online discussion appraisal. The students rated their degree of satisfaction on a 5-point scale: strongly disagree (1), somewhat disagree (2), neutral (3), somewhat agree (4), and strongly agree (5). The negatively worded items were reverse coded. The course appraisal includes items such as “The course syllabus and handouts are helpful.” The online discussion appraisal includes, “When engaged in online discussions, I put a lot of thought into my comments.” *The Student Satisfaction Survey* was administered one week prior to the final exam week. The reliability coefficient of Cronbach's alpha for the instrument was .92 overall with .88 for the course appraisal and .86 for the online discussion appraisal subscales.

## RESULTS AND DISCUSSIONS

### RQ1: Do students make a media choice of synchronous or asynchronous online discussion based on their learning styles?

Significant differences were found,  $\chi^2 (1, n = 118) = 3.86, p < .05$  with *Phi* of .19, indicating a moderate association between the option (w/ option vs. w/o option) and discussion format (chat vs. threaded). This finding indicates that students overwhelmingly chose the threaded discussion forum as opposed to chat when offered the option to choose between the two.

As to whether students with the option made their choice congruently with their learning style (introvert vs. extrovert), a two-way contingency table

**Table 1: Example Assessment Items**

<b>Level</b>	<b>Questions</b>
<b>Memorize Fact</b>	When evaluating Internet resources, which of the following criteria is the LEAST important for consideration to help your students determine accurate and acceptable sites? a) content validity b) navigation and usability c) authorship d) audience
<b>Comprehend Concept</b>	The primary difference between collaborative and cooperative learning focuses on the: a) degree of structure in the learning process b) role of individual accountability in the learning process c) type of end product produced in the learning process d) types of resources used in the learning process
<b>Apply Concept</b>	For your internship, you were assigned to teach a group of adult students how to create animation using Flash. The students have no prior experience working with animation editing tools and you are concerned about how to help them learn effectively. You therefore conducted several informal interviews with your students to try to find out the ways they prefer to learn. Based on their responses, you summarized their preferences into the three statements below. Indicate which of the three major learning theories best matches your summaries  The following need to be parallel 1. They prefer to be given the learning objectives and then work through a handout to understand how to create an animation. 2. They prefer to be shown analogies of creating animation because the subject is new to them, and they perceive they would learn better with illustrative examples such as the prevalent GIF animations on the Web. 3. They prefer to observe as you demonstrate step-by-step procedures on a given task, and practice repeatedly until they can master the task.
<b>Apply-Principle</b>	Because of your computer expertise you have been awarded a contract (for big \$\$\$) to teach a school faculty how to use databases for administrative purposes. By the end of the instruction the faculty should be able to create a personal database of student information and query the database. Briefly, how would you incorporate all three learning theories into your instruction (use examples of activities to support your answer).

**Table 2: Crosstabs on Discussion Format Versus Learning Styles Among the Option Group**

		Discussion format		
		Threaded	Chat	Total
Learning style				
Introvert	Count	59	3	62
	Expected count	56	6	62
Extrovert	Count	36	7	43
	Expected count	39	4	43
Total	Count	95	10	105
	Expected count	95	10	105

**Table 3: The Result of Chi-square Test Among the With Option Group on Discussion Format**

	Observed N	Expected N	Residual
Threaded	105	58.0	47.0
Chat	11	58.0	-47.0
Total	116		

analysis with crosstabs indicate that, overall, both introverts and extroverts largely chose threaded discussion. Even so, comparably, a larger percentage of the introvert students chose threaded discussion than the extrovert students (95.2% vs. 83.7%),  $\chi^2(1, n = 105) = 3.86, p < .05$  (see Table 2). Additionally, Phi of .19 indicates a moderate association between the percentage of introvert and extrovert students choosing different online discussion formats in the treatment condition which is consistent with other studies (e.g., Diaz & Carnal, 1999), and supports the notion that learning styles do somewhat influence students' choice of communication modes in the context of technology-based discourse.

