EXPLORING THE RELATION OF STUDENTS' LANGUAGE PROFICIENCY, ONLINE INSTRUCTOR GUIDANCE, AND ONLINE COLLABORATION WITH THEIR LEARNING IN HONG KONG BILINGUAL CYBER EDUCATION

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ABSTRACT

This research study adopted a quantitative approach to explore how the variables, namely student's English proficiency, online instructor guidance, and online collaboration, influence the learning effectiveness of the students taking an online introductory information technology course in cyber education in a bilingual higher education institution in Hong Kong. This study is important for cyber education administrators, as it investigated the important pedagogical quality of cyber education. Correlation analysis was conducted to identify whether any of these variables collected from the survey could be associated with students' online learning while multiple regression analysis was used to explore the combined effect of these variables on students' online learning. Validity and reliability of this study are highlighted in this paper. The major findings in this study revealed that (1) the students' English proficiency, online instructor guidance, and online collaboration are potential factors contributing to the students' online learning, and (2) the students' English proficiency has the largest effect while online instructor guidance and online collaboration have a moderate effect on the students' online learning.

Keywords: Cyber Education, Learning Effectiveness, Students' English Proficiency, Instructors' Guidance, Students' Collaboration, Online Discussion Forum

INTRODUCTION

This research study in cyber education in the context of Hong Kong's higher education was inspired by the different research findings of Wong (2008) and the Asian students' learning characteristics defined in Chin, Bauer, and Chang (2000) and Wong (2012). As Wong (2012) noted, these differences might be because unlike in many other studies in the literature, the participating students in his study (Wong 2008) learnt using the less familiar English language. Additionally, Wong (2012) explained that the differences lie in the cultural variability. Chin, Bauer, and Chang (2000) noticed that Asian students are generally more willing to participate in online discussion because they are not required to respond instantly in their less familiar English language; rather, they use their familiar language (e.g., Chinese) in the discussion forum. However, Wong (2012) noted that students' messages in the discussion forum require instructors' clarification. Hence, instructors' guidance in the discussion forum may be helpful to the students' online learning.

With these observations in mind, the researcher hypothesized that (1) students' English proficiency, (2) instructors' guidance in online discussion forum (or simply, online instructor guidance), and (3) peer students' collaboration in online discussion forum (or simply, online collaboration) will contribute to the student's learning in cyber education in the context of Hong Kong higher education.

This research study aimed to evaluate this hypothesis. Other potential factors, such as information technology (IT) literacy, motivation, and learning strategies, may also contribute to students' online learning, but the researcher only considered student's English proficiency, online instructor guidance, and online collaboration because their effect on the students' online learning might help to explain the difference between the findings of Wong's (2008) quasi-experiment and other comparative studies. Therefore, the following research questions were addressed:

1. How does each variable (i.e., student's English proficiency, online instructor guidance and online collaboration) correlate with the students' learning as reflected by their test scores achieved through teaching methods 1, 2, and 3? (See literature review for details of the teaching methods.)

2. How well do the variables predict the students' learning as reflected by their test scores achieved through teaching methods 1, 2 and 3? How much variance in the students' learning can these variables explain through teaching methods 1, 2, and 3?

3. What is the distribution of the students' views concerning the learning effectiveness of the three teaching methods and the importance of the variables?

The significance of this research study is fourfold. First, this study investigated the students' learning performance, which is an important issue that reflects the pedagogical quality of cyber education. Second, this study investigated the relation between students' use of less familiar English language with their learning in Hong Kong bilingual cyber education, something not addressed in the existing literature. Third, the previous studies did not consider the Asian students' learning characteristics when investigating the relation of online instructor guidance and online collaboration with students' online learning. This study considered these characteristics and investigated the relation of these variables with the students' online learning in the context of Hong Kong higher education. Fourth, the existing literature lacks consideration of the relative effects of the variables influencing students' online learning in cyber education. This study addressed this issue by identifying the variables that have relatively stronger or weaker effects.

