

## Use of Interactions in E-learning: A Study of Undergraduate Courses in Thailand

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### Abstract

*In the traditional classroom, the class attendance is accepted to be an important learning factor for students. Compared to e-learning, the use of interactions is considered to be a major factor in instruction and learning via computer-mediated communication (CMC) environment (Pena-Shaff et al., 2001). Literature in the field of distance education has classified the use of interactions into five groups. However, studies based on such literature but conducted in different context are still needed. The purpose of this paper is to investigate common characteristics of the use of interactions (UI) from the case of e-learning in Thailand. An exploratory factor analysis is used to examine the common components of the use of interactions in this context. The result reveals that UI is composed of three main factors, namely, human-to-human interactions, human-to-non-human interactions, and access duration. This outcome unveils the perception of the use of interactions, which reflects the student's actual use of e-learning. It also gives better understanding to the e-learning administrators and instructors about the pattern of interactions from the student perspective. Implications of the study are also included.*

### Introduction

The surge of information technology and an increasing competitive environment in higher education compel a drive for university lecturers to enhance both their pedagogical methods and student learning. Many technological products have been adopted for this purpose including e-learning. E-learning has been said that it provides more flexibility to users in time- and place-independence as well as other dimensions of access to learning (Arbaugh, 2000b, 2002; Oubenaissa et al., 2002; McGorry, 2003).

The application of e-learning into instruction is varied across courses in universities. It depends on the objectives and existing physical, financial and managerial environments each university faces (Siritongthaworn and Krairit, 2004). However, most of the courses in universities in Thailand are taught mainly in the classroom. Some of them adopt e-learning to supplement the face-to-face instruction for certain purposes (Siritongthaworn and Krairit, 2004). It is interesting to study e-learning in the context under this adaptation, e-learning as a supplementary tool to in-class instruction, where more investigation is needed.

The use of interactions is concerned as an important factor in teaching and learning

via computer-mediated communication (CMC) settings (Pena-Shaff et al., 2001). It could be comparable to the contact point where the knowledge transfers to student's cognition either from an instructor during class lecture, or from course materials during time studied (Bransford et al., 1999). It is necessary not only for the role of obtaining content, but also those of exchanging opinion as well as engaging student into active and collaborative learning (Alavi et al., 1995; Leidner and Jarvenpaa, 1995; Mortera-Gutierrez, 2002). Many studies claimed that the use of interactions in the online learning settings has direct relationship to the student achievement and attitude to the course taken (Chau, 1996; Mortera-Gutierrez, 2002; Opitz, 2002; Glenn et al., 2003). However research to investigate the framework and implication of interactions at a distance, including the Internet-based setting is still needed (Arbaugh, 2000a; Bork, 2002; Jung et al., 2002; Mortera-Gutierrez, 2002; Gao and Lehman, 2003).

This paper attempts to study the common characteristics of the use of interactions during student's access on e-learning in the context of Thailand, where e-learning is embarked for supplementing the classroom instruction. The following part is the theoretical background for building up framework and developing the measure of UI in the context. The later sections are composed of the research methodology, data analysis, result, and implication.

### **Theoretical Background**

Use of interactions is accepted as one of the key elements in learning in distance education (Jung et al., 2002; Mortera-Gutierrez, 2002) and differentiating distance education from traditional face-to-face instruction (Mortera-Gutierrez, 2002). The major difference between these two instructional methods lies on the level of intimacy and immediacy creating the social presence of the instructor and peers during

instruction (Gunawardena, 1995; Chidambaram, 1996; Sia et al., 2002). The face-to-face classroom provides a higher chance to deliver the favorable intimacy and immediacy to learners than the existing e-learning does due to the presence of paraverbal (e.g. tone of voice, inflection, voice volume) and nonverbal (e.g. eye movement, facial expression, hand gestures, body language) cues (Gunawardena, 1995; Warkentin et al., 1997).

Studies examining on the framework of interaction could be briefly summarized as following. Moore (1989) proposed three types of interaction: learner-content, learner-teacher, and learner-learner instructions. Kawachi (2003) inserted the directionality of these interactions to be content-to-student, teacher-to-student, and student-to-and-from-other-students. In the consecutive year after Moore's, Hillman et al. (1994) added the fourth type of interaction: learner-interface interaction. It was verified that a student in a distance education environment has to interact with a medium or technologies used to deliver instruction. A certain extent of technological proficiency is required for interacting with the technology in an e-learning environment (Kawachi, 2003). Furthermore, in such an environment that each student is treated as a distinct individual, Bork (2002) propounded that student's language and culture are another aspects in interacting with the interface.

