INCORPORATING WEB TECHNOLOGY IN FACE TO FACE COOPERATIVE LEARNING IN AN ENGINEERING COURSE

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Abstract

Traditional and monologue type of teaching and learning environment has been at the saturated stage. The teachers and students have shown their indifferences toward teaching and learning process. New approach, which requires students' involvement in learning process, was introduced.

Peer based learning activities through face-to-face interaction have been introduced to students. Variety of learner centered learning activities was developed and it has contributed in developing new learning culture to the students, i.e. collaborative and shared out attitude towards each other. Applying the Web Technology to this cooperative learning environment promotes more active and personal learning experiences to each individual student. Through threaded discussion facility students are able to evaluate, comment, share and enrich other ideas, opinions and problems.

Web technology supports the face-to-face cooperative learning, as students are able to keep their group and class learning activities on beyond their scheduled formal class meeting. Variety teaching-learning scenarios certainly play prominent role to this group activity.

Keywords: Web-based learning, Instructor centered learning, Student centered learning, Private/closed conference, Opened conference, Threaded discussion.

INTRODUCTION

Most of the courses at the higher education level are conducted by using the instructor centered learning (ICL) approach. One way and monologue communication from teacher to students is the most common teaching method in most classes at any institutions in Indonesia and perhaps in other countries as well. The fact is that what routinely goes on in most college classes is not teaching and learning, but stenography: professor transcribes notes from notebook to chalkboard, students transcribe from chalkboard back to notebook (Felder & Brent, 1994).

In the 1999 1st semester, I taught an introductory course in digital to sophomore students at the department of electrical engineering. A participatory and student centered approach had been applied and implemented. A teaching and learning model, which invites student actively to participate in the learning process through several peer-group activities, was introduced and implemented in the courses. Shifting interaction was dynamically conducted. It varied from instructor and group interaction, instructor and individual student, and lastly, student and student interaction. Through these interactions student was accustomed to participate in and contributed to the class learning process. Student had learned from each other and instructor was no longer expected to be the solely information resource to tap in.

After introducing the cooperative learning through peer-based activity successfully, in the 2nd semester I started incorporating the web technology into this SCL model. The selected course for this experiment was a more advanced elective digital course. Various learning activities in this active learning model such as discussion had been carried out beyond the regular, formal class session. Web-based discussion media were used to support student and instructor's need to communicate each other during their teaching and learning process. This paper describes the important issues, which should be incorporated in implementing web-based learning to support face-to-face cooperative learning environment.

PURPOSE

After having the experience in such a dynamic and participatory learning environment, students were expected to become better communicator. Expressing ideas and responding actively to any learning situations should have been easily noticed on some of the students. This was a pleasant experience that ever happened in my professional teaching experience to see student involved and participated actively in class. That was indeed a rare view.

This advanced digital course was designed and delivered in two ways of interaction. Traditional face-to-face interactions were conducted, and applying web-based learning media for further deeper discussion was also facilitated. Combining the web-based learning into this active face-to-face learning model was conducted for the following reasons:

1. Discussion and communication in this cooperative learning normally consume lots of time. It is almost impossible to provide additional time slot for continuing their discussion further beyond their face-to-face regular session. By applying web technology into this course, students could continue their discussion at any time and any places.

2. To promote internet technology to support student's learning process. This is a good opportunity for the department to invite students to use computer technology more often as an alternative tool to access information. The increased skills in operating computer will response to our new curriculum that demands for computer literacy as basic competencies.

3. To develop an alternative learning media that could reduce student's boredom in their routine daily traditional learning environment. As communication could be accessed anywhere at anytime, it is expected to be able to reduce student's surfeit in attending class.

PEER LEARNING ACTIVITIES

Most of the learning activities were conducted in-group. Normally they are allowed to choose their group member who they think they could work best with. There should not be more than six people in a group. This limited number of students in a group is set to make the interaction among them more intense.

Working in-group doesn't mean just for doing things together (Lawanto, 2000). To facilitate fruitful and dynamic group activity, a good working scenario was essential. A well design-working scenario played an important role to their learning outcome. The scenario should include information describing the role for each member to play, the expected outcome from each group, the time length for the discussion, and other necessary issue students need to know prior to virtual interaction.

As Gavriel Salomon (1992) stated the real collaboration requires a genuine interdependence. There are three characteristics to a genuine interdependence. First, the need to share necessary information, meanings, conceptions, and conclusions provided by the member of a team. Second, the division of labor among team members whereby roles complement each other in a join endeavor, the end product of which requires this pooling of different roles. Third, the pooling together of minds, that is-the join activity of thinking in explicit terms that can be examined, changed, and elaborated upon by peers.