LITERATURE REVIEW

Wong (2008) carried out a quasi-experiment involving the introductory IT course in a Hong Kong higher education college (in short, the college), which offers opportunities for graduates from secondary schools to earn Associate Degree and Higher Diploma programs. This research was carried out during the four semesters from 2006 to 2008 and explored whether the students could learn more effectively, less effectively, or equally effectively, as reflected by their test scores, in cyber education in comparison to classroom teaching. An a priori statistical power analysis was assessed using Cohen's (1988, 1992a) computations and the tool G*Power (Erdfelder, Faul, & Buchner, 1996) to assess whether the total sample size $n = 300$ was large enough to identify a medium effect size and stringent statistical power. Then, 300 participants were selected at random from the classes of the students who had registered for this IT course and divided into three independent groups in accordance with three teaching methods.

One group of 100 students, as a control group, was assigned to teaching method 1 in which the students had to attend both lectures and tutorials in classrooms as they did in classroom teaching. The other two groups were the experimental groups. One group of 100

students used teaching method 2. They did not attend lectures or tutorials in classrooms and learned mainly through reading the materials in the college's cyber education system and discussing them with other students and instructors in the discussion forum in that system. The remaining group of 100 students used teaching method 3. The students were not required to attend lectures, but they were required to attend tutorials and learn through the materials posted in the college's cyber education system.

The participating students who were assigned to the three teaching methods were scheduled to take the same test on the same day each semester. The test answer scripts and question papers were collected at the end of the test, and those test questions were not released to the students after the test because most of the questions were used again in the coming semesters for this quasi-experiment. Tukey multiple-comparison method was used to rank the average test scores on these three teaching methods. The average test scores of the three groups of students were used for comparison because the average test scores of each group reflect average performance of students in that group.

Wong's (2008) quasi-experiment revealed two main findings. First, the average test score of the introductory IT course attained by the students in classroom teaching (teaching method 1) was close to the average test score attained by the students taking the online introductory IT course with instructors' guidance in tutorials (teaching method 3). Second, the students participating in teaching method 1 and teaching method 3 scored significantly higher compared to the students' taking the online introductory IT course without attending lectures and tutorials in classrooms (teaching method 2).

As Wong (2012) noted, Wong's (2008) quasi-experiment differed from many other findings (e.g., Aberson, Berger, Healy, Kyle and Romero, 2000; Johnson, Aragon, Shaik and Palma-Rivas, 2000; Lim, Kim, Chen and Ryder, 2008; Wang and Newlin, 2000). For example, unlike Wong's (2008) findings, Lim, Kim, Chen, and Ryder (2008) reported that the students in on-line instruction (teaching method 2) and the combined mode (teaching method 3) learned better compared to the students in classroom teaching (teaching method 1). In Wong's (2008) quasi-experiment, the higher education students are mostly Chinese who are learning in English language. This is a characteristic of Hong Kong higher education, as using English as a medium of instruction enhances students' English proficiency (Johnson, Shek, & Law, 1993). It is important to enhance students' English proficiency to keep a high standard of English and help to maintain the international trading power in Hong Kong (Education Commission, 1996, 1999) and English proficiency can help the understanding of the primary significant studies in many

disciplines, which are mostly written in English (Li, Leung, & Kember, 2001). In other studies (i.e., Aberson, Berger, Healy, Kyle, & Romero, 2000; Johnson, Aragon, Shaik, & Palma-Rivas, 2000; Lim, Kim, Chen, & Ryder, 2008; Wang & Newlin, 2000), the participating students did not learn in less familiar language.

Student's English proficiency helps students learn in classroom settings (Graham, 1987; Ho & Spinks, 1985). The researcher was not aware of any studies in the literature that would explore student's English proficiency in relation to students' learning in cyber education. Additionally, some previous studies (e.g., Ellis & Calvo, 2006; Fredericksen, Pickett, Shea, Pelz, & Swan, 2000; Garrison & Akyol, 2013, 2015; Hwang & Arbaugh, 2009; Swan, 2001) found that online learning is related to online guidance and online collaboration. This research furthered the understanding of this relationship in the context of Hong Kong higher education.

Exploration of the effect of the students' English proficiency, online instructor guidance, and online collaboration of students during online learning in this study involves the examination of the relationship between the elements in a community of inquiry (CoI) framework (Garrison, Anderson, & Archer, 2000) and the students' online learning. The CoI framework is a conceptual model that identifies three elements, namely, (1) cognitive presence, (2) teaching presence, and (3) social presence, as crucial pre-requisites for a successful online learning experience. The effect of the students' English proficiency on their on-line learning was explored by examining the relationship between the CoI's cognitive presence and students' on-line learning. The cognitive presence in this study contains the students' English ability to interact with the contents of the cyber education materials. Online instructor guidance corresponds to the CoI's teaching presence and online collaboration corresponds to the CoI's social presence. When examining the effect of online collaboration, the researcher focused on the interaction among the students regarding course content or medium of instruction topics.