**RQ2: Does instructional environment (online vs. face-to-face) influence students' choice of discussion format?**

A preliminary one-sample chi-square test on discussion format was conducted with just the With Option and showed a strong difference,  $\chi^2(1, n = 116) = 76.17, p < .001$ , with an effect size of .66, indicating that, like the whole-group finding, a substantially larger proportion of students chose threaded discussion as opposed to chat (see Table 3). Looking more deeply, to evaluate whether the course format (FTF vs. online) influenced students' choice of discourse mode (synchronous vs. asynchronous), a two-way contingency table analysis with crosstabs was conducted which showed no significant difference:  $\chi^2(1, n = 116) = 0.99, p > .05$ , with effect size of .01 and Cramer's V of .01. The results reveal that the sample proportion is equivalent to the hypothesized

**Table 4: The Result of Crosstabs Among the Option Group on Discussion Format Versus Discussion Format**

		Discussion format		Total	
		Threaded	Chat		
Course Format	FTF	Count	86	9	95
		Expected Count	86	9	95
	Online	Count	19	2	21
		Expected Count	19	2	21
Total	Count	105	11	116	
	Expected Count	105	11	116	

proportion (see Table 4). In other words, there is no apparent connection between the discussion format chosen and course format. Intuitively, a need for compensation can easily be assumed; that is, those in the online course might fulfill their need for compensation by choosing the synchronous discussion format and those in the face-to-face courses might choose the asynchronous format. Yet, the result rejects such a hypothesis.

Based on the findings from questions 1 and 2, a follow-up discriminant analysis was utilized to determine whether students' demographic characteristics (e.g., age, gender, student status, total hours granted in the program, and credit hours currently enrolled in) as potential predictors accounted for their decisions. The overall Wilks' Lambda was not significant,  $\Lambda = .97$ ,  $\chi^2(5, n = 85) = 2.32$ ,  $p > .05$ , indicating that the predictors did not differentiate between the threaded and chat discussion format of choice. These results indicate that the collective student demographics and enrolled course format had no impact on students' choice of discourse mode.

**RQ3: Does the choice of chat versus threaded discussion collaboration option have a differential impact on student satisfaction?**

To answer the question, a MANOVA was conducted to determine the effect of the option availability (w/ option vs. w/o option) on satisfaction, which included overall satisfaction, and two subscales: course appraisal, and online communication appraisal. The MANOVA showed significant differences between the w/ option group and the w/o option group on the three dependent variables, Wilks'  $\Lambda = .97$ ,  $F(1, 179) = 4.37$ ,  $p < .05$ . The multivariate  $\eta^2$  of .34, based on Wilks'  $\Lambda$ , is considered moderate. Analyses of variances (ANOVA) on each dependent variable were conducted as follow-up tests to the MANOVA. In the course appraisal subscale, the w/ option group had significantly higher satisfaction with the course than the w/o option group did,  $F(1, 179) = 6.23$ ,  $p < .05$ . For the online communication appraisal subscale, no difference was found between the two groups,  $F(1, 179) = 3.56$ ,  $p > .05$ .

Table 5 displays the descriptive statistics on the student satisfaction scales for the option availability. The w/ option group ( $M = 53.42$ ,  $SD = 6.71$ ) rated the course more positively than the w/o option group ( $M = 50.63$ ,  $SD = 8.19$ ). The

**Table 5: Means and Standard Deviations on the Student Satisfaction for the Option Availability ( $n = 179$ )**

	Student satisfaction			
	Course appraisal		Online communication appraisal	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Option Availability				
w/ option	53.42	6.71	60.49	9.86
w/o option	50.63	8.19	57.73	9.71

**Table 6: Means and Standard Deviations on the Cognitive Achievement for the Option Availability ( $n = 250$ )**

	Cognitive achievement							
	Memorize-Fact		Comprehend-Concept		Apply-Concept		Apply-Principle	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
w/ option	.65	.27	.58	.20	.53	.29	.64	.29
w/o option	.70	.27	.61	.21	.64	.27	.68	.32

w/ option group ( $M = 60.49$ ,  $SD=9.86$ ) also rated the mode of communication more positively than the w/o option group ( $M = 57.73$ ,  $SD = 9.71$ ) but the difference was not statistically significant.

**RQ4: Does the choice of chat versus threaded discussion collaboration option have a differential impact on student cognitive achievement?**

A MANOVA was used to determine the effect of the option availability (w/ option vs. w/o option) on the four tiers of student achievement. The MANOVA showed significant differences between the two groups, Wilks'  $\Lambda=.96$ ,  $F(1, 179) = 2.48$ ,  $p < .05$ . ANOVAs on each dependent variable were conducted as follow-up tests to the MANOVA. Significant difference was found between the two groups at the Apply-Concept level,  $F(1, 250) = 9.81$ ,  $p < .01$  but not at the other three levels. For Apply-Concept specifically, Cohen's  $d$  of .39 indicates 26.74% of nonoverlap, which is considered moderate.

