INCENTIVE STYLES, ASYNCHRONOUS ONLINE DISCUSSION, AND VOCATIONAL TRAINING

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ABSTRACT

Vocational education and training (VET) is intended to prepare adult learners for careers that are based on practical activities. With the underlying constructivist andragogy, this study intended to examine the effects of computer-mediated group collaboration in vocational education, and how that affects the associated learning outcomes. For collaborative learning, use of asynchronous computer-mediated communication as one of the major media prevails not only in web-based formats but in face-to-face. Specifically, our intent was to explore effectiveness of asynchronous online discussion (AOD) and the learning outcome accordingly. The results provided evidence that the participants in the AOD performed substantially better than those with no use of AOD in the bi-weekly quizzes as well as the learning outcomes. As incentive styles come into play, we found that the introverts performed as well as the extroverts disregarding the AOD participation. The results concluded that use of group collaboration as andragogical strategy (use of AOD) inferred better learning outcomes in the context of VET.

INTRODUCTION AND THEORETICAL BACKGROUND

Vocational education, alternatively called vocational education and training (VET) or technical education, prepares adult learners for careers that are based on

practical activities. Distinct from the traditional academic routes, VET specifically develops adult learners' expertise in a particular group of techniques. Finch and Crunkilton (1999) proposed that curriculum in VET should be intended to directly help students develop a broad range of knowledge, skills, attitudes, and values clearly contributing to their employability. Potential issues related with performance assessment also need to be clarified for career training and education (Apling, 1989). From the underlying teaching-learning objectives to the intended assessment, the instructional strategies integrated with computer technologies seem even more versatile in this digital era. Doolittle and Camp (1999) indicated that traditional learning-teaching approaches in vocational education do not adequately address collaborative work skills. They suggested that constructivist learning environments offer the potential for collaborative learning in the context of real-life situations and problems, specifically for entry-level jobs and advancement in the workplace (Billett, 1996). Therefore, this study intended to examine the effects of computer-mediated group collaboration in vocational education, and how that affects the associated learning outcomes.

Computer-mediated learning often facilitates group collaboration in a variety of manners. Asynchronous online text-based discussion forums are one kind. Numerous studies (e.g., Roberts & McInnerney, 2007) affirm the application of computer-supported collaborative learning (CSCL). With the rapid development of computer-mediated communication (CMC), online discussions have become more involved in traditional classroom settings to promote critical thinking (Garrison, Anderson, & Archer, 2000, 2001; Vaughn & Garrison, 2005), knowledge construction, and learning autonomy (Lim & Chai, 2004; Marra, Moore, & Klimczak, 2004). Use of online discussions also turns to be one of the vital tools with regard to instructional management (Jollife, Ritter, & Stevens, 2001). Online text-based discussion can be viewed as a virtual environment in which learner-learner and learner-facilitator meet to collaborate and to share information. The effective use of Internet integration in the classroom teaching is to augment information exchange (Fisher, 2000). Online and traditional classroom learning are no longer either-or; instead, online learning seems to compliment potential limitations of traditional classroom learning. That is, conventional classroom learners also can benefit from participating in asynchronous online discussion outside the classroom. Irons, Keel, and Bielema (2002) described such an instructional arrangement as *blended learning,* in which the two modalities are appropriately applied to specific purposes.

Asynchronous interactions are prevailing not only in web-based courses but also in traditional face-to-face courses. The merits of using asynchronous text-based Internet communication technology are not only to better support interpersonal interaction but also to sustain two-way communication. Asynchronous text-based Internet communication is not bound by time or place and is more cost effective (Bates, 1997). That is, asynchronous online text-based discussion allows people to spend time reading, reflecting on a message, and responding.

Even more, asynchronous online text-based discussion allows international collaboration in which people need to communicate across different time zones (Aoki, 1995). As observed from Poole's (2000) case study on how students participate in a discussion-oriented online course, students seem to prefer the asynchronous discussion boards because they have enough time to draft reflected responses to others' postings. Sufficient time for reflection is indeed the major merit of asynchronous online discussion forums. The students are able to self-regulate when it is best for them to participate in the threaded discussion and to avoid distractions. At any rate, when integrating asynchronous Internet communication tools into traditional classrooms, most university instructors still "*continue to experience a tension between structure, dialogue and autonomy*" (Kanuka, Collett, & Caswell, 2002, p. 151). Computer-mediated communication (CMC) has perceived advantages and contributed to student cognitive and affective outcomes (Johnson, 2008).