The existing literature (e.g., Arbaugh, 2008; Ellis & Calvo, 2006; Garrison & Akyol, 2013, 2015; Hwang & Arbaugh, 2009; Swan, Day, Bogle, & Matthews, 2014) on online learning constructs or factors related to the CoI framework did not deal with the relative effects of the CoI's elements. This study attempted to look into these relative effects.

METHODOLOGY

In this research, correlation and multiple regression analyses were used to find the relationship between the predictor variables (i.e., the students' English proficiency, online instructor guidance, and online collaboration) and students' learning, which is reflected by their test scores obtained in Wong's (2008) quasi-experiment. The students' English proficiency could be measured by their English proficiency marks which were obtained by the highest International English Language Testing System (IELTS) scores or computing the equivalent scores for the highest Hong Kong public English examination grades achieved by the students based on the Hong Kong Examinations and Assessment Authority's 2007 and 2008 survey results on the equivalence between Hong Kong public English examination grades and the IELTS scores. The online instructor guidance could be operationalized by the number of relevant messages posted by the instructors and viewed by the students in the online discussion forum of the college's cyber education system. The online collaboration could be operationalized by the number of the students' relevant guidance messages posted and read by their peers in the discussion forum. Since the college's cyber education system had recorded which forum messages a system user read, a college student could check the number of his or her viewed forum messages.

The research was conducted at the college with the college's permission. At the beginning of the research, the researcher explained the importance, purpose, features, procedures, and scope of the research to the participants. The participants were requested to give informed consent by completing the consent form. The researcher, as an insider in this research, might have introduced informant bias (Mercer, 2007). To minimize informant bias, participants were assured of informant anonymity and ensured that researcher's role was independent. Besides, the researcher avoided forming the authority relationship (Cooper, 1993) by sampling the students taking the introductory IT course from the classes, which were not taught by the researcher. To ensure confidentiality, the researcher stored the research data in highly secure computer systems.

Data Collection

The researcher used stratified random sampling with proportional allocation (Weiss, 2012) to select 75 participating students from each of the three groups in Wong's (2008) quasi-experiment. The sample size $n = 75$ for each stratum was chosen for two reasons. First, this sample size facilitates further study of the students' perceived effect of the potential factors using multiple regression analysis. As proposed by Tabachnick and Fidell

(2013), the threshold for the sample size in multiple regression is $N > 50 + 8v$, where v is the number of predictor variables. As multiple regression analysis was used later and three predictor variables (i.e., student's English proficiency, online instructor guidance and online collaboration) were involved in the analysis, the researcher used the sample size 75, which is larger compared to the threshold $50 + 8 \times 3 = 74$. Second, this sample size was generated by a priori statistical power analysis using G*Power (Erdfelder, Faul, & Buchner, 1996). Given the 5% significance level ($\alpha = 0.05$), 90% statistical power, which is more stringent than 80% proposed by Cohen (1992b), and the desired effect size $f^2 = 0.065$ representing small to medium effect (Cohen, 1992a), the total sample size of 222 was generated in all three groups by G*Power for multiple regression analysis. In this regard, the sample size $n = 75$ in each group (that is, $75 \times 3 = 225$ in all three groups) is slightly larger than the G*Power-generated sample size of 222; thus, the study can be expected to yield small to medium effect sizes and 90% statistical power.

The participants were invited to complete the online questionnaire developed by the researcher for the purpose of this study. Some questions, starting from question number 11 of the online questionnaire, are shown in Appendix. However, the use of questionnaires can have a rather low response rate. As advised by Saunders, Lewis, and Thornhill (2012), the researcher met with the respondents, explained the purpose of collecting data through questionnaires, administered the questionnaires, and collected the completed questionnaires during the meeting in order to improve response rate. In addition, the researcher cross-checked the information in the questionnaires with the participants' accounts in the college's cyber education system to ensure that the participants filled the questionnaires correctly and honestly.

