Learners' Characteristics and Critical Thinking in Online Asynchronous Collaborative Learning

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Abstract- **Collaborative learning is an established technique for teaching and learning in which the students have their own learning responsibilities for each other and for themselves. This is a social process in which the learners learn from peers by participating interactively with learning materials, observing the solution approach adopted by every peers, ensure each peer is focused towards the task and motivated in highlighting issues and decisions. The potential benefits that can be obtained by the learners learning through collaborative learning are enormous. In spite of various studies on collaborative learning in asynchronous learning environment, not much focus has been given on the effect of learners characteristics on the critical thinking when collaborating online in the small groups of diversified learners to solve a given problem. Critical thinking is an important component in the students online discussion in small groups which has diversified learners. This paper attempts to answer the following question: Are there any differences in learners' actual critical thinking ratio during the online collaboration attributable to their characteristics? This study is conducted in premise of that the learners learning is not so much a matter of building up correct responses or eliminating incorrect responses. The most important thing is for students to have the opportunity in a group to test the adequacy of their ideas. It is how critical thinking skills are developed in the online group discussion.**

Keywords- **asynchronous collaborative learning, critical thinking**

I. INTRODUCTION

Educating the blue collar or lower income workforce to gain knowledge on various critical fields is a paramount challenge. In

Malaysia, the provision for education especially to the workforce is the biggest challenge for the government as the nation strives to become a fully developed country

by the year 2020. One solution is to use technology as an enabler to bring education to the masses. Universities are taking up the challenge by updating the content of their programs but more importantly, re-looking at the delivery systems. One of the emerging delivery systems much talked about is the Open and Distance Education and electronic learning (e-learning). Open and distance education (ODE) and e-learning are fast becoming the way of providing education to the masses. ODE and e-learning give opportunity for the working adult to enrol in programs that match their interest without leaving their job. Adult students are loosely identified with a larger group characterized as "non-traditional." While definitions vary, the National Center for Education Statistics (NCES) in United States (US) has come up with seven characteristics that typically define non-traditional students. According to the NCES, adult students often:

- Have delayed enrolment into postsecondary education
- Attend part-time
- Are financially independent of parents
- Work full-time while enrolled
- Have dependents other than a spouse
- Are a single parent (in some cases)
- Lack a standard high school diploma

Serving adult learners and conventional learners are two different extremes. According to CAEL (Council for Adult and Experiential Learning), one of the main principles of effectiveness for serving adult learners are teaching & learning process There are seven exemplary practice supporting effective teaching-learning process. In this paper we have shown how the following two exemplary practices can be implemented through pedagogy of asynchronous collaborative learning in small groups and eventually investigate how students characteristics influence their critical thinking ratio during the online collaboration process::

- Employs a teaching-learning process that includes a high degree of interaction among learners and between learners and faculty.
- Considers adult learners to be co-creators of knowledge.

A. Asynchronous Collaborative Learning Pedagogy

Collaborative learning is an established technique for teaching and learning ([10], [11], [13]) in which the students in a group have their own learning responsibilities for each other and for themselves ([5]). According to [20], this is a social process in which the learners learnt from peers by participating interactively with learning material, observing the solution approach adopted by every peers, ensure each peer is focused towards the task and motivated in highlighting issues and decisions.

The potential benefits that can be obtained by the learners learning through collaborative learning are ([24], [10], [11],[13]):

- Resource sharing and cohesive brainstorming
- Monitoring of the problem solution approach by the peers
- Interactive is conducive for the good performance
- Positive effects on the cognitive growth and transmission and acquisition of kills
- Development of interest and sense of belonging
- Help the learners in applying problem solving techniques which is more algorithmic
- Sustainable deep learning
- Good performance achievement
- Develop skills wanted by the industry
- Increase the confidence level in giving the solutions and satisfaction on the process that was experienced.

New development in the education field sees the advent of universities which are started to

involve in distance learning programs by offering more market demand programs through online mode of teaching and learning. This is done by using Learning Management System (LMS) which enables the universities to offer their courses to their in campus and off campus students ([22]). LMS has facilities that enables the interaction among the students, between the students and the content and between the instructor and students. Among the facilities available in LMS are synchronous-based chat rooms, email, facilities for video/audio and discussion board. Synchronous-based discussion board or chats are used in many blended courses and courses conducted entirely through on-line. On the other hand, asynchronous-based discussion tools such as discussion board or threaded forums facilitate communication among the learners which can be archived for reference. It also gives space to the students to think what to be typed in the discussion board (i.e. enables reflections). In addition, asynchronous discussion boards (or also known as asynchronous threaded forums) are used intensively in the courses in which the students and learners interact in the social and academic context. Numerous researches have highlighted the effectiveness of asynchronous communication as a learning source. The prominent research in this field was conducted by [6]. [6] discovered asynchronous environment can be used to enhance the learning process. This can be achieved through the combination of active learning and knowledge construction. Environments that have the interactive and asynchronous aspects enable active learning. According to [6], knowledge is constructed through generation, linkage and structuring of idea through online mode of communication.