During fac- to-face session, I started session with a short brief or lecture. Simple question and answer session could follow, students are encouraged to comment or convey their opinions during this session. As it was inspired by the experiences of Felder (1995), in my class -there were activities such as recalling prior material, responding to questions, problem solving, working through derivations or text material, analytical/evaluative/creative thinking, and generating questions were implemented in the course.

HYBRID MODEL: FACE TO FACE AND WEB-BASED INTERACTION

This digital course is a design-oriented course- students are expected to understand the concept for various topics and design project on the advanced digital circuit. Students are engaged in various learning activities individually and in group- face-to-face and virtually through web.

As mentioned earlier, face-to-face interaction is essential to build social acquaintance among students. For this purpose, the first two weeks I had delivered the teaching through face-to-face sessions. During face to face session, key-points, or important issues for particular topic is brought up. Face to face session is also scheduled if students experienced problem and need to clarify particular topic with their friends or me physically. As shown in Figure 1, a learning activity model is designed to facilitate such students and instructor to communicate to each other throughout the course. In general, virtual interaction with their virtual group through web is conducted after I have provided enough information to start with for further discussion or introduce new topic/chapter.

Students are expected to participate in both face to face sessions as well as in virtual interaction. I have decided and informed to the students that any tasks done through face-to-face session is 50% and any activity conducted through web contributes the other 50% of their total score. This proportion of evaluation weigh is informed at the beginning of the semester.

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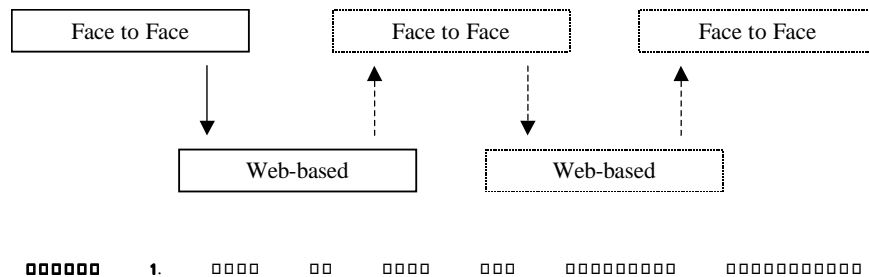
The schedule for both types of activities has been set prior to the course and was informed to the students. However, any necessary face-to-face meeting can be arranged depending upon any group needs. All face-to-face sessions are informed to all students.

LEARNING THROUGH WEB: LEARNING ACTIVITIES

As students are expected to work collaboratively in the virtual realm, building a solid team is an important factor to maximize their work effectiveness. Knowing the classmate in such a personal way is essential. Several early face-to-face meetings are meant for that purpose. The sharing and discussion among participants would be at greater intensity once participants had acquainted among themselves.

Implementing web-based learning is not just putting course materials into the web. Appropriate and well-thought instructional model must be prepared prior to the implementation phase. Figure 2 shows variety of learning activities, which is conducted throughout the course. Activities from question and answer (Q/A) to study case or problem solving are done virtually. Normally, I started with reading assignment then I posted several key issues related to the assigned reading on the web. Students were expected to post their opinion or give comment to other's opinion for that specific issue.

More serious tasks such as problem solving or project assignments are delivered through this web media. Each group solves the same problem privately, which means that only their peer members will be able to participate in the discussion. After having solved the problem, each group is invited to post their group solution to the class. Since this was a class presentation, thus everything is opened and accessible by all students.
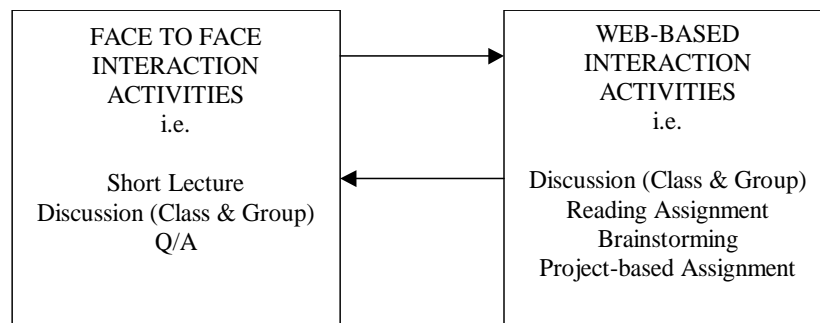
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┌─────────────────────────┐          ┌─────────────────────────┐
│    FACE TO FACE         │ ───────▶ │     WEB-BASED           │
│    INTERACTION          │          │     INTERACTION         │
│    ACTIVITIES           │          │     ACTIVITIES          │
│    i.e.                 │          │     i.e.                │
│                         │          │                         │
│    Short Lecture        │ ◀─────── │  Discussion (Class & Group) │
│  Discussion (Class & Group) │      │   Reading Assignment    │
│    Q/A                  │          │    Brainstorming        │
│                         │          │  Project-based Assignment │
└─────────────────────────┘          └─────────────────────────┘
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Figure 2. Activities through face-to-face interaction and web