Analyses

Correlation analysis was performed using a Statistical Package for the Social Sciences version 17.0 (SPSS) to identify the potential factors by locating the variables that have a positive correlation with the students' test scores. The researcher also tested the significance of the correlation coefficient. Multiple regression analysis was also performed using SPSS to explore the combined effect of the three predictor variables on students' test scores. The researcher used both simultaneous multiple regression and sequential multiple regression, as they are useful in explanatory research to determine the extent to which the predictor variables influence the outcome variable (Keith, 2006).

Validity and Reliability

In this research, statistical conclusion validity and construct validity were examined. Statistical conclusion validity refers to the certainty with which a researcher can infer how two variables are related. Making inference about the relationship involves null hypothesis testing (Christensen, Johnson & Turner, 2014). In this study, the null hypothesis proposed no relationship between the independent variables (i.e., students' English proficiency, online instructor guidance, and online collaboration) and the dependent variable (i.e., students' learning as reflected by the students' test scores). The significance or probability values (p-values) generated by SPSS indicate whether the analytical result is statistically significant, and it can be used to determine whether the inference about the variables being related is valid.

Construct validity is the extent to which the construct is accurately measured in the study. This largely depends on the operationalization of construct. For this study, the three independent variables were operationalized quantitatively. Students' English proficiency was operationalized by the students' English proficiency marks. Like in Gerber, Grund, and Grote (2007), online instructor guidance was operationalized by counting the number of content-related and language-related messages posted by the instructors in the discussion forum, and online collaboration was operationalized by counting the number of content-related and language-related messages posted by students in the discussion forum. The dependent variable students' learning was measured by test scores obtained in Wong's (2008) quasi-experiment. Face validity is a form of construct validity. Face validity involves subjective perceptions of whether a measure covers the investigated construct. As Stangor (2015) stated, face validity is "the extent to which the measured variable appears to be an adequate measure of the conceptual variable" (p. 97). For example, there was face validity for measuring online instructor guidance - students having more guidance from the instructors in a discussion forum were more likely than the other students in that forum to view the instructors' content-related and language-related guidance messages. Another way to access construct validity is convergent validity (or called construct validity by Babbie (2014), which refers to "the degree to which a measure relates to other variables as expected within a system of theoretical relationships" (p. 156)). Convergent validity is obtained by examining the degree to which the operationalization converges on a similar operationalization. This validity can be evaluated using statistical procedures (Creswell, 2012). The learning effectiveness of the teaching methods, as measured by questions 12 to 14, could be compared with the participants' responses to question 18, and their

convergence could be measured. In addition, the data obtained from questions 15 to 17 of the questionnaire could be statistically compared with those obtained from the questionnaire question 19.

The researcher measured internal consistency reliability using Cronbach's (1951) coefficient alpha. Questions 12 to 17 of the questionnaire contains 5 similar statements measured on a 7-point Likert's (1932) scale ranging from "strongly agree" = 1 to "strongly disagree" = 7 for last 2 items while for the first 3 items, the scoring is reversed, ranging from "strongly agree" = 7 to "strongly disagree" = 1. Additional response option of "not available" was also included. The "not available" option, which means a particular statement is not applicable to a participant, is scored as 0. Internal consistency assesses whether similar statements yield similar scores, and it can be measured with Cronbach's coefficient alpha, which should ideally be above 0.7 (Nunnally, 1978). In addition, to ensure that the participants understood the questions and gave reliable answers, the researcher offered explanations, as needed, when the participants completed the questionnaire in the meetings.

RESEARCH FINDINGS

The demographics of the sample indicated that the respondents' ages ranged between 18 and 23, 95% of the respondents were Chinese, the remaining 5% were other Asians, and 100% of the respondents use English to learn in the college. This indicates that most respondents use Chinese in their daily lives and use the less familiar English to learn. In response to the question 18, most respondents (86.67%, 73.33%, and 86.67% in teaching methods 1, 2, and 3, respectively) ranked teaching method 1 as the most effective method and (88%, 76%, and 88% in teaching methods 1, 2, and 3 respectively) ranked teaching method 2 as the least effective learning method. In response to the questions 12, 13, and 14, the mean score on the seven items was computed (excluding 0 score for "not available" item). Table 1 shows that Cronbach's alphas α exceeded 0.7, meaning that the internal consistency reliability is acceptable (Nunnally, 1978). The highest mean score ($\sqrt$ -marked) emerged for question 12, indicating that teaching method 1 is the most effective learning method while the lowest mean score (s-marked) for question 13 indicated that teaching method 2 is the least effective method. These findings are consistent with survey results of questionnaire question 18 and Wong's (2008) findings.

