E-learning: Analysis of online discussion forums in promoting knowledge construction through collaborative learning

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Abstract: - Extensive discussions and debates about the advantages of using technology to create a shared space among learning participants have been presented in studies in the field of e-learning. One of the approaches in using or adopting technology for learning is through the use of online discussion forums, which as reported has beneficial impact on the teaching and learning process. Online discussion forum is also a form of learning through networking which provide opportunities for students to seek, obtain, and share information. Therefore, students' participation and interaction in the forum can provide some insight into how they learn about a course in a virtual environment. In addition, it is also essential to consider how online discussion forums may promote knowledge constructions in students.This study examines preliminary data of an online discussion forum in a course at Masters level (MA) in order to investigate if there is evidence of shared construction of knowledge among students through collaborative learning behaviours. The findings indicate that the students actively processed and reviewed the postings in the online discussion forums. They also relate their postings to what they have learned in the lectures, besides providing links to relevant websites for further reading. Therefore, there is evidence that the students worked collaboratively in order to respond to the postings based on the topics presented during the lecture and tutorial. Finally, analysis of the students' discourses indicate various phases of knowledge construction (based on the IAM model), which is a reflection of their cognitive thinking process.

Key-Words: - e-learning, content analysis, online forum discussion, knowledge construction, collaborative learning, asynchronous communication

1 Introduction

The fact that e-learning is the way forward and is pivotal in education nowadays, either in schools or higher learning institutions should not be underestimated [1]. With the impact of technology on teaching and learning, teachers' role has become that of facilitators, while students are expected to be active learners who process information from a variety of sources [2]. An increasingly popular technological tool in teaching and learning is via online forum facilities and platforms as they provide opportunities for students to interact with others beyond the classroom four walls and network with other students and lecturers beyond the class meeting times, 24 hours per day and 7 days per week. In the conventional mode, lectures and tutorials activities rely on the lecturer's and students' interaction in class discussion, reviews of handouts and presentations for information and clarification to implement the structured activities and feedbacks.

Nowadays, online forums are widely used to connect people who usually have the same interests in order to allow them to share and exchange information and ideas. In fact, online forum is described as web-based application that has been used extensively to bring people together with shared interests and mind-set. [3], [4]. It is extensively used nowadays to supplement conventional ways of giving lectures and conducting tutorials. In a study based on e-learning platform, majority of the students consider such platform as a means to improve the communication between students and teachers [5].

Online forum is also extensively used nowadays as a mode to interact and to get feedback among students who are not comfortable to interact in class due to the fact that they are shy learners. Online forum can assist the shy learners to interact and also to participate in environment where they are not pressured. Information from many sources and contacts can be elicited and various opinions and information can be used for completing the class assignment and as a way to generate ideas and brainstorming for writing activities. In addition, discussion forums have also been used for educational purposes as a tool for promoting different modes of learning that can lead to enhanced learning outcomes for students [6]. Discussion forums were first introduced in the mids 1980s as a form of asynchronous electronic communication [7]. When learners work together using the computer, they are engaged in the

processes of hypothesizing, purposeful discussion, reflection, creative thinking, persistence and cooperation. The asynchronous format of online discussion forums as reported can "promote high levels of cognitive engagement and critical thinking" [8]. This implies that asynchronous communication in the forum can promote learning cognitively. The opportunity for collaborative learning in the online discussion helps to promote shared knowledge building activities because the interactions facilitate students' involvement in learning from other students of different backgrounds and experiences. Collaborative work in the forum develops a common ground for students to share knowledge which is subsequently put into construction and reflection. Furthermore, the asynchronous format of this computer mediated communication (CMC) is acknowledged as an effective means of creating a critical community in which learners exchange ideas and evaluate each other's beliefs and practices and also formulate various conceptions of their work.

Since language is the basis of human interaction and knowledge transfer, knowledge is not restricted to what an individual knows, but is a composition of overlapping and nested knowing of various persons [9]. To make it clearer, a brief reference to Piaget's theory is described [10]. Based on Piaget's adaptation theory, knowledge construction takes place through assimilation and accommodation, the two central processes that complement each other in the adaptation theory. In the adaptation theory, social interaction activates individual thinking processes. This means that peer interaction is an effective tool which provides feedback and interaction to help learners in knowledge construction processes. For instance, varying viewpoints are brought to the online discussion forum because students come from various background (e.g academic background, culture and nationality). In addition, it has been suggested that online forum provides the opportunity for scaffolding of thinking to occur [11]. Therefore, social interaction and context is formed, enabling the learners to display individual as well as collaborative reflection.