Learning differences may be interpreted as a biologically and developmentally imposed set of personal characteristics that invite the matched teaching or learning strategy to be effective for some or ineffective for others. Numerous instruments have been developed to identify or measure such differences such as the Myers-Briggs Type Indicator (Myers & McCaulley, 1985), Index of Learning Style (Felder & Solomon, 2002), Gregorc's Style Delineator (Gregorc, 1984), Learning Style Inventory (Kolb, 1984), and the Keirsey-Bates Temperament Sorter (Keirsey, 1998). With numerous instruments available, the practical use of learning styles in online learning contexts warrants studies (Beyth-Marom, Saporta, & Caspi, 2004). According to Jonassen and Grabowski (1993), three broad categories regarding individual differences are:

a. cognitive (including cognitive abilities, controls, and styles);
b. personality; and
c. prior knowledge.

Amidst the personality realm, expectancy and incentive styles cover introversion/extraversion, locus of control, achievement motivation, and risk taking vis-à-vis cautiousness. The introversion/extraversion incentive style were proposed by Myers-Brigges Type Indicator (Myers & McCaulley, 1985). Myers-Brigges Type Indicator (MBTI) differentiates 16 psychological types based on the preferred orientation on each of four axes or dimensions. Four dichotomous dimensions classify individuals as:

a. introvert (I) or extrovert (E);
b. sensing (S) or intuitive (N);
c. thinking (T) or feeling (F); or
d. judging (J) or perceiving (P).

In the midst of the four dimensions, the introversion/extraversion dichotomy pertains to the incentive style this study intended to examine.

Based upon an operational definition of introversion and extraversion, extroverts think most effectively when interacting with others but only become aware they are thinking when they are uttering. On the contrary, introverts focus on reflection of ideas without interacting with others (Quenk, 1999). Along the same lines, Keirsey and Bates (1984) defined an extrovert learner as one who needs people as a source to regenerate his/her energy, whereas an introvert learner prefers solitude to recover energy. Keirsey and Bates continued that introverts tend to be "*slow to volunteer in the classroom, hesitating in sharing their ideas with others, and need privacy,*" whereas extroverts are more ready to "*enter into group activities and to accept the ideas of others*" (p. 101). Moreover, the introvert more attends to internal reality (the inner world) and concentrates more on concepts and ideas. On the contrary, the extrovert tends to focus on external reality (the outer world) and directs attention toward people and objects (O'Brien, Bernold, & Akroyd, 1998). The introversion–extraversion dimension is also postulated as "*preference for being in the world*" (Fox-Hines & Bowersock, 1995, p. 4). Note that introverts intend to reflect quietly and alone, whereas extroverts intend to seek energy from socialization. When it comes to online text-based discussion, extroverts are fond of prompt interaction such as brainstorming to learn effectively, for they process the learning during instantaneous message exchange. Contrarily, introverts tend to be fond of delayed interaction. That way, they have sufficient time being alone to process messages quietly and deeply, and to reflect on them. While asynchronous discussion forum is time independent, the energy attitude of introverts would be satisfied in such a discussion mode.

With the use of adequate questionnaires, Harrison, Andrews, and Saklofske (2003) concurred that researchers characterize students' incentive styles according to how internalization and information retention might be processed in three tiers:

a. various learning environments (e.g., classroom layout);
b. sociological factors (e.g., individual vs. group work); and
c. physical factors (e.g., visual or auditory).

Regardless of the way instruction should be delivered, from an instructor's standpoint, realizing students' learning preference can be beneficial in several ways. The instructor can orient his lecture toward those students with the modal learning preference, keeping in mind that some students may be at a disadvantage. In light of instructional delivery, however, asynchronous courses apparently tend to be more flexible in terms of time, distance, and most importantly, learner preferences. In reiteration, the extent to which an instructor has flexibility in a traditional classroom is debatable. Facing a whole classroom of students with various learning preferences, an instructor may be overwhelmed by attempting to utilize pedagogy that fits all needs, particularly when the class includes a blend of nontraditional and traditional students, which is often

the case in higher education. Hypothetically, online instructional environments seem more compatible with a versatility of individual characteristics. In short, Allen, Bourhis, Burrell, and Mabry (2002) suggested that, as a stem of individual difference, learning preference is the predominate impact on the issue of distance education. Students always learn differently regardless the learning settings (e.g., traditional courses, blended distance courses) (Parkinson, Greene, Kim, & Marioni, 2003).