Studies shows that collaboration in the asynchronous learning environment is as effective as face-to-face tutorials even though there are situations in which the students are not happy with the interaction process and quality of the group discussion ([17]).

Research on the use of asynchronous forum, participation and interaction in the discussion is at least at par with discussion that takes place in the classroom. ([8], [18], [19]). Studies using content analysis on the electronic messages shows that online discussions support collaborative learning, accept the use of collaborative skills and promote the knowledge construction in the social manner. [9] in their studies found that asynchronous discussion is sufficient to support the development of learning community in which the students establish the both elements of cognitive and emotions needed for effective learning. [2] has investigated the interaction of students in asynchronous discussion and found students in this category involved in higher order of cognitive interactivity compared to students from the face to face meeting. [21] has investigated whether the students in the online mode has sense of belonging. His research shows that this is not impossible and concluded that the sense of belonging in the online environment is positively correlated with the intended learning level. [15] found that students in the online mode allocate more time to achieve the learning objective compared to the students in face-to-face tutorials.

II. PROBLEM STATEMENT

Collaborative learning is an established technique for teaching and learning in which the students in a group have their own learning responsibilities for each other and for themselves. This is a social process in which the learners learn from peers by participating interactively with learning materials, observing the solution approach adopted by every peers, ensure each peer is focused towards the task and motivated in highlighting issues and decisions. The potential benefits that can be obtained by the learners learning through collaborative learning are enormous. Many researchers have highlighted the importance of studies on online learning and the characteristics of the students ([3], [14], [23]). Research shows

that students have different satisfaction in online discussions and appreciate the online discussions differently. Research conducted by [7], [8] and [12] concluded that students characteristics may influence the application and the successful of online discussions such as collaborative learning. In spite of various studies on collaborative learning in asynchronous learning environment, not much focus has been given on the effect of learners characteristics to the critical thinking when collaborating online in the small groups of diversified learners to solve a given problem. One main objective of asynchronous learning community is as place to create critical thinking that will lead to knowledge construction. Thus, critical thinking is an important component in the students online discussion in small groups which has diversified learners.

III. RESEARCH OBJECTIVES

Based on the problem statement in the previous section, the following objective is formulated in this study: Are there any differences in students' actual critical thinking ratio during the online collaboration attributable to their characteristics in regard to their age, CGPA, gender, their prior knowledge on the domain and location of their learning centres?

This study is conducted in premise of that the learners learning is not so much a matter of building up correct responses or eliminating incorrect responses. The most important thing is for students to have the opportunity in a group to test the adequacy of their ideas. It is how critical thinking skills are developed in the online group discussion. The study does not gives emphasis on the motivational factors on the grounds that all adult learners enrolled in part time studies have high level of commitment and motivation ([1]). Also we believe that learners profile is the one give effect to the learners motivational factors and not vice versa.

IV. METHODOLOGY

The study was conducted in Jan 2007 semester in which the students at the undergraduate level are required to collaborate online in small groups using asynchronous threaded forum to solve a programming problem. Each group has 3 students and the instructor will act as a facilitator and each group is given separate forum in order to do their online discussion. Then, the students' discussion transcripts are analyzed in order to determine the individual critical thinking ratio and the groups critical thinking ratio. A correlation and F-test are done in order to determine whether there is any correlation between individual critical thinking ratio and the groups critical thinking ratio and also to determine whether there is significance difference among the levels of the independent variables. Five independent variables that have relationship to both demographic and academic components that were investigated in this study are:

- Learners age
- Learners CGPA
- Gender
- Learners prior knowledge on the domain
- Location of the learning centres which are distributed across the country

Data were analyzed with SPSS v14 software using one-way ANOVA and Pearson correlation tests.

V. THEORETICAL FRAMEWORK

The objectives of this research are guided by Community of Inquiry framework as shown in Fig. 1 ([4]).
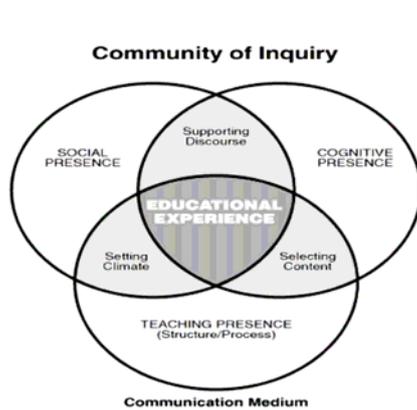
Fig. 1 Community of Inquiry (CoI)

According to [4], a worthwhile educational experience is embedded within a Community of Inquiry that is composed of teachers and students who are he key participants in the educational process. The model of this Community of Inquiry assumes that learning occurs within the Community through the interaction of three core elements: cognitive presence, social presence, and teaching presence.