Descriptively, the w/o option group scored higher than the w/ option group on all four tiers of cognitive achievement (See Table 6 and Figure 4, p.410). The w/ option and the w/o option group both performed best in the Memorize-Fact level, which is the lowest tier in the cognitive hierarchy. The w/ option group performed poorest in the Apply-Concept level, whereas the w/o option group performed their worst in the Comprehend-Concept level. Both groups performed highest in the lowest tier in the cognitive hierarchy. Although these differences reached significance only at the Apply-Concept level, the consistency indicates that further research into the relationship between student choice and academic achievement merits further study.

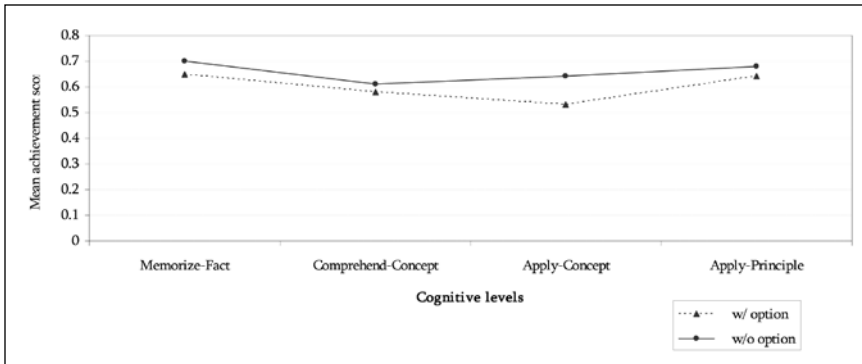


Figure 4: Ordinal interaction of cognitive achievement by option

## CONCLUSIONS

When given the option to choose synchronous or asynchronous online discussion, students were influenced somewhat by their learning styles; in this study, a higher percentage of academic introverts than extroverts chose the threaded discussion forum, which intuitively makes sense. However, this difference may not have much impact on instructional strategies in this course as these undergraduate students achieved similarly in both the online and FTF sections, a finding that is mostly consistent with other research as Lou, Bernard, and Abrami (2006) reported in their theory-based meta-analysis regarding media and pedagogy research in undergraduate distance education.

However, this study examined achievement in a more granular, hierarchical fashion and found that the media option factor appears to negatively impact one of the higher tiers of cognitive engagement (apply-concept) as opposed to no effect on the lower tiers, (i.e., memorize-fact, comprehend-concept). While some researchers have found that small group activities do not always enhance college student performance (Cole & Smith, 1993; Niehoff & Mesch, 1991), particularly when well-designed instruction is offered (Klein, Erchul, & Pridemore, 1994; Klein & Schnackenberg, 2000), the media option seems to raise students' overall learning satisfaction with the course, which is consistent with Irons et al.'s (2002) suggestion that providing students a choice of communication tools should better meet students' needs and, in turn, increase their satisfaction. The lack of substantial difference in satisfaction with the communications tools themselves is also consistent with others' findings (e.g., Neuhauser, 2002) which may mean that these two tools are simply acceptable parts of contemporary instruction, and therefore does not merit differential consideration any more than text presented online or in a book.

Therefore, whether a course is delivered online or face-to-face, the design of the course remains the most critical element affecting student satisfaction (Stein, 2004) and learning. Adding supplemental instructional activities (e.g., small group activities) don't necessarily affect student performance (e.g., Cole & Smith, 1993; Klein, Erchul, & Pridemore, 1994; Klein & Schnackenberg, 2000; Niehoff & Mesch, 1991) so it is important that collaborative activities are designed to be an essential instructional element as in this study.

## IMPLICATIONS

Providing options for online text-based discussion modes to accommodate learning needs and to support the learning process is worthy of consideration. Ideally, learners should make choices based on their learning styles but this study shows that isn't the case. In addition, informal solicitation from e-mails and face-to-face contact, indicated most students in the treatment condition reported that they chose the communication medium not because of any mindfulness of how they learn best, or their learning style, but because of time management issues. This trend is consistent with Anderson and Kent's (2002) study on interactive televised courses that found students chose to take televised courses because of travel and time considerations. Furthermore, recent studies have found that most students are incapable of regulating their learning to optimize self-directed learning in online environments (Azevedo & Cromley, 2004; Kramarski & Mizrachi, 2006) because few of them are skilled at deploying vital self-regulatory processes and mechanisms such as effective cognitive and metacognitive strategies (e.g., Azevedo & Cromley, 2004; Hadwin & Winn, 2001).

Therefore, because many students do not make choices that benefit their learning, course instructors can potentially make a difference by focusing on student metacognition skills. By helping students think about their thinking and learning, students should gradually become more proficient in making the right decisions with regard to their choices in learning media. Finally, providing students with a choice of collaborative communication tools improves student satisfaction, a factor that may contribute to continued and new enrollments but, at the same time, efforts should be made to help students make choices congruent with how they learn most efficiently, rather than convenience.