Table 1 Mean Scores and α of the Questions 12, 13 and 14 of the Questionnaire

Teaching Method the Respondents were in	Questionnaire Question	Mean Score	Cronbach's Coefficient Alpha α
1	12	5.84 $\sqrt$	0.748
	13	3.69 s	0.867
	14	4.78 x	0.875
2	12	5.23 $\sqrt$	0.811
	13	3.25 s	0.898
	14	4.06 x	0.866
3	12	5.42 $\sqrt$	0.878
	13	3.49 s	0.893
	14	4.32 x	0.837

In Table 2, all correlation coefficients generated are positive and significant at 1% level. Comparatively, the students' English proficiency has a strong correlation (i.e., the largest $r = 0.609$, $r = 0.839$, and $r = 0.689$ in teaching methods 1, 2, and 3 respectively where r is the linear correlation coefficient), online instructor guidance has a medium correlation, and online collaboration has a weak correlation with the students' test scores. The correlation between each predictor variable and the test scores of students in teaching method 2 condition is the largest among the teaching methods.

Table 2. Comparisons of Strengths of Correlations between the Students' Test Scores and Each of Students' English Proficiency Marks, Online Instructor Guidance, and Online Collaboration in Teaching Methods 1, 2, and 3

Teaching Method	Correlation Coefficient between Test Scores and the Following Three Variables			Strength of Correlation
	Students' English Proficiency Marks	Online Instructor Guidance	Online Collaboration	
1	0.609	0.494	0.331	Weak
2	0.839	0.586	0.405	Strong
3	0.689	0.459	0.339	Medium
Strength of Correlation	Strong	Medium	Weak	

Simultaneous multiple regression was used to identify predictor variables that have the stronger or weaker effects on students' test scores in each teaching method. The investigator converted the standardized coefficients for different predictor variables to the same scale to facilitate comparison (Keith, 2006; Pallant, 2013). The standardized regression coefficient β represents the magnitude of effects in multiple regression. Following Keith's (2006) criteria used in a similar research on school learning and learning performance, the students' English proficiency, as shown in Table 3, has a very large effect ($\beta = 0.702$) while online instructor guidance and online collaboration have a moderate effect ($\beta = 0.214$ and $\beta = 0.173$ respectively) on the students' learning using teaching method 2.

Table 3 Magnitude of the Effects of Predictor Variables on the Students' Test Scores

Predictor Variables	Beta (β) in Teaching Method			Magnitude of Effect
	1	2	3	
Students' English Proficiency Marks	.480s	.702√	.578	large
Online Instructor Guidance	.256√	.214s	.242	moderate
Online Collaboration	.192√	.173s	.174	moderate

Note: √ - the largest influence among the three teaching methods; s - the smallest influence among the three teaching methods

By comparing different teaching methods, students' English proficiency has the largest effect (√-marked) on the students' learning when using teaching method 2 and smallest effect (s-marked) when using teaching method 1. Online instructor guidance has the largest effect (√-marked) on the students' learning when using teaching method 1 and smallest effect (s-marked) on the students' learning when using teaching method 2. Online collaboration has the largest effect (√-marked) on the students' learning when using teaching method 1 and smallest effect (s-marked) on the students' learning when using teaching method 2.

The adjusted R^2 indicates the combined effect of the predictor variables on the students' learning. Table 4 compares the different magnitudes of the combined effect in these three teaching methods. The adjusted $R^2 = 0.776$ indicates that the predictor variables have the strongest combined effect on the students' test scores when using teaching method 2. The adjusted $R^2 = 0.461$ indicates the smallest combined effect when using teaching method 1.