In this study, our endeavor is to explore the use of asynchronous online discussion (AOD) in the context of blend instruction in accordance with learning outcomes. The specific hypotheses are delineated as follows.

H1: Students participating in asynchronous online discussion (AOD) will evidence significantly higher average quiz scores than students not participating in AOD.

H2: Students participating in asynchronous online discussion (AOD) will evidence significantly higher course grades than students not participating in AOD.

H3: Introvert and extrovert students will perform significantly on learning outcomes.

H4: There will be a significant relationship between participation rate in AOD and VET achievement.

METHOD

This study aims to obtain empirical data in an effort to gain insight into the effects of asynchronous online discussion forums in which student participation was examined in relation to overall course performance, in addition to their incentive styles accordingly. This study employs a repeated-measure quasi-experimental design. The design involves one experimental group participating in asynchronous discussion forum, and one control group with no online discussion assigned. The groups constitute intact classes, in which equivalency could not be presumed or assured, hence all these groups do not have pre-experimental sampling equivalency.

Sample

The participants ($n = 73$) were the college freshmen enrolled in a IT Essentials: PC Hardware and Software course offered by Department of Information Technology in a vocational institute. The gender ratio is disproportionate: 97% ($n = 71$) were male and 3% ($n = 2$) were female. The institution has a proportionally strong number of students identified as lower socioeconomic status. Approximately 40% of the enrollees applied for student loans, and were in need of part-time

jobs to support themselves financially. Different from research universities, this institute is categorized as vocational education and training and emphasizes on knowledge application and hands-on training. The *IT Essentials: PC Hardware and Software* course was primarily carried face-to-face (FTF). The course covered eight subordinate modules based on the learning objectives in coherence with fundamentals of information technology. The learning objectives of the modules were listed in Table 1.

Measures

Introversion–Extraversion Index (I-E Index)

The I-E Index was developed by Lin and Overbaugh (2007) and was to concentrate on the sources of seeking energy and application in learning scenarios. The 9-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

Table 1. Objectives of the Quizzes

Measures	Objectives
Quiz 1: Information Technology Basics	Discuss the basics of Information Technology
Quiz 2: How Computer Works	Discusses how computers work and the boot process
Quiz 3: Assembling a Computer	Discuss how to install computer components and how to assemble a functional computer
Quiz 4: Operating System Fundamentals	Discuss the basics of the operating system
Quiz 5: Windows NT/2000 Operating System	Discuss NT/2000 Operating System
Quiz 6: Windows XP Operating System	Discuss XP Operating System
Quiz 7: Networking Fundamentals	Discuss how networks work and how they share services
Quiz 8: Multimedia Capabilities	Discuss the multimedia capabilities of the PC

includes items such as "*To work effectively, you usually (a) prefer to work quietly and independently; (b) prefer to work collaboratively.*" 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 extraversion. The I-E index was administered online at the beginning of the 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).

Bi-Weekly Quizzes

There were eight quizzes covering selective modules of the *IT Essentials: PC Hardware and Software* (Version 3.1) course developed by Cisco Networking Academy™. The objectives were listed in Table 1. The content validity of the quizzes was also substantiated. Derived from the selective modules, each of the quizzes covers 30 multiple-choice questions. For preparation, the students have a week to discuss online (use of AOD)/self-study (no use of AOD) the content after a weekly face-to-face meeting was delivered to all the participants. All the participants were required to take a 45-minute online quiz accordingly after the weekly face-to-face meeting.

Learning Outcome

Two accumulative exams, *Exam I* and *Exam II* measured the learning outcome. The exam I covers 50 multiple-choice questions derived from quiz 1 to quiz 4. Likewise, the exam II covers 50 multiple-choice questions derived from quiz 5 to quiz 8. Distinguished from the quizzes, the gist of the two accumulative exams is to assess which cognitive levels the student could have achieved from the eight quizzes. The exam questions are designed to assess the higher levels of the cognition tier, application, and analysis, based on Bloom's Taxonomy of Learning (Bloom, 1956). The grading scheme for the two accumulative exams were reviewed and determined by two subject-matter experts.