### Contributors

ShinYi Lin is assistant professor of the Department of Information Technology at Ching Kuo Institute of Management and Health, Taiwan. She received her PhD in urban education/ educational technology from Old Dominion University, Virginia. Her research interests include instructional strategy and distributed learning in adult education. (Address: 336 Fu-Hsing Rd. Keelung, Taiwan 203, ROC; slin@ems.cku.edu.tw.)

Richard C. Overbaugh is associate professor of Darden College of Education at Old Dominion University, Norfolk, Virginia. (Address: 145 Education, Old Dominion University, Norfolk VA, 23529; roverbau@odu.edu.)

### REFERENCES

- Anderson, L. P., & Kent, C. A. (2002). Interactive televised courses: Student perceptions of teaching effectiveness, with recommendations. *College Teaching*, 50(2), 67-74.
- Aoki, K. (1995). Synchronous multi-user textual communication in international tele-collaboration. *Electronic Journal of Communication*, 5(4), 1-17.

- Azevedo, R., & Cromley, J. G. (2004). Does training of self-regulated learning facilitate student's learning with hypermedia? *Journal of Educational Psychology, 96*, 523–535.
- Bean, J. P., & Bradley, R. K. (1986). Untangling the satisfaction-performance relationship for college students. *Journal of Higher Education, 57*(4), 393–412.
- Beyth-Marom, R., Saporta, K., & Caspi, A. (2005). Synchronous vs. asynchronous tutorials: factors affecting students' preferences and choices. *Journal of Research on Technology in Education, 37*(3), 245–262.
- Cole, B. C., & Smith, D. L. (1993). Cooperative learning strategies for teaching adult business English. *Journal of Education for Business, 68*(3), 170–173.
- Cross, K. P. (1981). *Adults as learners: Increasing participation and facilitating learning*. San Francisco: Jossey-Bass.
- Davison, L., Bryan, T., & Griffiths, R. (1999). Reflecting students' learning style. *Active Learning, 10*, 10–13.
- Diaz, D., & Cartnal, R. (1999). Student learning style in two classes: Online distance learning and equivalent on-campus. *College Teaching, 47*(4), 130–135.
- Duck, H., & Ogden, W. R. (1990). An essay on Jungian typology and its implications for education. *Educational Resources Techniques, 29*(1), 17–21.
- Felder, R. M., & Soloman, B. A. (2004). *Index of learning styles*. Retrieved from <http://www.ncsu.edu/felder-public/ILSpage.html>
- Forbes, S. A., & Ross, M. E. (2003). Reliability of scores and the researcher. *Journal of Research in Education, 13*(1), 102–109.
- Gregorc, A. F. (1984). *Gregorc Style Delineator: Development, technical and administrative manual*. Maynard, MA: Gabriel, Inc.
- Hadwin, A., & Winn, P. (2001). CoNoteS2: A software tool for promoting self-regulation. *Educational Research and Evaluation, 7*, 313–334.
- Irons, L. R., Keel, R., & Bielema, C. L. (2002). Blended learning and learner satisfaction: Keys to user acceptance? *USDLA Journal, 16*(12), 29–39.
- Jolliffe, A., Ritter, J., & Stevens, D. (2001). *The online learning handbook: Developing and using Web-based learning*. Sterling, VA: Stylus.
- Keirse, D. (1998). *Please understand me II: Temperament, character, intelligence*, 1st Ed., Prometheus Nemesis Book Co.
- Klein, J. D., Erchul, J. A., & Pridemore, D. R. (1994). Effects of individual versus cooperative learning and type of reward on performance and continuing motivation. *Contemporary Educational Psychology, 19*, 24–32.
- Klein, J. D., & Schnackenberg, H. L. (2000). Effects of informal cooperative learning and the affiliation motive on achievement, attitude, and student interactions. *Contemporary Educational Psychology, 25*, 332–341.
- Knowles, M. S. (1988). *Self-directed learning: A guide for learners and teachers*. New York: Cambridge Book.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall, Inc., Englewood Cliffs, N.J.
- Kramarski, B., & Mizrachi, N. (2006). Online discussion and self-regulated learning: Effects of instructional methods on mathematical literacy. *Journal of Educational Research, 99*(4), 218–230.

