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A Proposed Model for Online Project Based Collaborative Learning: Expert Review

Sharifah Nadiyah Razali[1], Faaizah Shahbodin[2] , Gede Pramudya Ananta[3]

[1,2,3]Faculty of Information and Communication Technology,
University of Technical Malaysia Melaka,
Melaka, Malaysia.
shnadiyah@yahoo.com; faaizah@utem.edu.my

***Abstract*: Interest in collaboration is a natural outgrowth of the education trend towards active learning. Many researchers have found that collaborative learning improves academic performance, promotes soft skills development (i.e., communications, collaboration, problem-solving and critical thinking skills), and increases satisfaction in the learning experience. Nevertheless, several studies have reported the complete opposite. In that respect, based on previous findings, three factors and nine elements have been identified from the literature. The purpose of this study is to measure the interrater agreement between nine (9) experts. Findings from this study show that all experts agreed with all of the factors and elements that produce effective Online Collaborative Learning. This study also proposes an Online Project-Based Collaborative Learning model. This model is currently in a conceptual phase and requires significant development before it can be used to gather data. Therefore, during the next stage of this study, a prototype will be designed and developed based on the proposed model.**

***Keywords*:** Collaborative Learning, Online Collaborative Learning, Interrater Agreement.

I. Introduction

In the 21st century, educators are utilising emerging technologies to develop not only knowledge of graduates, but also their soft skills in order to enhance their competencies that meets employers' requirements. Technology can be used to encourage learning process, support communication setting, assess learning activities, manage resources and create learning materials. Although technology is seen as an important enabler for improving student-learning outcomes; to get the greatest value from technology, best practices of learning design are required. Collaborative learning has been proven in promoting soft skills development. Previous work result, [1] indicated that most of the lecturers at Malaysian Polytechnic had implemented Collaborative Learning approach, however the feedback from employers that students lack the soft skills. This shows that collaboration does not happen naturally in a group.

The benefits of collaboration in learning have been proven by Social Constructivism [2]. According to [3], learning tends to be most effective when students are in the position to work collaboratively in expressing their thoughts, discussing and challenging ideas with others, and working together towards a group solution to the given problem. Zhu [4] defines Collaborative Learning as a social interaction involving the acquisition and sharing of experience or knowledge amongst learners and teachers. Collaborative learning, which in an online environment is typically referred to as online teams or online groups, refers to instructional activities for getting students to work together online to achieve common educational goals. Interest in collaboration is a natural outgrowth of the trend in education toward active learning, whereby students become involved in constructing their own knowledge through discovery, discussion, and expert guidance.

Many published reports have outlined the advantages of collaborative learning, suggesting that it improves academic performance, promotes soft skills development (communication, collaboration, problem solving, and critical thinking skills) and also increases satisfaction in the learning experience (refer Table 1).

Table 1. Benefit of collaborative learning.

Author / Year	*Performance*	*Soft Skills*				
		Communication	Collaboration	Problem Solving	Critical Thinking	*Satisfaction*
Ada / 2009 [5]	X	X	X		X	
Kabilan et al / 2011 [6]		X	X	X		
Chen / 2011 [7]	X					X
Lee and Lim / 2012 [8]	X	X				
Zhu / 2012 [4]	X					X

Contrary to this, other research has shown evidence that online learning can pose an even greater challenge for collaborative work than face-to-face (F2F) learning. According to [9], establishing and maintaining an active collaboration is a challenging task due to the lack of active participation by group members in their group work. Results from the interview session on Collaborative Learning experience in the research by [10] showed that there exists group tension towards the fairness of being given the same

mark. Educators are not able to assume that every student makes an equal contribution to the group work and then allocate the same marks to all members [11]. Therefore, educators must allocate marks based on a student's contribution to encourage students to participate actively in their group work activity [12].

Lee and Lim [8] found that instructors may not observe all the processes occurring within student groups and the evaluation are done only on the quality of the final product, ignoring the teamwork process. They suggested, instructors should closely monitor group interaction messages and do peer evaluations. Wang [13] also suggested that educators, including teachers and lecturers, should closely monitor how their students work together in a collaborative learning process for effective learning to take place. By monitoring the collaborative learning process, it can help educators keep track of students' on-going performance.

In previous research [14], based on several pieces of literature, researchers summarized the factors that affect the effectiveness of Online Collaborative Learning environments (as shown in Table 2). From the study, using a matrix table, three factors that affect the effectiveness of Online Collaborative Learning were determined as Learning Interaction, Learning Design, and Learning Environment.