2 Methodology

Several models have been developed to study participation in discussion forums, which generally fall under one of these categories: levels of disagreement, argument structure, interaction-based and content analysis [12]. To reiterate, the objective of the present study is to examine how the students interact and collaborate online in the process of constructing knowledge. In order to examine the online discourses, content analysis approach was used. Content analysis

is defined as "a research methodology that builds on procedures to make valid inferences from text" [13].

Two models, namely the Interaction Analysis Model and categories of Collaborative Behavior are used to examine the online discourses. The Interaction Analysis Model [14] examined constructivist knowledge creation phases, while categories of Collaborative Behaviour [11] display collaborative learning situations. The Interaction Analysis Model examined the transition between phases of critical thinking (meaning negotiation) in order to illustrate the construction of knowledge. There are five progressive phases as shown in Table 1.

Table 1: Interaction Analysis Model.

Phase 1: Sharing/comparing of information–5 levels; (A), statement of observation or opinion, (B) corroborating examples provided by one or more participants, (C) statement of agreement from one or more other participants, (D) asking and answering questions, to clarify details of statements (E) definition, description, or identification of a problem.
Phase II: Discovery, exploration of dissonance or inconsistency among ideas, concepts or statements-3 levels; (A) identifying and stating areas of disagreement, (B) asking and answering questions to clarify source of extent of disagreement (C) restating the participants' position and possibly advancing arguments or considerations.
Phase III: Negotiation of meaning/co-construction of knowledge-4 levels; (A) Negotiation or clarification of the meaning of terms, (B) Negotiation of the relative weight to be assigned by types of argument, (C) Identification of areas of agreement or overlap among conflicting concepts (D) Proposals and negotiation of new statements embodying compromise, co-construction.
Phase IV: Testing and modification of proposed synthesis or co-construction -5 levels; (A) Testing the proposed synthesis against 'received fact', (B) testing against existing cognitive schema, (C) testing against personal knowledge. **PhaseV**: Agreement statements/applications of newly constructed meaning-3 levels; (A) summarization of agreements,(B) applications of new knowledge (C) metacognitive statements of participants illustrating their understanding that their knowledge or ways of thinking have changed as a result of the conference interaction experience, (D) testing against formal data collected (E) testing against contradictory testimony in literature.

There are three categories of Collaborative

Behaviour as displayed in table 2.

Table 2: Categories of Collaborative Behaviour

Category	Code	Decsription
Contributing	HeG	*Help giving*: responding to questions & requests from others
	FBG	*Feedback giving*: providing feedback on proposals from others
	RI	*Exchanging resources & information* to assist other group members
	SK	*Sharing existing knowledge* and information with others
	Ch	*Challenging others*: challenging the contributions of other members & seeking to engage in debate
	Ex	*Explaining or elaborating*: supporting one's own position (possibly following a challenge)
Seeking Input	Hes	*Help seeking*: seeking assistance from others
	FBS	*Feedback seeking*: seeking feedback to a position advanced
	Ef	*Advocating effort*: urging others to contribute to the group effort
Monitoring	ME	*Monitoring group effort*: Comments about the group's process & achievements

2.1 The study and participants

A study was conducted with the participants by analyzing their interaction in the online discussion forum designed for the particular course. The participants comprised of 15 students following a course at MA level. The course is conducted for 14 weeks (1 semester). This course is a compulsory course for the students and they are required to complete the pre-requisite courses before they can enroll for this course. Face-to-face lectures and tutorials are conducted once a week for 3 hours. The lecturer will deliver a topic based on the course schedule for 1hour or 11/2 hours and this is followed by tutorial task. The lecture is not just one way interaction because during the lecture, the lecturer will ask questions and ask students to complete some activities based on the topic. This is to ensure that the students can understand the topic before they proceed with the tutorial task.

The students are from Malaysia, Jordan, Libya, Iraq, Iran and Yemen. Their age ranged from mid-twenties to mid-thirties and they have a degree in either English Language or English Literature. From our observation and class interaction, majority of students who are competent and widely exposed to ICT are from Malaysia. Only several students from the Middle East are familiar with ICT, but most are limited users of ICT. This is due to the fact that in many parts of the Middle East, the coverage of Internet is still limited and the subscription fees is very high. The availability of the hardware is also a limitation.