Procedure

The participants randomly enrolled in the two classrooms for the course, and the two classrooms were randomly drawn into two groups: experimental group and control group. The treatment was the use of asynchronous online discussion forum. In the experimental group, the participants were randomly divided into small groups of three, and eligible for joining in the discussion forum to reflect on the units and prepare for the quizzes over a week period. Those in the control group then prepared for the quizzes of the units independently, where no group discussion was utilized. That is, the experimental group worked in small groups

via asynchronous online discussion, while the control group worked independently without aids of online discussion.

RESULTS

Asynchronous Online Discussion (AOD) and Bi-Weekly Quizzes

A one-way multivariate analysis of variance (MANOVA) was conducted to determine the effect of use of discussion forum (asynchronous discussion vs. independent-no asynchronous discussion) on the dependent variables, eight quizzes. Significant differences were found, $F(10, 62) = 10.02$, $p < .001$, between the use of AOD and independent study on the dependent measures. With the two levels of the independent variable, significant Hotelling's Trace of 1.62 was reported. (See Table 2.)

Table 3 reports the Analysis of Variances (ANOVA) on each dependent variable that was conducted as follow-up tests to the MANOVA. As shown in Table 3, the ANOVA on Quiz 2 was significant, $F(1, 71) = 9.31$, $p < .001$, $\eta^2 = .12$. The multivariate Eta squared (η^2) of .12 indicates that 12% of multivariate variance of the Quiz 2 score was attributed to the effect. The analysis on Quiz 3 was significant, $F(1, 71) = 22.09$, $p < .001$, $\eta^2 = .24$. For Quiz 6, the analysis was significant, $F(1, 71) = 4.73$, $p < .05$, $\eta^2 = .24$. Likewise for Quiz 3 and Quiz 6, 24% of multivariate variance was attributed to the effect. The two groups differentiated from each other in the Quiz 7 scores, $F(1, 71) = 8.88$, $p < .001$, $\eta^2 = .11$. The test rejects the null hypothesis and partially confirms our hypothesis that the students who participated in the AOD performed better in their three bi-weekly quizzes than those who did not.

Asynchronous Discussion Forum and Learning Outcomes

A one-way analysis of variance (ANOVA) was conducted to evaluate the difference between use of AOD and independent study in the learning outcome measured by the two summative exams. The independent variable, use of discussion forum, has two levels: use of AOD and no use of AOD. The dependent variable was the learning outcome by multiple-choice exams, in which the questions were selected from the question pool of the quizzes. The results of the ANOVA was significant, $F(1, 93) = 21.73$, $p < .001$, $\eta^2 = .20$. Traditionally, h2 (Eta squared) values of .01, 06, and .14 represent small, medium, and large effect sizes, respectively. In this case, η^2 of .20, an effect size indicator in the General Linear Model procedure, represents a large effect size. The result indicated that the participants in the ADF group and the independent learning group performed differently in the learning outcome. The descriptive statistics for the learning

Table 2. Quiz Scores as a Function of AOD

	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5	Quiz 6	Quiz 7	Quiz 8
Use of AOD								
Mean	69.02	75.37	45.72	65.95	57.2	71.71	75.37	66.95
SD	28.05	24.13	18.92	27.53	32.37	30.67	26.32	32.11
No Use								
Mean	65.89	61.33	64.38	56.41	65.25	58.31	58.13	69.13
SD	21.24	10.96	13.66	19.27	17.59	18.62	21.99	18.03

Table 3. Summary of MANOVA for the Measures by Use of AOD

Dependent variables	Learning outcome			
	df	F	p	η^2
Use of asynchronous online discussion forum (Use of AOD vs. No Use)				
Quiz 1	1	.28	.60	.00
Quiz 2	1	9.31	.00	.12
Quiz 3	1	22.09	.00	.24
Quiz 4	1	2.78	.10	.04
Quiz 5	1	1.61	.21	.02
Quiz 6	1	4.73	.03	.06
Quiz 7	1	8.88	.00	.11
Quiz 8	1	.12	.73	.00

outcome revealed that the AOD experimental group ($M = 65.77$, $SD = 20.72$) scored lower than the control group ($M = 81.44$, $SD = 8.21$).