Table 4 Magnitude of Combined Effect of Predictor Variables on the Students' Test Scores

Teaching Method	Adjusted R ²	Magnitude of Combined Effect
1	0.461	Weak
2	0.776	Strong
3	0.550	Medium

In sequential multiple regression, the statistical significance and the magnitude of the effect of the predictor variables depend on the order in which the predictor variables are entered into the regression equation based on their perceived importance (Keith, 2006). In Table 5, the highest mean score ($\sqrt{\text{v}}$ -marked) showed up for question 15, indicating that students' English proficiency is the most important; the lowest mean score (s-marked) showed up for question 17, indicating that online collaboration is the least important. Table 5 also shows that Cronbach's alphas α exceeded 0.7, meaning that the internal consistency reliability is acceptable (Nunnally, 1978). These findings are in line with survey results of questionnaire question 19.

Table 5 Mean Scores and α of the Questions 15, 16 and 17 of the Questionnaire

Teaching Method the Respondents were in	Questionnaire Question	Mean Score	Cronbach's Coefficient Alpha α
1	15	5.85 $\sqrt{\text{v}}$	0.829
	16	4.21 x	0.891
	17	2.82 s	0.937
2	15	5.88 $\sqrt{\text{v}}$	0.798
	16	3.90 x	0.896
	17	2.29 s	0.885
3	15	5.44 $\sqrt{\text{v}}$	0.884
	16	3.96 x	0.806
	17	2.57 s	0.774

From these results, the researcher first entered the most important predictor variable, students' English proficiency marks, followed by online instructor guidance and finally online collaboration into the sequential regression. The SPSS-generated model 1 includes the first predictor variable, students' English proficiency marks entered, model 2 includes students' English proficiency marks and online instructor guidance while model 3 contains all the three predictor variables. Based on the Beta (β) values listed in the SPSS-generated

coefficients tables and Keith's (2006) criteria, Table 6 contains three tables that compare the magnitude of effects among the predictor variables in the three models. It shows the students' English proficiency has the largest effect on the students' test scores in the models.

Table 6 Magnitude of the Effects of Predictor Variables on the Students' Test Scores in the Three Models of Teaching Methods 1, 2, and 3

Model 1				
Predictor Variables	Beta (β) in Teaching Method			Magnitude of Effect
	1	2	3	
Students' English Proficiency Marks	.609 s	.839 $\checkmark$	.689	large
Model 2				
Predictor Variables	Beta (β) in Teaching Method			Magnitude of Effect
	1	2	3	
Students' English Proficiency Marks	.491 s	.722 $\checkmark$	.605	large
Online Instructor Guidance	.302 $\checkmark$	.260 s	.268	moderate
Model 3				
Predictor Variables	Beta (β) in Teaching Method			Magnitude of Effect
	1	2	3	
Students' English Proficiency Marks	.480 s	.702 $\checkmark$	.578	large
Online Instructor Guidance	.256 $\checkmark$	.214 s	.242	moderate
Online Collaboration	.192 $\checkmark$	.173 s	.174	moderate

Note: $\checkmark$ - the largest influence among the three teaching methods; s - the smallest influence among the three teaching methods

DISCUSSION AND CONCLUDING REMARKS

The analytical results showed that the three predictor variables (i.e., the students' English proficiency, online instructor guidance, and online collaboration) correlate positively with the students' learning, as reflected by their test scores. The positive correlations revealed that these variables potentially influence the students' learning. These results support the finding that the elements in the CoI framework proposed by Garrison, Anderson, and Archer (2000) may contribute to students' online learning.

In addition, strong correlations emerged between the students' English proficiency and their learning, medium correlation emerged between online instructor guidance and the students' learning, and weak correlation emerged between online collaboration and the students' learning. The strongest correlation emerged between each predictor variable and the students' learning using teaching method 2, that is, cyber education without attending lectures and tutorials in classrooms. These results indicate that students' English proficiency is a crucial potential factor and the influence of these variables is stronger in Hong Kong bilingual cyber education. Thus, the finding that teaching method 2 in Hong Kong bilingual cyber education is less effective in learning than teaching method 1 (classroom teaching) in Wong's (2008) study differs from other similar studies mainly due to the stronger influence of the variables, especially students' English proficiency, on students' online learning.

Furthermore, the combined effect of the predictor variables on the students' learning was significant. The students' English proficiency exhibits the largest effect while online instructor guidance and online collaboration have a moderate effect on their learning. When comparing different teaching methods, the students' English proficiency had the largest effect on the students' learning in cyber education without attending lectures and tutorials in classrooms (teaching method 2). These results provide empirical evidence to support the stronger effect of the CoI's cognitive presence, as reflected by the students' English proficiency on the students' online learning.