2.2 Features of the Forum and Protocols

The lecturer of the course used available discussion board in the Internet, which is http://www. invisionfree.com. The online discussion forum captures the users logging in data into the forum: login and logout date, time and date of reply or posting. The online forum has features which consists of creation of category and topic, statistic board (containing information of total posting by members, the number of registered members), replies by registered members (date and time of reply),the number of members who read the postings, quote function, edit function and personal message (PM).

The students were informed that the online forum is to supplement the lectures and tutorials because they only meet once a week and only for three hours per meeting. Participation in the discussion board is not compulsory, but they are encouraged to participate as much as possible. Anyone can post a topic or lead the discussion, not necessarily the lecturer only. Research has shown that when students facilitate the discussion, there is a higher levels of content mastery in the discussion [15], [16]. In order to prompt the discussion, the lecturer posted a topic after the 3 hours meeting with the students on the next day. The CREST + model, which has six levels of questions is used as a guide to post question to the students [17]. It is essential to design the right type of questions as a question can

reflect many aspects of learning. Furthermore, designing the right type of questions can promote and guide students towards giving constructive responses. The six levels of questions are as follows:

1. Basic constructivist question – questions that encourage students to create meaning out of the course content.
2. Literature-based question – questions whereby students are instructed to find existing, discipline-specific literature to prove or disprove, agree or disagree, or expand upon the concept under discussion.
3. Experiential question – questions which are designed around a concept or theory that is taught but is aimed directly for students to bring in their personal experiences.
4. Post building – questions which are built on questions which were asked earlier in the course.
5. Evaluative/reflections question – questions whereby students are asked to reflect on the course so far or the current lesson.
6. Final question with instructions – questions that have some form of assessment and instruction build into it, e.g., asking students to show their depth of understanding or to synthesize and to evaluate the topic discussed.

3 Data Analysis: Findings and discussion

A combination of qualitative and quantitative data was used to analyse the students' discourses in the online forum. The students' total number of postings were obtained from the log file of the forum and is used to support the quantitative data. In addition, content analysis using Interaction Analysis Model and categories of Collaborative Behavior were used to analyze the content of the students' discourses which is used to support the qualitative data.

3.1 Analysis of discussion

The analyzed data was based on two topics posted in the forum, which are Unit of Analysis and Speech Act Theory. The results pertaining to the total number of postings revealed that students dominated the discussion, not the lecturer; a finding that showed that this online forum was somewhat student-centered. The lecturer only contributed twice, an indication that online discussion provides a learning environment wherein students were responsible of their own learning and responsive to each other. The lecturer's role in initiating the discussion and in wrapping up the discussion where relevant helps in that it encourages students to take the responsibility for each discussion.

It is relevant to point out here that there is a gap of one week between the first topic (Unit of Analysis) and second topic (Speech Act Theory). There were 16 replies and 98 views on the first topic and 13 replies and 130 views on the second topic. It is interesting to note that there is significantly a high number of views than number of replies or postings, indicating that the students read the replies posted by others, possibly evaluated the content and then decided on whether to contribute or not. It is also pertinent to state here that the second topic was initiated by one of the students because the Internet line was down when the lecturer wanted to post a topic on the next day after her meeting with the students.

3.1.1   Analysis of discussion for topic 1

After analyzing in detail the content of the replies posted by the students, several patterns of interactions emerged which revealed the various phases of interaction based on the Interaction Analysis Model [14]. The students' discourses represented reflective discourses through collaborative learning behavior that lead to construction of knowledge.

It is important to point out that the total percentage for results based on the *Interaction Analysis Model* does not add up to a total of 100% because there are sub categories for each phase. The percentage displayed is the total percentage in figure 1 is for the sub categories found in each phase. The results as shown in figure 1 revealed that the highest percentage was for phase 1 at 56.25%, (total percentage for 2 sub categories), followed by phase II at 31.25%(total percentage for 2 sub categories), phase III with 16% of replies (total percentage for 2 sub categories), phase IV, also with 16% of replies (total percentage for 1 sub category) and for phase V, there was 12.5% replies (total percentage for 1 sub category).