Table 2. Factors that affect the effectiveness of online collaborative learning environments.

Author(s)	Factors
Vygotsky, 2008[2]	• Tenor / Personal (learners' relationships) • Mode / Behaviour (language/textual) • Fields / Environment (social activity)
Tu and Corry (2002) [15]	• Social context / constructed from the CMC users' characteristics and their perception of the CMC environment (social form, informal and casual communication, personal and sensitive means of communication, the recipients, social relationships, access/location, and perceptions on media) • Online communication / attributes of the language used online and the applications of online language (stimulating, expressive, conveying feelings and emotions, meaningful, easily understood keyboarding skills, expressiveness, characteristics of discussion and language skills) • Interactivity / activities in which CMC users engage and the communication styles they use (CMC as pleasant, immediate, responsive and comfortable with familiar topics, response time, communication styles/skills and the size of discussion groups)
Gerbic, 2006 [16]	• CMC Environment (easy access, familiarity, group size, technical problems, lack of participation, spontaneous exchanges, a lot of information, express thoughts in text rather than speech, written messages, posting message anxiety). • Curriculum (interesting discussion topic, link online discussions with assessment, voluntary, integrates online discussions into a course, interaction satisfaction, course workload and program culture). • Student (subject familiarity, confidence level, reading preferences, lack of time, motivation, time management, extra workload, commitment to online discussion and online discussion role and value.)
Sun et. al, 2008 [17]	• Learner (computer attitude, computer anxiety, Internet competence) • Instructor (response time, e-learning attitude) • Course (flexibility, quality) • Technology (technology quality, internet quality) • Design (Perceived usefulness, perceived ease of use) • Environment (Assessment, interaction)
Ali, 2011 [18]	• Learner • Learning process • Content (subject matter) • Learning environment • Time constraints for learning • Lecturer
Kaur, Shriram and Ravichandran, 2011 [19]	• People (dynamic, patience, subject knowledge, clear instruction, fellow students and support staff) • Structure (clear delineation and comprehensive activities) • Environment (accessibility, navigation and support) • Resources (varied, well selected and learning style)
Filigree, 2012 [20]	• Technology (integrates learning spaces and flexible learning environment) • People (training, guidance and support) • Process (high quality content, content relevance to subject and adapt pedagogical tools and models)

For the learning environment factor, [17] suggested that it should consist of usefulness, ease of use, technology quality and internet quality elements. Meanwhile, [19] supported different elements, such as accessibility, navigation and support. In the other hand, [18] stated that the environment should be static and student, teacher and resources controllable. Filigree[20] stated that it should include integrated learning spaces and flexible learning environments. According to [21], the learning environment factor refers to tools that can be used within the environment, or the type of learning that will be delivered within the system.

In this study, the elements that clarify the learning environment factor will be usefulness, ease of use, stability and accessibility. According to the TAM model, proposed by [22], usability defines the usefulness and ease of use of the technology. He identified perceived usefulness as being the degree of work performance after implementation of a system, and perceived ease of use as the users' perception on ease of implementation of the system. According to [19], accessibility

is defined as instant access and instant notification. Meanwhile, according [20], stability is defined as flexibility. According to [23], developers should provide a suitable platform that can facilitate and increase interaction and collaboration between leaners. It can also help teachers to monitor student engagement.

In the learning interaction factor, six elements were identified by [17] as Learner attitude towards computers, Learner computer anxiety, Learner internet self-efficacy, Learner perceived interaction with others, Instructor response timeless and Instructor attitude towards e-learning. However, [19] found that dynamics, patience, subject knowledge, clear instruction, fellow students, and support staff, were all elements of the learning interaction factor. Ali [18] defined it as learner and lecturer elements, and [20] suggested it should consist of training, guide, and support elements.

Interaction is the backbone of any online learning [19]. A successful course will have a high proportion of student-student interaction. This interaction can make the course come to life. A number of studies to define the relationship between learner interaction found that the early stages of a collaborative learning environment only involves [2], [15], [16]. However, recent studies have defined interactivity as, not only involving learners with learners, but also involving the relationship between learners and teachers [17–20]. In this study, authors will use learner-learner interaction and learner-teacher interaction based on [24].