- Lee, J., MacKendree, J. Dineen, F. & Mayes, T. (1999). Learning vicariously in a distributed environment. *Active Learning*, 10, 4–9.
- Lou, Y., Bernard, R. M., & Abrami, P. C. (2006). Media and pedagogy in undergraduate distance education: A theory-based meta-analysis of empirical literature. *Educational Technology Research and Development*, 54(2), 141–76.
- Merrill, M. D. (1994). *Instructional design theory*. Englewood Cliffs, NJ: Educational Technology Publications.
- Moore, M. G. (1989). Three types of interaction. *The American Journal of Distance Education*, 3(2), 1–6.
- Murphy, K., & Collins, M. (1997). Development of communication conventions in instructional electronic chats. *Journal of Distance Education*, 12, 177–200.
- Myers, I., & McCaulley, M. (1985). *A guide to the development and use of the Myers-Briggs type indicator*. Palo Alto, CA: Consulting Psychologists Press.
- Neuhauser, C. (2002). Learning style and effectiveness of online and face-to-face instruction. *The American Journal of Distance Education*, 16(2), 99–113.
- Niehoff, B. P., & Mesch, D. J. (1991). Effects of reward structures on academic performance and group processes in a classroom setting. *The Journal of Psychology*, 125(4), 457–467.
- Overbaugh, R. C., & Lin, S. Y. (2003, October). *Cognitive hierarchies and the need for curriculum-referencing assessments for constructivist achievement*. Presented at the annual conference of the Association for Constructivist Teaching Conference, Portsmouth, VA.
- Overbaugh, R. C. & Lin, S. Y. (2005). Problem-based learning and fourth grade: Who really benefits? *The Constructivist*, 16(1). Available online: <http://www.odu.edu/educ/act/journal/vol16no1/index.html>
- Pascarella, E. T., Whitt, A. N., Edison, M., Hagedorn, L. S., & Terezini, P. T. (1996). What have we learned from the first year of the national study of student learning? *Journal of College Student Development*, 37(2), 182–192.
- Poole, D. M. (2000). Student participation in a discussion-oriented online course: A case study. *Journal of Research on Computing in Education*, 33(2), 162–179.
- Quenk, N. L. (1999). *Essentials of Myers-Briggs Type Indicator assessment*. New York: John Wiley & Sons.
- Sproull, L., & Kiesler, S. (1993). Computers, networks, and work. In L. M. Harasim (Ed.), *Global networks: Computers and international communication* (pp. 105–119). Cambridge, MA: MIT Press.
- Stein, D. (2004). Course structure: Most important factor in student satisfaction. *Distance Education Report*, 8(3), 4.
- Swan, K. (2001). Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education*, 22(2), 306–331.
- Thurmond, V. A., Wambach, K., Connors, H. R., & Frey, B. B. (2002). Evaluation of student satisfaction: Determining the impact of a Web-based environment by the controlling for student characteristics. *The American Journal of Distance Education*, 16(3), 169–189.

Wilson, R. L., & Weiser, M. (2001). Adoption of asynchronous learning tools by traditional full-time students: A pilot study. *Information Technology and Management, 2*, 363–375.

Wynd, W. R., & Bozman, C. S. (1996). Student learning style: A segmentation strategy for higher education. *Journal of Education for Business, 71*, 232–235.

Zafeiriou, G. J., Nunes, M., & Ford, N. (2001). Using students' perceptions of participation in collaborative learning activities in the design of online learning environments. *Education for Information, 19*, 83–106.

## **APPENDIX: INTROVERSION—EXTROVERSION INDEX**

This is an indicator of your attitude of seeking energy. There are no right or wrong answers, only your best answer. Please answer each of the following statements as honestly and promptly as possible to show your natural preference. When in doubt go with your first instinct. There are only nine questions that will take but a couple of minutes to complete.

Your confidentiality will be respected.

1. To work effectively, you usually
  - a) prefer to work quietly and independently
  - b) prefer to work collaboratively
  
2. You have a tendency to
  - a) concentrate more on thoughts, concepts, and ideas
  - b) concentrate more on people, objects, and places
  
3. You think most effectively when you
  - a) work quietly without interacting with others
  - b) interact with others and spell out your thoughts
  
4. When it comes to a new learning task, you usually
  - a) think first, then act
  - b) act first, and reflect later
  
5. You perceive yourself as a
  - a) reflective thinker
  - b) “on the fly” thinker
  
6. In real-time, face-to-face discussions, you are usually
  - a) reluctant to share your ideas
  - b) inclined to share your ideas and accept the ideas of others
  
7. In a group discussion, you are usually
  - a) slow to volunteer your ideas and thoughts
  - b) ready and willing to volunteer your ideas and thoughts

8. In face-to-face discussions, you usually
  - a) listen more and talk less
  - b) do a lot of talking
  
9. With regard to online communication, you
  - a) prefer delayed interaction
  - b) prefer real time, immediate interaction