For reasons associated with ease of application, precision, and order, indicators into categories are grouped so as to indicate more clearly the phase or aspect of each element that is being demonstrated by each group of indicators.

TABLE 1
CATEGORIES OF COI'S ELEMENTS

Elements	Categories
Cognitive presence	Triggering Event Exploration Integration Resolution
Social Presence	Emotional Expression Open Communication Group Cohesion Instructional Management
Teaching Presence	Building Understanding

Source: [4]

The element in this model that is most basic to success in higher education is cognitive presence. This term here is taken to mean the extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication. Cognitive presence is a vital element in critical thinking, a process and outcome that is frequently presented as the ostensible goal of all higher education ([4]).

The second core element of the model, social presence, is defined as the ability of participants in the Community of Inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as ``real people.'' The primary importance of this element is its function as a support for cognitive presence, indirectly facilitating the process of critical thinking carried on by the community of learners.

The third element of the model, teaching presence, consists of two general functions, which may be performed by any one participant in a Community of Inquiry; however, in an educational environment, these functions are likely to be the responsibility of the teacher. The first of these functions is the design of the educational experience. This includes the selection, organization, and primary presentation of course content, as well as the design and development of learning activities and assessment. A teacher or instructor typically performs this function. The second function, facilitation, is a responsibility that may be shared among the teacher and some or all of the other participants or students. This sharing of the facilitation function is appropriate in higher education and common in computer conferencing ([4]). This study is focusing on the cognitive component of the Community of Inquiry.

VI. TRANSCRIPT ANALYSIS: RESULTS

Content analysis is a generic name for a variety of textual analyses that typically involves comparing, contrasting, and categorizing a set of data such as postings in online discussions' forum. Students collaborative transcripts have been analyzed

for the evidence of the critical thinking ratio based on critical thinking model protocol developed by [16]. Two groups of tutorial classes have been chosen randomly for this analysis. The first group consists of 19 online collaborative groups (overall total of 42 students) from remote town while another group consist of 5 groups (overall total of 14 students) of online collaborative groups from a major town. A correlation test has been performed between individual critical thinking and the group's critical thinking. There is close relationship between individual critical thinking and the group critical thinking (r=0.72 with p=0.01) and difference between them is not significant (p=0.334). There is a significant difference between critical thinking ratio of individual and the highest value that can be obtained (p=0.00). There same goes for the difference between critical thinking ratio of individual and the highest value that can be obtained (p=0.00).

A one-way Anova test was performed using the five independent variables (age, CGPA, students prior proficiency level of the domain, gender and location of the learning centre) and one dependent variable (individual critical thinking ratio obtained through [16] protocol). The results are shown below:

PRIOR DOMAIN KNOWLEDGE
F=1.029 (p=0.338) → *Not significant*

CUMULATIVE GRADE POINT AVERAGE (CGPA)
F=3.065(p=0.086) → *Marginal Significant*

GENDER
F=0.641(p=0.427) → *Not Significant*

AGE
F=0.157(p=0.855) → *Not Significant*

LOCATION
F=2.733(p=0.104) → *Not Significant*

VII. DISCUSSION

Overall, this study found that among the five variables of age, CGPA, students prior proficiency level of the domain, gender and location of the learning centre, only CGPA that has marginal significant for the individual critical thinking ratio. The rest are not significant to the critical thinking ratio – both to the individual and the group. One interesting finding is that there is close relationship between individual critical thinking ratio and group critical thinking ratio. Other important finding that need to be stressed here is that the difference between the average critical thinking ratio of individuals and groups are significantly lower from the maximum critical thinking value that can be achieved. It means the critical thinking ratio of the student and group is low and there is a room for improvement. It also can be concluded the five independent variables investigated in this study are not the factor that influence the critical thinking ratio for the groups and individuals. The results show that there are other factors that directly contribute to the critical thinking of individual and the group. The factors could be the role of tutor in the online discussion, the dynamics of discussion in the forum, etc. More research need to be conducted in order to investigate other factors. Understand learners in order to help them develop coping and adaptation strategies so that the online collaborative learning experience is effective and enjoyable. As educators, we must continue to focus on how we can help each learner feel comfortable and confident in the online environment.

The post-hoc test was not performed because the main idea of this study was to identify whether there any significant differences in students' perception on critical thinking during the online collaboration attributable to their characteristics and in students' actual critical thinking ratio during the online collaboration attributable to their characteristics.

VIII. CONCLUSION

This paper has presented how an effective online collaboration in the asynchronous mode that brings together learners from different background can be implemented for e-learning or ODE learners. In order to gain more insights on the nature of discussion that taking place, a critical thinking ratio that occurred in the forum has been calculated. The variables of interest in this study are the location of the learning center, CGPA, age, learners prior knowledge on the domain and gender, Through one-way Anova test, it is found that none of the variables have a big influence on the magnitude of the critical thinking of the individual learners and the groups. There are other factors that need to be considered to make asynchronous collaborative learning as effective as possible.

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