For the learning design factor, [17] concluded that it should consist of flexibility, course quality, and assessment. Meanwhile, [19] said that the resource should be varied and well selected, consider student learning style, use clear delineation and provide comprehensive activities. Ali [18] defined it differently as process, content and time constraint for learning. Filigree [20] identified the elements of high quality content, content relevant to subject, and adapt pedagogical tools and model. Chanchalor and Somchitchob [25] suggested that these learning activities must be well planned. Therefore, all developers must choose appropriate technologies and create motivating learning designs. In this study, the author will use content, process, time constraint and assessment elements to clarify the learning design factor. All elements that clarify each factor have been summarized in Table 3 below.

Table 3. The factors and elements of an effective online collaborative learning.

Factor	Element
Learning Interaction	Learner-Learner Interaction Learner-Teacher Interaction
Learning Design	Content Process Evaluation Time Constraints
Learning Environment	Usability Accessibility Stability

II. Materials and Methods

In previous work, researchers determined the factors and elements that affect the effectiveness of Online Collaborative Learning. This study aims to measure the interrater agreement on the three factors and nine elements that were determined in [26], before proposing a model. The research method is illustrated in Figure 1.

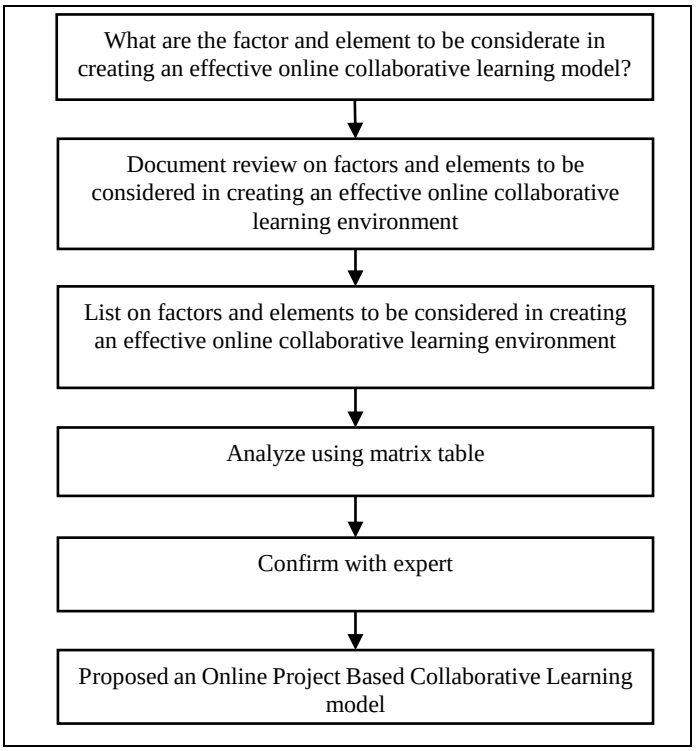

Figure 1. Research method

Interrater reliability is referred to as the extent of agreement among data collectors. It is important to test interrater reliability to ensure that the data collected in this study represents the variables measured accurately [27]. To measure interrater reliability, several statistical analysis methods, such as Cohen's kappa (two raters) and Fleiss kappa (extended from Cohen's version for three or more raters), are employed. In this study, data will be collected from three Online Collaborative Learning (OCL) experts, three Subject Matter Experts (SME), and three System Experts (SE). Fleiss kappa analysis will be used to measure the percent agreement to determine interrater reliability. In order to measure the percent agreement among the data collectors, a matrix table has been created; in which the columns represent the different raters, and the rows represent the variables for which the raters had collected data. The interrater reliability value can be interpreted by referring to Table 4.

Table 4. Source (Fliess et al., [28])

Kappa Value	Interpretation
< 0.40	Poor agreement
0.41-.74	Intermediate to good agreement
0.75 – 1.00	Excellent agreement

III. Results and Discussion

This section presents the findings based on the focus of this study, which was to measure the interrater agreement of three factors and nine elements that were determined using a literature review by nine experts.

Based on the literature, this study determined that three factors affect the effectiveness of online collaborative learning, namely Learning Environment, Learning Design and Learning Interaction. The table shows a 100% agreement between the experts. From Table 5, we can conclude that the experts were in excellent agreement with all of the determined constructs from the literature review.