Sutton (2001) defined the fifth form of interaction as "vicarious interaction", which is a derivative form of interaction distinct from the four previous items. It takes place when a student does not participate directly but actively observes and cognitively processes on both interactions between the instructor and other students, and those between two of or among other students during the instructional delivery. Such a student is called a vicarious interactor, who assimilates the cognitive outcome from these interactions of others. Nonetheless, a study

of the effect of vicarious interaction found no evidence that the vicarious interactions contribute to the improvement in learning quality of students (Kawachi, 2003).

Interaction is also categorized in other different ways. Bates (1995) classified interaction regarding to the time and context of interaction to be synchronous vs. asynchronous, and personal vs. social interaction. Moller (1998) categorized three types of virtual community in the web-based instruction (WBI) context, based on the interaction characteristics, to be academic community (interactions between learners and instructors), intellectual community (interactions among peers to accomplish collaborative work), and interpersonal community (interactions promoting the interpersonal community). Moller's classification of interaction was adopted by Jung et al. (2002) in studying the effects of three interaction types on learning, satisfaction, participation, and attitude towards online learning in a WBI environment.

Schwier and Misanchuk (1993) suggested a descriptive taxonomy of multimedia interaction based on levels of interaction, functions used, and transactions. According to these criteria, interaction is classified as reactive, proactive, and mutual interactivity. Gao and Lehman (2003) adopted Schwier's taxonomy in investigating the effects of learning materials on achievement and motivational perceptions, with different interaction levels, in a WBI environment. The results revealed that the achievement of students in both the reactive and proactive groups are outperformed those controlled by receiving no interaction.

Kanuka and Anderson (1998) revealed that interpersonal or social interaction between learners and instructor could be attributed to learner satisfaction and frequency of interaction in WBI. Moreover, significant time engaged in social interaction was also claimed to contribute to social-

cognitive process among learners in the online community. Hannafin (quoted in Gao and Lehman, 2003) supported the time dimension of interaction that the qualitative approach in the interaction research usually refers to some external factors which learners coping during instructional delivery including frequency, interval, and number of questions.

## **Methodology**

### ***1 Case Selection***

The students, who experience in a course which e-learning is used as a supplementary tool to the main classroom teaching, are our target respondents. In order to access to the certain respondents, the criteria in selecting the courses to be investigated are outlined as following.

1. The main instruction is conducted in the classroom basis. E-learning takes a supplementary role in either all or partial instruction of the course. E-learning here restricts to only the asynchronous web-based instruction.
2. There is a clear and in-active evidence of online two-way communications between both instructor to learners, and learner to learners in the course website to enhance learning.
3. At least, two benefits from e-learning—resource depository and out-of-class communication—are expected from the course selected. The other benefits, such as modes of homework submission, course-on-demand, etc., could be in addition, but not obliged.

The investigation started from meeting with some practitioners in educational technology field in universities. The suggestion to the tentative courses or universities was received. The observation

to the recommended courses was made in the courses where access was allowed. Interviews with the relevant course instructors were made to examine if the course's characteristics are met with the requirement. The investigation had been done between September and December 2003 covering eleven universities in Bangkok Metropolitan and provincial areas. Four undergraduate courses from three universities were finally selected.

## 2 Scale Construction

Observations for the content of selected course websites were done with allowance of

the corresponding instructors. The interaction characteristics of the selected courses were outlined based on the content from literature. Only the characteristics that were found in common among four cases are included. Questionnaire items were adapted from the literature of five types of interaction, firstly proposed by Moore (1989). The measurement of interaction tends to assess in the dimensions of frequency and interval. Ten key questionnaire items were adopted from this stage as Table 1 shown below.

**Table 1 Main items measuring interaction on e-learning**

<i>Interactions</i>		<i>Items</i>
Learner-interface	1	UI1 The average number of times you login into the course web page (times per week).
	2	UI2 Maximum time spent online on this course page each time you logged-in (hours).
	3	UI3 Time spent online on this course page in average each time you logged-in (hours).
Learner-content	1	UI4 The number of times you access to read, see or download course materials of the course through e-learning system.*
	2	UI5 The number of times you access to read, see or download additional resources of the course through e-learning system.*
Learner-instructor	1	UI6 The number of times you ask or discuss with the instructor through course web board.
Learner-learners	1	UI7 The number of postings of the issues you don't clearly understand or the issues you'd like to share with the others on the course web board.
	2	UI8 The number of postings you obtain feedbacks from your friends on the main course web board.
	3	UI9 The number of times you answer, discuss, or propose ideas for the issues posted by the others on the main course web board.
Vicarious	1	UI10 The number of times you access to (only) read the messages posted by others in the course web board.