RESEARCH LIMITATIONS AND FUTURE RESEARCH

This study could not confirm the cause-effect relationship between the three variables (i.e., the students' English proficiency, online instructor guidance and online collaboration) and the students' learning. This limitation provides implications for further research in which qualitative interviews could be used as a follow-up to confirm any cause-effect relationship, obtain the participants' views on their experiences with using cyber education, and learn the ways to develop effective learning in cyber education.

Another limitation is the problem with generalizing the findings in this study to other courses (e.g., language training, business management, and psychology courses) in other similar bilingual or multi-lingual higher education contexts. Although the researcher collected survey data from a relatively large sample size [$N = 225$ (75 participants $\times$ 3 teaching methods) students], the findings of this study may not be applicable to other larger sample cases. This limitation suggests that future research should replicate this study to

other courses in other similar bilingual or multi-lingual higher education contexts.

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APPENDIX

11. In the quasi-experiment, please indicate the number of guidance messages in the discussion forum, excluding the salutation, greetings, administrative messages, messages not related to guidance (e.g. Hi, How are you?, I am not interested in this course, the deadline of assignment 1 is...). The guidance message includes the message about course content, explanation and clarification. The guidance message also includes the message guided you in the use of English such as explaining IT terms, correcting the use of English words, sentences, phrases, showing the steps of doing things, ...

On-line Discussion Forum

The number of guidance messages from INSTRUCTORS viewed by me in the discussion forum is _____.

The number of guidance messages from other STUDENTS viewed by me in the discussion forum is _____.

For each item in questions 12-17, please indicate your view by choosing ONE of the following options:

a. Strongly agree	- means that I strongly agree with the specified statement.
b. Agree	- means that I agree with the specified statement.
c. Agree somewhat	- means that I agree somewhat with the specified statement.
d. Neutral	- means that I am neutral with the specified statement.
e. Disagree somewhat	- means that I disagree somewhat with the specified statement.
f. Disagree	- means that I disagree with the specified statement.
g. Strongly disagree	- means that I strongly disagree with the specified statement.
h. Not available	- means that the specified statement is not available (NA) to me.
-

12. Please indicate your views on **classroom teaching** as follows:

(These questions are about your views on the learning effectiveness of classroom teaching for the introductory IT course.)	NA							
I have found that the materials (e.g. handouts, notes, assignments, tests, cases and projects) conducted by the teachers in class are effective for my learning.	a	b	c	d	e	f	g	h
Teaching and learning activities in class (e.g. teachers' explanation, demonstration, discussions, case studies and projects) can help my learning effectively	a	b	c	d	e	f	g	h
I have found that I have effectively achieved knowledge, concepts or ideas from the teachers in class.	a	b	c	d	e	f	g	h
I have difficulty in learning effectively in class.	a	b	c	d	e	f	g	h
I have found the teaching materials and activities in class useless for my effective learning	a	b	c	d	e	f	g	h

13. Please indicate your views on on-line education with no lectures and no tutorials as follows:

(These questions are about your views on the learning effectiveness of on-line education only with no lectures and no tutorials for the introductory IT course.)	NA							
I have found that the on-line materials (e.g. handouts, notes, assignments, tests, cases and projects) are effective for my learning.	a	b	c	d	e	f	g	h
The on-line activities (e.g. explanation, demonstration, discussions, case studies and projects for the on-line materials) can help my learning effectively	a	b	c	d	e	f	g	h
I have found that I have effectively achieved knowledge, concepts or ideas from the on-line materials.	a	b	c	d	e	f	g	h
I have difficulty in learning effectively in on-line education with no lectures and no tutorials.	a	b	c	d	e	f	g	h
I have found the materials and activities in on-line education useless for my effective learning	a	b	c	d	e	f	g	h