Phase I, which is about sharing and comparing information has the highest score because students need to share and compare information in order to develop an understanding of the topic before they moved on to the other phases. As the results revealed, the phase with the next highest score is phase II on discovery and exploration of ideas, concepts and statements. This is expected because after the students have compared and shared information, they are ready and confident to discuss and explore ideas, concepts and statements posted by members of the discussion board. Both phases III and IV have similar results. Only 12.5% of replies fell in phase IV (applications of newly constructed meaning) because this is the beginning of the semester and the students may have not done a lot of reading yet.
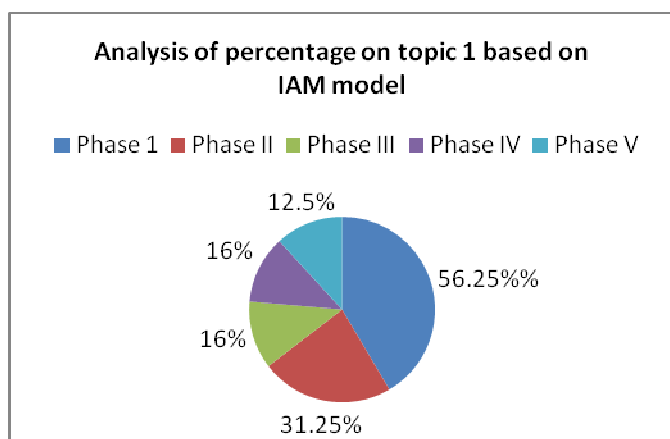
Figure 1: Results for Interaction Analysis Model for Topic 1

The students' discourses in table 3 on content analysis of the students' discourses represented reflective discourses such as statements of observation and opinion, asking and answering questions, expressing agreement and disagreements and restating of positions and negotiations; all of which are instances of learning behaviour (from the 5 phases of the IAM model) that lead to construction of knowledge.

Table 3: Content Analysis of IAM model: the 5 phases

Phase I-sharing/comparing of information
A total of 9 postings with 2 sub categories: A & B.
Statement of observation (A)
During analyzing a text, the analyst must focus on one unit of the text so as not to deviate from the main goal of the study.
Statement of opinion and provision of example for discussion purpose (B), e.g:
I agree. You must select a particular unit of analysis to help the researcher to see what to analyze to achieve the objective of the study.

Phase II – discovery & exploration of dissonance or inconsistency among ideas, concepts or statements
A total of 5 postings with 2 sub categories: A & C.
Disagreement (A),e.g:
"I think I disagree with you because you talk about the unity of the thesis when Dr asked about certa in the analysis"
Restatement of position on topic, by advancing argument (C), e.g:
Let me clarify. Both are important. Selecting a unit will make the researcher focus on what they want to do. When you write a thesis, you must show all parts are connected.

Phase III – negotiation of meaning/co-construction of knowledge
A total of 4 postings with 2 sub categories: C & D.
Putting forward agreement, (C), e.g:
Yes, I agree with you M because a clear idea of the study will definitely help the researcher to decide which unit of text to analyse.
Proposals and negotiation of new statements Embodying compromise, co-construction (D), e.g:
Your argument on unit of analysis as sampling is valid because it will enable the researcher to also decide on the sampling type.

Phase IV – testing and modification of proposed synthesis or co-construction.
A total of 4 postings with 1 sub category: A
Testing the proposed synthesis against received facts (A), e.g:
If I want to study average classroom performance, the data must be on the group, not individual performance because I'm interested in the average score. Am I right?

Phase V-agreement statements/applications of constructed meaning
A total of 2 posting with 1 sub category: C
Metacognitive statements illustrating their understanding that their knowledge or ways of thinking have changed as a result of the conference interaction experience.
Now I realize in social research this hierarchy of unit of analysis is important like hierarchical model.