\* *The item assessed according to the list of content provided in a specific e-learning course.*

### 3 Data Collection

Interviews with all four instructors and twenty students were made before the survey. The objectives of interviews were to validate the measure, and to understand the actual behavior of the students in interpreting the results. The feedback confirmed the measure to be content-valid.

Respondents of the survey are undergraduate students undertaking four selected courses. These courses are in three areas of Humanities including Arts History, English Language, and Thai Language. The respondent's educational majors are in three areas of arts: Interior Design, English Language, and Communication Arts. They are at the age between 18-21 years old. Every course contains approximately 30-40 students, except one with 60 students. The

total number of respondents is 159. The questionnaires were distributed and collected on the last class of each course during February and March 2004, which were then processed to statistical analysis procedures.

### Results and Discussions

Table 2 presents primary descriptive statistics of data. Analysis was performed using the SPSS statistical application. Two main statistical diagnostic measures used in this study are factor analysis and reliability coefficient. In factor analysis, principle components analysis with orthogonal varimax rotation is used for factor extraction. The factors that account for adequately large variance are presented in a more meaningful configuration.

**Table 2 Descriptive Statistics of data**

	<i>N</i>		<i>Mean</i>	<i>Std. Deviation</i>
	<i>Valid</i>	<i>Missing</i>		
UI1	152	7	1.6842	1.04483
UI2	157	2	1.1529	1.02636
UI3	157	2	1.0637	.90357
UI4	157	2	1.0815	.86747
UI5	157	2	.8772	.83422
UI6	149	10	.9060	1.44887
UI7	151	8	.5563	1.08711
UI8	145	14	.6483	1.34645
UI9	150	9	.8467	1.71741
UI10	131	28	1.6489	2.35641

**Table 3 Rotated Component Matrix and Cronbach's Alpha of UI items**

	<i>Component</i>		
	<i>1</i>	<i>2</i>	<i>3</i>
UI2			<b>.863</b>
UI3			<b>.678</b>
UI1		<b>.727</b>	
UI4		<b>.793</b>	
UI5		<b>.834</b>	
UI6	<b>.839</b>		
UI7	<b>.857</b>		
UI8	<b>.917</b>		
UI9	<b>.898</b>		
UI10	<b>.670</b>		
<i>Rotation Sums of Squared Loadings:</i>			
<i>Total (Eigen Values)</i>	3.763	2.078	1.399
<i>% of variance</i>	37.629	20.784	13.995
<i>Cumulative %</i>	37.629	58.413	72.407
<i>Cronbach's alpha</i>	.8763	.7031	.5831

*Extraction Method: Principal Component Analysis.*

*Rotation Method: Varimax with Kaiser Normalization*

*- Rotation converged in 5 iterations*

*Note: the factor values lower than 0.400 are not presented.*

Another statistical analysis instrument is reliability coefficient, Cronbach's alpha (Cronbach, 1951) to estimate the scale consistency among items in the group (Hair et al., 1998). The Cronbach's alpha is generally acceded upon the level of 0.70, albeit it is acceptable at 0.60 in exploratory research (Hair et al., 1998). Table 3 illustrated the factors extracted from factor analysis and the Cronbach's alpha from reliability analysis of the data.

Factor analysis loaded ten questionnaire items into three components. Item UI6-UI10, UI1 and UI4-UI5, and UI2-UI3 form Factor 1, 2, and 3 respectively. These factors contribute to the explanation in UI variable 72.41% of total variance. Internal consistency, represented by Coefficient Alpha, of all items is as much as 0.8408. It reports an existence of cohesive internal relationships of all measurement items in representing UI.

The first component represents the most contributory element to UI at a figure of

37.63% of total variance explained. It signifies the group of items measuring interactions between learner and instructor (L2I), learner and learners (L2L), and vicarious interaction. In other words, it delineates the interaction between human and human, or human-to-human interaction. The result shows that the respondents perceive all types of interaction with human as one factor they exposed during e-learning use. Alpha value of this factor is .8763 representing a high internal consistency of this component.

UI could be explained by the second factor 20.78 % of the total variance in this study. The items under this group depict the interactions between learner and interface (L2IF), and the learner and content (L2C). This provides us an insight that the respondents perceive items under this group as one factor: the interaction between human and non-human, or human-to-non-human interaction. The reliability analysis reports a .7031 alpha value, which is over the

acceptable criterion.