Incentive Style and Learning Outcomes

A one-way analysis of variance (ANOVA) was conducted to evaluate difference between introverts and extroverts in the learning outcome. There were 39% of introverts ($n = 33$) and 61% of extroverts ($n = 51$). The analysis of variance rejected the directional hypothesis and found no significant difference, $F(1, 82) = .10$, $p > .05$. Therefore, it was inferred that the introverts performed as equally well as the extroverts regardless of their participation in AOD. That is, in the context of this study, use of AOD suggested improved learning outcome in some way.

Participation in Asynchronous Online Discussion (AOD) and Learning Outcome

The Pearson Product-Moment Correlations were computed among the degree of participation and the learning outcome. It was our intent to examine whether the more the participants participated in the context of asynchronous discussion forum, the greater the learning outcome. Results from the Pearson correlation of participation rate and VET achievement showed that the greater the participation in AOD, the higher the VET learning outcome for the case, $r(93) = .50$, $p < .001$. The finding cohered with our hypothesis. For behavioral sciences in general,

correlation coefficients of .10, .30, and .50, irrespective of sign, are typically interpreted as small, medium, and large coefficients.

DISCUSSION AND IMPLICATIONS

The participants in the AOD performed substantially better than those not in the three bi-weekly quizzes: Quiz 2 (How Computer Works), Quiz 6 (Windows NT/2000 Operating System), and Quiz 7 (Windows XP Operating System). However, the AOD group did less satisfactory in Quiz 3 (Assembling a Computer). The learning objectives of the units varied based on the content. The content of Quiz 3 differed from the others. Quiz 3 was geared toward more hands-on knowledge and emphasized on the procedural, step-by-step content, while the others did not put that much weight on hands-on training. The general characteristics of the participants in the study were more motivated in hands-on activities. The control group (no use of AOD) tended to process the procedural content as in Quiz 3 differently as compared to the experimental group (use of AOD). In the text-based discussion for Quiz 3, the students in the AOD group expressed a mindset that the assigned text-based discussion on the content seemed sufficient for the task while those in the no use of AOD takes repetitive practices on computer assembly in the labs. The findings were comprehensible when taking into account the factor of learning strategies, and the fundamental nature of the content. The conclusions also lend support to the result that the AOD group performs less satisfactory than the no use group in the two accumulative assessments.

Small group discussion, no matter in face-to-face or online formats, involved group dynamics, which takes in the way group members interact and collaborate in addition to their nature of learning traits. Wang and Woo (2007) elaborated that group characteristics consisting of a mix of introversion and extraversion are more appropriate for asynchronous online discussions (AOD). Correspondingly, several studies (e.g., Belcher, 1999; Kern, 1995) point out that asynchronous online discussions tend to benefit people in subordinated positions, such as those who are shy, introverted, reticent, or having language difficulties. Generally, online discussion, as King (2001) concluded, supports learners who may not have opportunities to meet or interact with their learning counterparts in the educational aspects.

Multiple empirical studies have confirmed the evidence of gender difference in the domain of digital divide (Cooper, 2006), modes of educational testing (Horne, 2007), different experiences (Gutek & Bikson, 1985), and interaction patterns of online discussion (Palmer, Holt, & Bray, 2008). In his project on analyzing how gender and learning style affected decision making and perception, Salter found that males and females differed significantly in certain aspects of incentive styles. In both face-to-face and online learning environments, "*female students place emphasis on relationships, are empathetic in nature, and*

prefer to learn in an environment where cooperation is stressed rather than competition" (Blum, 1999, p. 51). Lee (2002) posited three popular gender issues in existing literature:

a. the dynamic of social interaction and its purposes and style;
b. motivation factors; and
c. expression frequency and style, discussion, and feedback.

In addition to the gender issue that could confound the study, English anxiety would be another as English is not the first language to the students. During the face-to-face instruction, the students were permitted to use the Internet for assistance on vocabulary and grammar once any difficulty was encountered. To minimize the language bias, the students were also permitted to use a dictionary during the quizzes and exams. Hopefully, through the learning, the students get more accustomed to those jargons and wordings common in the area of information technology. This study could be repeated to a group of participants with a balanced ratio of gender for reassurance in such a scenario. Learning through discussions is an important strategy for students (Ellis & Calvo, 2004; Hung, Tan, & Chen, 2005). Again, this study confirms that using AOD in vocational training seemed to be an effective strategy in such learning aspects and contexts.

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