Next is the result for the categories of *Collaborative Behavior*. It is again essential to state that total percentage of result for categories of *Collaborative Behavior* does not add up to a total of 100% because there are sub categories for each category. The percentage displayed in table 4 is the total percentage for the sub categories found in each category.The results as displayed in figure 2 showed that there was a high percentage of contributing category, comprising feedback giving (FBG) at 62.5%, sharing knowledge (SK) at 43.75% and explaining (Ex) at 37.5%. For seeking input, only help seeking behavior (Hes) was found which was at 12.5%.
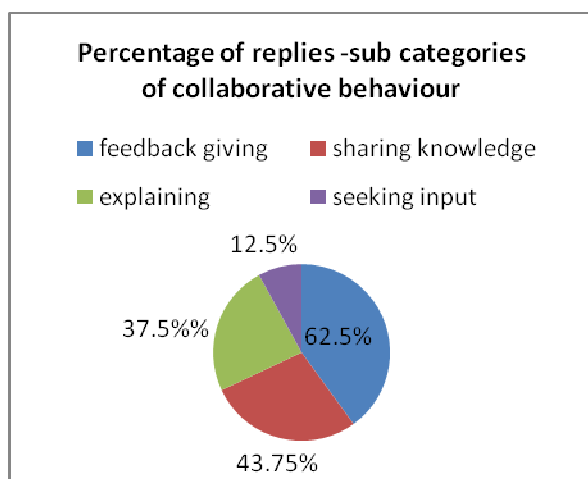
Figure 2: Result for sub categories based on Collaborative Behavior categories

The content analysis of collaborative behaviour (table 4) showed that instances of giving feedback and explaining have helped the students in the process of sharing knowledge. In addition, their initiative of seeking input in order to seek assistance from their friends is also indicative of collaborative learning behavior. Therefore, this suggests that the collaborative behavior contributed to the five phases of interaction (IAM model), which enabled students to arrive at knowledge construction through participation in the online forum discussion.

Table 4: Content Analysis for categories of Collaborative Behaviour

Type of contribution
Contributing: e.g: **FBG (feedback giving:providing feedback on proposals from others)**   *"I agree the analyst has to be focused because he cannot deviate from the research aims, objectives and questions"*   *"Your suggestion to be clear about which unit or text to analyse from the beginning is valid in order to have a clear guide"*   **SK (Sharing knowledge: Sharing existing knowledge and information with others)**   *"The reasons are different subjects need different methods and techniques of analysis. If a researcher deals with too many issues, he or she will lose the aim of research".*   *"I found this information in a website. It provides a step by step reading on how to choose what to analyse."*

I recommend you visit this website"   **Ex (Explaining or elaborating: Supporting one's own position (possibly following a challenge)**   *" two reasons – first, selecting that particular unit of analysis will help the researcher see which unit is appropriate to be used. Second, it will help him/her focus on the text instead of getting lost"*
Seeking input: e.g: **Help seeking: seeking assistance from others**   *"I am getting confused now are you talking about a unit of analysis or unity of the whole tesis? Can you please make it more clear?". "Hi everyone. Ok what about sampling of unit? I'm not clear about sampling issue"*

3.1.2   Analysis of discussion for topic 2

The analysis for topic 2 discovered similar types of interaction as displayed in the interaction patterns for Topic 1. There were a total of 13 replies on this topic over a time period of 1 week. It should be noted that the total percentage for results based on the IAM model (figure 2) does not add up to the total of 100%, just like in figure 1 because there are sub categories for each phase. The percentage shown for each phase is the total percentage for the sub categories in each phase.

As shown in figure 2, the highest percentage of replies was for phase I at 53.84% (total percentage for 3 sub categories), followed by phase III at 46.15% (total percentage for 2 sub categories). The next phase was phase IV at 38.46% (a total of 1 sub category), followed by phase II at 30.76% (a total of 2 sub categories) and finally phase V with 23.07% (1 sub category). The result for topic 2 revealed different Interaction Analysis pattern compared to topic 1, whereby phase III, IV and V has higher percentages compared to the percentages for the three phases in topic 1.
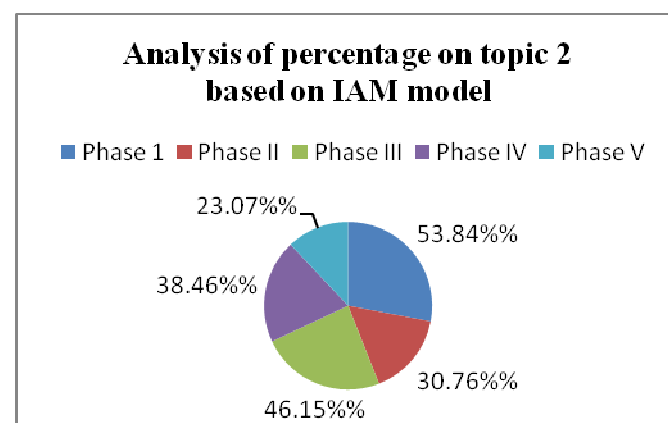