Table 5. Fleiss Kappa Analysis – Factor

Factor	OCL1	OCL2	OCL3	SME1	SME2	SME3	SE1	SE2	SE3	%Agreement
Learning Environment	1	1	1	1	1	1	1	1	1	100
Learning Design	1	1	1	1	1	1	1	1	1	100
Learning Interaction	1	1	1	1	1	1	1	1	1	100
Interrater reliability										**100**
Value of Kappa										**1**

Table 6 represents an analysis of all of the elements that clarify online collaborative learning factors. From previous work, the three elements that clarify the learning environment factors are usability (E1), stability (E2) and accessibility (E3). For the learning interaction factor, the two elements were interaction between learner-learner (I1) and learner-teacher (I2). Another four elements, namely content (D1), process (D2), evaluation (D3) and time constraint (D4), were used to clarify the learning design factor. The table shows that all experts agreed about all elements determined from the literature.

Table 6. Fleiss Kappa Analysis – Element

Element	OCL1	OCL2	OCL3	SME1	SME2	SME3	SE1	SE2	SE3	%Agreement
E1	1	1	1	1	1	1	1	1	1	100
E2	1	1	1	1	1	1	1	1	1	100
E3	1	1	1	1	1	1	1	1	1	100
D4	1	1	1	1	1	1	1	1	1	100
D5	1	1	1	1	1	1	1	1	1	100
D6	1	1	1	1	1	1	1	1	1	100
D7	1	1	1	1	1	1	1	1	1	100
I8	1	1	1	1	1	1	1	1	1	100
I9	1	1	1	1	1	1	1	1	1	100
Interrater reliability										**100**
Value of Kappa										**1**

The findings from this study show that all experts agreed with all of the factors and elements that affect the effectiveness of online collaborative learning. Referring to each factor and element can help educators to design and develop their own online collaborative learning environment. Furthermore, all factors and elements were used to propose an online project based collaborative learning model (see Figure 2).

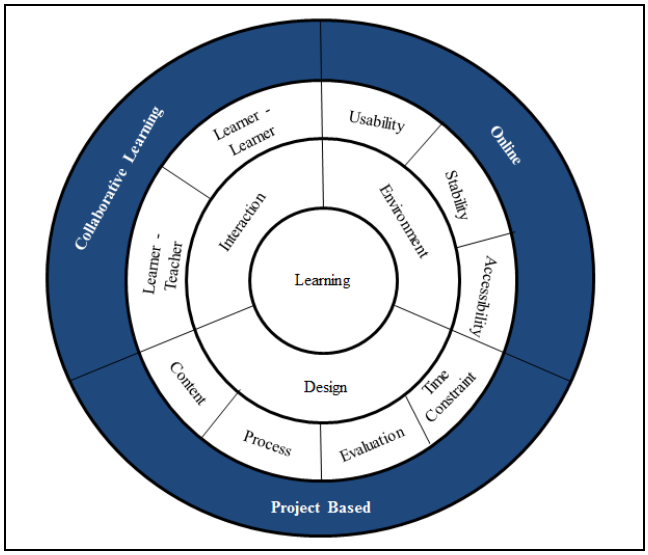

Figure 2. Online project based collaborative learning model.

IV. Conclusion

Fliess Kappa is an extension of Cohen Kappa (which measures the agreement between two or more raters). According to [27], Fliess Kappa is a simple measure of agreement between raters using a percentage value. It is important to confirm that all of the factors and elements, that were determined from the literature, with several experts before proposing a model. It is hoped that this study will give emphasis to other researchers about the importance of interrater agreement to ensure the reliability of a proposed model.

The previous section measured the interrater agreement of the proposed model. The factors and elements identified will be used to design and develop an online project based collaborative learning prototype during the next stage of this research. At present, the model is only in a conceptual phase; and requires significant development before it can be used to gather data phase and requires significant development before it can be used to gather data.

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Author Biographies

First Author Sharifah Nadiyah Razali was a Senior Lecturer in Computer Systems and Support Program, Masjid Tanah Community College. Currently, she is working towards a PhD in IT degree at Universiti Teknikal Malaysia Melaka (UTeM). Her research interest are e-learning, Collaborative Learning and Networking System.

Second Author Faaizah Shahbodin is an Associate Professor at Faculty of Information and Communication Technology, Universiti Teknikal Malaysia Melaka (UTeM). She received her Degree in Computer Science in 1994 from Universiti Utara Malaysia (UUM), and Master in Computer Science in 1997 from Queensland University of Technology (QUT), Brisbane, Australia. She completed her Ph.D in Multimedia Education Systems at University Kebangsaan Malaysia (UKM).Her research interests are primarily on Problem Based Learning, multimedia applications, Creative Contents and User Interface Design. Currently, she is a Deputy Dean (Academic) for the Faculty of Information and Communication Technology, UTeM, Melaka