The last set consists of two items (UI2, UI3). It conveys an approximate 14.00 % of total variance in UI explanation. This construct typifies the duration of accessing on e-learning, which is another dimension clearly distinguished from the previous two factors. This is consistent to Kanuka and Anderson (1998) that time engaged in social interchange could contribute to the social-cognitive processes among participants in the online forum. The alpha value of this dimension is quite low ( $= .5831$ ) owing to the very limited number of items (two). However, it is quite close to the acceptable level in the exploratory research (0.60) as discussed previously. Moreover, Nunnally supported that, for early stages of basic research, reliabilities of .50 to .60 are considered sufficient (quoted in Churchill, 1979). These reasons could justify this dimension acceptable.

Three factors loaded from UI items help us understand the pattern of interactions used by students. Although the items are not extracted into five groups according to five types of interaction (Moore, 1989; Hillman et al., 1994; Sutton, 2001), it portrays the student's viewpoint, which does not resemble the instructor or knowledge provider perspective. In this context, students pay more respect on class attendance, which is considered to be their main instructional delivery method. Interactions between L2I and L2L including vicarious interaction are mostly done on face-to-face contact, either in-class or out-of-class, which is more convenient than online communication. This could be the reason the online communication, regardless of to whom, is perceived to be one factor. In other words, this factor is viewed as after-class or out-of-class communications.

Even though the content on e-learning provides students with extended learning experiences, students usually consider the content being taught in the classroom as a

higher priority concerned. Content in e-learning is viewed as an additional, but not compulsory, source of learning experience. For the interface aspect, the student respondents agree during the interview that e-learning is so user-friendly that they have no problem in interacting with the technology. The interface simply seems to be an exit that everyone passes through before accessing e-learning. They interact with both content and interface with less awareness of active learning. This could be the reason that they perceive these two types of interaction (L2C and L2IF) as one factor representing human-to-non-human interaction. It brings them about content and learning experiences provided in the systems.

The last factor concerns the time duration of access. It is a dimension of interaction separated from the frequency aspect inhibited in the prior two factors as discussed in the earlier paragraph.

### **Conclusions and Implications**

This paper investigates the student's use of interactions (UI) during e-learning access. E-learning in this context is used to supplement the classroom instruction. A survey of UI was conducted and the data was loaded into three dimensions: human-to-human interaction, human-to-non-human interaction, and access duration. It could be implied that students perceived the interaction on e-learning in three distinct concerns: means of out-of-class communication, channel to learning experiences, and time to spend on e-learning.

E-learning instructors should be aware of the student's perception of UI in designing course activities. One main activity is communication within the learning community using e-learning facilities. Instructor should take an important role in creating conversation online either synchronously or asynchronously. The idea is to start with friendly, interesting,

entertaining, and informal atmosphere before developing to be more cohesive feeling and higher in a sense of community. Moreover, e-learning infrastructure should be equipped at an adequate level so that everyone feels convenient to communicate.

The next dimension of interaction is a channel to learning experiences in the mode of human-to-non-human. In addition to user friendliness, design of hypertext or hyperlink could help create flexibility in accessing to the content. The chapter designed in form of small, but related, objects could assist learner who likes to learn non-linearly.

Time spent by student on each chapter should be a factor consistently controlled in designing an e-learning module. Furthermore, it should not take longer than the period that an individual can concentrate on, e.g. not longer than two hours, etc., per session or chapter. The time spent on e-learning too long may not bring about learning experiences but stress and fatigue.

### Suggestions for Future Research

Future research should cover more courses in the sample due to more available of technology in the future. Moreover, the course activities leading to more varied types of interaction on learning should be investigated. An identical research where program of study or discipline of course is a control variable should be conducted to see if there is any difference in the result.