Figure 3: Results for Interaction Analysis Model for Topic 2

The content analysis of the students' discourses based on the IAM model (table 5) lead to the conclusion that the students were more confident in discussing the topic. This explained why there was higher percentage for phases III, IV and V for topic 2 compared to topic 1. Their increased confidence level resulted in negotiating meaning and testing of knowledge against 'received fact' which was presented and discussed in the class, and hence, led to knowledge building. In fact, the student's initiative to post a topic is indicative of the students' motivation for learning and testing of knowledge against existing cognitive schema.

Table 5: Content Analysis of IAM model: the 5 phases

Phase I-sharing/comparing of information   A total of 7 postings with 2 sub categories: B & D   **Corroborating examples provided by participant (B), e.g:**   *Your example is good but I think you have too many non-linguistic behavior that can't be as utterances.*   **Asking & answering questions, to clarify details or statements (D),** e.g;   *Could you explain or elaborate your opinion that speech event isn't part of speech act?*
Phase II – discovery & exploration of dissonance or inconsistency among ideas, concepts or statements   A total of 4 postings with 2 sub categories: A & C.   **Disagreement (A),**e.g: *I disagree with you because speech act is closely tied to culture"*   **Restatement of position on topic, by advancing argument (C)**, e.g: *Let me explain. I think SA theory has limitations too for instance, how do you consider non-utterances?*
Phase III – negotiation of meaning/co-construction of knowledge   A total of 6 postings with 2 sub categories: B & D.   **Negotiation of relative weight to be assigned by types of argument (B), e.g;**   *This can't be identified as utterance. It indicates non utterance because it's the door bell ringing. It indicates action, not utterance. How would you justify this?*   **Proposals and negotiation of new statements Embodying compromise, co-construction (D),** e.g: *This part isn't apology. It is indirect SA because B is reluctant to help A. This would call for inclusion*

of pragmatics, i.e. politeness.Am I right Dr?

Phase IV – testing and modification of proposed synthesis or co-construction   A total of 5 postings with 1 sub category: A   **Testing the proposed synthesis against received facts (A),** e.g: *lets improve our understanding of the last lecture on Speech Act. How do we apply the structural features of the theory to this dialogue between 2 persons?*
Phase V-agreement statements/applications of constructed meaning   A total of 3 posting with 2 sub categories combined Together: A & B   **Summarization of agreement & applications of new knowledge,** e.g: *L you based it on direct or indirect SA. N you looke from illocutionary & perlocutionary act & a new aspect, culture. Interesting!*

For *Collaborative Behaviour* category, the result in figure 4 does not add up to a total of 100% because the percentages shown are total percentages for the sub categories of the collaborative behavior category. The results (table 6) revealed that feedback giving (FBG) in the contributing category was significantly higher which was at 84.16% than the other subcategories. The other subcategories like exchanging resources and information to assist other group members, RI, accounted for 53.84% and sharing knowledge, SK, accounted for 46.15%. For seeking input, only feedback seeking, FBS behavior was Found which was at 15.38%.
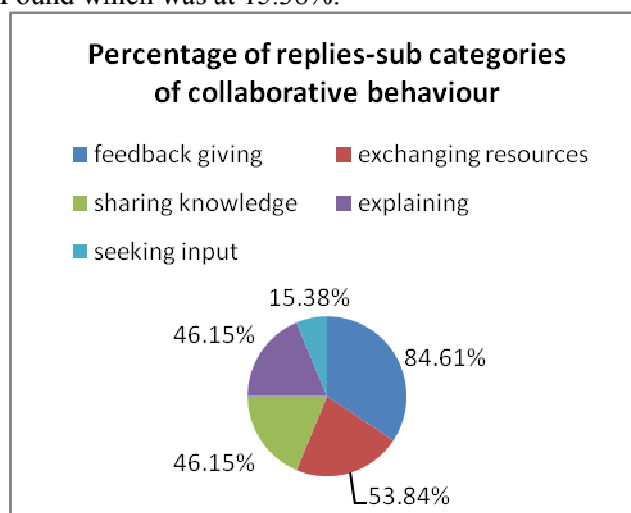

Figure 4: Results for sub categories based on Collaborative Behavior categories

Based on content analysis of collaborative behavior, the students display collaborative behavior in seeking and constructing knowledge, through various means of

learning behavior as shown in table 6. It is concluded that online discussion forum has provided a platform for the students to make sense of what they have learned in the lecture and tutorial.