14. Please indicate your views on on-line education with tutorials but no lectures as follows:

(These questions are about your views on the learning effectiveness of on-line education with instructors' guidance in tutorials only but without lectures for the introductory IT course.)	NA							
I have found that the on-line materials (e.g. handouts, notes, assignments, tests, cases and projects) and the materials presented by instructors in tutorials are effective for my learning.	a	b	c	d	e	f	g	h
The on-line activities with instructors' guidance in tutorials (e.g. instructors' explanation, demonstration, discussions, case studies and projects for the on-line materials) can help my learning effectively	a	b	c	d	e	f	g	h
I have found that I have effectively achieved knowledge, concepts or ideas from the on-line materials with the help from instructors in tutorials.	a	b	c	d	e	f	g	h
I have difficulty in learning effectively in on-line education even with the guidance from instructors in tutorials.	a	b	c	d	e	f	g	h
I have found the materials and activities in on-line education and instructors' guidance in tutorials useless for my effective learning	a	b	c	d	e	f	g	h

15. Please indicate how English as a medium of instruction affects your learning as follows:

(These questions are about how English medium of instruction affects your learning for the introductory IT course.)	NA							
I can understand the materials (e.g. handouts, notes, assignments, tests, cases and projects) in class/on-line education in English.	a	b	c	d	e	f	g	h
Presentation in English such as step-by-step instructions and explanations in class/on-line education can help my learning	a	b	c	d	e	f	g	h
The teaching and learning activities in English in class/on-line education are useful for my learning.	a	b	c	d	e	f	g	h
I have difficulty in learning the materials in English in class/on-line education.	a	b	c	d	e	f	g	h
Using English as a medium of instruction makes my learning hard.	a	b	c	d	e	f	g	h

16. Please indicate how instructors' guidance in discussion forum helps your learning as follows:

(These questions are about how instructors' guidance in discussion forum in on-line education system helps your learning for the introductory IT course.)	NA							
There are sufficient opportunities for me to ask questions/raise issues and obtain help from the instructors through the discussion forum.	a	b	c	d	e	f	g	h
The comments, explanations and feedback from the instructors on my coursework in the on-line discussion forum are helpful to my learning.	a	b	c	d	e	f	g	h
I can extend my learning in the course through discussing with instructors on the on-line discussion forum.	a	b	c	d	e	f	g	h
I have found the messages posted by instructors in discussion forum useless for my learning.	a	b	c	d	e	f	g	h
I think I can learn by myself, so the instructors' guidance in discussion forum is unnecessary.	a	b	c	d	e	f	g	h

17. Please indicate how students' collaboration in discussion forum helps your learning as follows:

(These questions are about how students' collaboration in discussion forum in on-line education system helps your learning for the introductory IT course.)	NA							
It is easy for me to ask questions/raise issues and obtain help from the students through the discussion forum.	a	b	c	d	e	f	g	h
The comments, explanations and feedback from other students on my coursework in the on-line discussion forum are helpful to my learning.	a	b	c	d	e	f	g	h
I can extend my learning in the course through discussing with other students on the on-line discussion forum.	a	b	c	d	e	f	g	h
I have found the messages posted by other students in discussion forum useless for my learning.	a	b	c	d	e	f	g	h
I think I can learn by myself, so the other students' help/guidance in discussion forum is unnecessary.	a	b	c	d	e	f	g	h

For questions 18-19, please indicate your ranking of the teaching methods/variables by putting the following rank number on the boxes provided e.g. 1:

1. The most helpful	- means that the specified teaching method/variable is the most helpful to me.
2. Helpful	- means that the specified teaching method/variable is the helpful to me.
3. The least helpful	- means that the specified teaching method/variable is the least helpful to me.

18. In your opinion, what are the ranks for the following three teaching methods?

- ☐ Teaching method 1 - classroom teaching
(In this method, students attend lectures in classroom and are taught by teacher. Instructor's guidance is available in tutorials. On-line discussion forum is available.)
- ☐ Teaching method 2 – on-line learning with NO LECTURES and NO TUTORIALS
(In this method, students learn independently by reading on-line materials by themselves and they could learn through peers and instructors in the discussion forum.)
- ☐ Teaching method 3 – on-line learning with TUTORIALS but NO LECTURES
(In this method, students learn independently by reading on-line materials by themselves and obtain instructor's guidance in tutorials. They could learn through peers and instructor in the discussion forum.)

19. In your opinion, what are the ranks for the following three variables/factors related to learning effectiveness in on-line education?

- ☐ Students' own language proficiency
- ☐ Instructors' guidance (or help from instructors) in discussion forum
- ☐ Students' collaboration (or help from students) in discussion forum