### References

- Alavi, M., Wheeler, B. C., and Valacich, J. S. 1995. "Using IT to reengineer business education: An exploratory investigation of collaborative telelearning." *MIS Quarterly* 19 (3):293-312.
- Arbaugh, J. B. 2000a. "How classroom environment and student engagement affect learning in Internet-based MBA courses." *Business Communication Quarterly* 63 (4):9-26.
- . 2000b. "Virtual classroom characteris-
- tics and student satisfaction in Internet-based MBA courses". *Journal of Management Education* 24 (1):32-54.
- . 2002. "Managing the on-line classroom: A study of technological and behavioral characteristics of web-based MBA courses". *Journal of High Technology Management Research* 13 (2):203-223.
- Bates, T. 1995. *Technology, Open Learning and Distance Education*. London: Routledge.
- Bork, A. 2002. "Interactive learning – interactive learning: Twenty years later". *Contemporary Issues in Technology & Teacher Education* 2 (4):605-611.
- Bransford, J. D., Brown, A. L., and Cocking, R. R., eds. 1999. *How People Learn: Brain, Mind, Experience, and School*. Washing D.C.: National Academy Press.
- Chau, P. Y. K. 1996. "An empirical assessment of a modified technology acceptance model." *Journal of Management Information Systems* 13 (2):185-204.
- Chidambaram, L. 1996. "Relational development in computer-supported groups". *MIS Quarterly* 20 (2):143-163.
- Churchill, G. A. 1979. "A paradigm for developing better measures of marketing constructs". *Journal of Marketing Research* 16 (1):64-73.
- Cronbach, L. J. 1951. "Coefficient alpha and the internal structure of tests". *Psychometrika* 16:297-334.
- Gao, T., and Lehman, J. D. 2003. "The effects of different levels of interaction on the achievement and motivational perceptions of college students in a web-based learning environment". *Journal of Interactive Learning Research* 14 (4):367-386.
- Glenn, L. M., Jones, C. G., and Hoyt, J. E. 2003. "The effect of interaction levels on student performance: A comparative analysis of web-mediated versus traditional delivery". *Journal of Interactive Learning Research* 14 (3):285-299.
- Gunawardena, C. N. 1995. "Social Presence Theory and implications for interaction and collaborative learning in computer.

- conferences". *International Journal of Educational Telecommunications* 1 (2):147-166.
- Hair, J. F., Anderson, R. E., Tatham, R. L., and Black, W. C. 1998. *Multivariate Data Analysis*. 5th ed. Upper Saddle River, New Jersey: Prentice-Hall.
- Hillman, D. C. A., Willis, D. J., and Gunawardena, C. N. 1994. Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education* 8 (2):30-42.
- Jung, I., Choi, S., Lim, C., and Leem, J. 2002. Effects of different types of interaction on learning achievement, satisfaction and participation in web-based instruction. *Innovations in Education and Teaching International* 39 (2):153-162.
- Kanuka, H., and Anderson, T. 1998. Online social interchange, discord, and knowledge construction. *Journal of Distance Education* 13 (1):57-74.
- Kawachi, P. 2003. Vicarious interaction and the achieved quality of learning. *International Journal on E-Learning* 2 (4):39-45.
- Leidner, D. E., and Jarvenpaa, S. L. 1995. The use of information technology to enhance management school education: A theoretical view. *MIS Quarterly* 19 (3):265-291.
- McGorry, S. Y. 2003. Measuring quality in online programs. *Internet and Higher Education* 6 (2):159-177.
- Moller, L. 1998. "Designing communities of learners for asynchronous distance education". *Educational Technology Research and Development* 46 (4):115-122.
- Moore, M. G. 1989. Three types of interaction. *The American Journal of Distance Education* 3 (2):1-6.
- Mortera-Gutierrez, F. 2002. Instructor interactions in distance education environments. *Journal of Interactive Learning Research* 13 (3):191-209.
- Opitz, C. 2002. Online course accessibility: A call for responsibility and necessity. *Educational Technology Review* 10 (1):81-105.
- Oubenaissa, L., Giardina, M., and Bhattacharya, M. 2002. Designing a framework for the implementation of situated online, collaborative, problem-based activity: Operating within a local and multi-cultural learning context. *International Journal on E-Learning* 1 (3):41-46.
- Pena-Shaff, J., Martin, W., and Gay, G. 2001. An epistemological framework for analyzing student interactions in computer-mediated communication environments. *Journal of Interactive Learning Research* 12 (1):41-68.
- Schwier, R. A., and Misanchuk, E. 1993. *Interactive multimedia interaction*. Englewood Cliffs, NJ: Educational Technology Publications.
- Sia, C. L., Tan, B. C. Y., and Wei, K. K. 2002. Group polarization and computer-mediated communication: Effects of communication cues, social presence, and anonymity. *Information Systems Research* 13 (1):70-90.
- Siritongthaworn, S., and Krairit, D. 2004. E-learning technology adaptation: Cases of universities in Thailand. Paper read at PICMET'04 (Portland International Conference on Management of Engineering and Technology) Symposium on 'Innovation Management in the Technology-Driven World', Jul 31-Aug 4, 2004, at The Ritz-Carlton Hotel, Seoul, Korea.
- Sutton, L. A. 2001. The principle of vicarious interaction in computer-mediated communications. *International Journal of Educational Telecommunications* 7 (3):223-242.
- Warkentin, M. E., Sayeed, L., and Hightower, R. 1997. Virtual teams versus face-to-face teams: An exploratory study of a Web-based conference system. *Decision Sciences* 28 (4):975-996.