Table 6: Collaborative Behaviour Categories

Type of contribution
Contributing **FBG (feedback giving)** *"You both have analyzed the utterances from different angles. That's good"* **RI (exchanging resources and information to assist other group members)** *"These sites might be useful. It will help with the assignment"* **SK (Sharing knowledge)** *"In my opinion, it depends on the relation between the hearer and the speaker that make them speak like that. It's related to culture"* **Ex (Explaining or elaborating)** *"In the the four examples on demand, it's important to note that we seem to be able to know what to say and when in different contexts. So the utterances have different perlocutionary effect on the hearer"*
Seeking input **FBS (Feedback seeking)** *"Can we improve our understanding of the lecture? Lets try to analyse this dialogue based on it.*

4 Conclusion

The data collected on the two topics posted in the online forum at the beginning of the course revealed that there were instances of agreement, disagreement, explanation and negotiation of meaning, help giving, sharing of knowledge and illustration of understanding as a result of participation in online discussion. This implies that the students were engaged in some fairly deep and thorough review of the topics. Based on the content analysis of the students' discourses, longer postings tended to include support such as personal experiences, references from readings and links to relevant websites. In addition, the students handled the discussion and participated actively throughout the discussion. The lecturer only contributed four times on both topics. Thus, there is clear evidence that the students were involved in collaborative learning as they worked together to develop responses to the topic delivered and discussed in class. Much bridging and triggering occurred in the asynchronous collaboration, through participation and taking responsibility in learning [18]. In fact, it has been reported that the provision of discussing feedback through intergration of ICT in learning could help learners incorporate new information into prior knowledge and promote meaningful learning [19].

The content analysis of the students' discourses also indicated that students were processing the topic delivered and discussed in class at various interaction levels, which is a reflection of their cognitive thinking through collaborative behavior. The result also suggests that in asynchronous discussion, students have more time to process the content before they reply. Their contributions showed they were focused and as mentioned, the replies were supported with readings or links to relevant website which points to the fact there is development of knowledge. Therefore, discussion forum plays an important role in supporting collaborative learning [13]. In addition, the use of technology has been shown to increase not only partipation in e-learning but also that of cooperative learning [18]. Discussions and access to other students which enable the students to learn from other students' experiences will bring about important paradigm shift in teaching and learning [20]. Furthermore, opportunities given to students for collaborative and evaluative learning will help nurture and develop students who are resourceful and more self-directed in learning [20].

However, in concluding this paper, it is important to note that the composition of the students will also determine the success or the failure of the online forum. The students in the present study comprises students who are eager to learn and share knowledge. This is because although they are not graded for participating in the online discussion forum, their contribution to the forum revealed a wealth of discussions that contributed to the writing of this paper.

5 Implications

The findings of this study have raised implications on how online forum discussions can be used to supplement conventional classroom setting. As the results revealed, the forum give students more time to reflect on the course content, make evaluative comments and constructive contributions. It has been shown that the students have more time to read printed materials and online materials beyond what is given in the classroom. This result is consistent with the results of previous studies [21] [22]. But including online discussion forum does not automatically ensure increased learning in students. Considerations for the environment and the user actions which lead to achievement of a specific goal must be clearly outlined [23]. This means that the design of the online discussion forum needs to take into account the essential structured environment in order to help

WSEAS TRANSACTIONS on COMMUNICATIONS

Nor Fariza Mohd. Nor, Norizan Abdul Razak, Jamaluddin Aziz

improve the quality of learning and construction of knowledge. One such example is a multi-agent model proposed for argumentation and dialogue in e-learning which help encourage collaboration with the tutor and with other learners in order to make learning more realistic and more stimulating [24].

Therefore, based on the findings, it is suggested that more systematic studies concerning designing appropriate tools within discussion forums to ensure better learning for students in order to take full advantage of these evolving IT resources need to be carried out. It is a challenging task but one which has positive role and impact for students and lectures in promoting and encouraging higher level learning competencies with the use of technology.

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