Another model popularly used is a mosaic model. One big project is divided into several smaller tasks. Each group did one piece and at the end all group solutions are presented and evaluated together. Student is invited to evaluate and learn how other group work fitted in and contributed to the project. Very enriching discussion is observed through this model. Enthusiasm in working collaboratively among peer is shown as each group has contributed to the total solution of the assigned project.

For any activities which student's response are acquired, a specific timeline for that particular task have to be provided. This timeline definitely helps to keep the interaction moving among students. Figure 3 shows a Q/A model of which have been implemented virtually in this course.
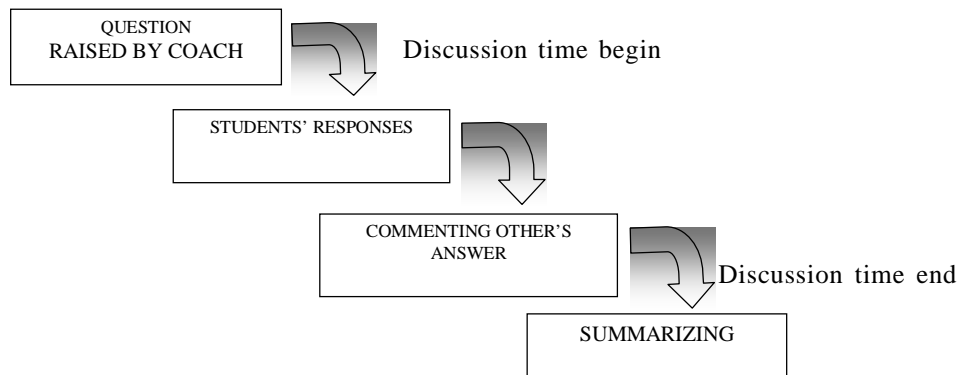
Figure 3. Web-based Question & Answer Model

Any virtual discussion can be conducted synchronously as well as synchronously. Students are expected to discuss a specific topic through threaded discussion. They are encouraged to give their opinions and criticize other student's opinion or answer by replying the message in the specific forum.

During working with their virtual groups, students are able to communicate to their peers, other group members and as well as with me as their instructor. Figure 4 represents all the possible ways for each student to interact to each other. Communication among peers was closed, which means their conversation will not be possible accessed by other group. While as a participant of the class, each student will also have access to interact to communicate with other student or me individually. This communication scheme replicates real face-to-face communication in regular classroom.
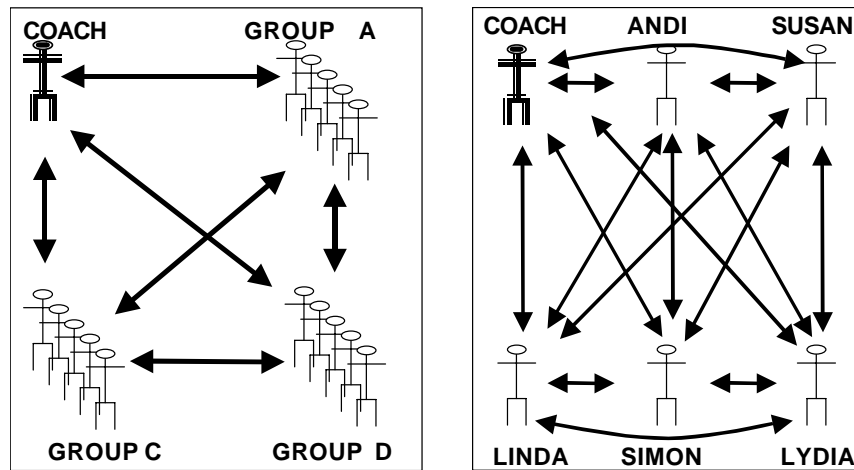
Figure 4. Communication during virtual discussion

COLLABORATION THROUGH VIRTUAL INTERACTION

The students are provided with online computer and internet accesses. Each student is provided with unique login name and password to enable him or her to connect to one of our department servers. A collaborative tool, WebBoardÔ has been installed in our server to facilitate student virtual collaborative work for this course.

There are two types of forum, later referred as conferences, which enable students to work collaboratively throughout the course. Those two types are private or closed conference and opened conference. Private or closed conference was a conference, which can be accessed by the particular authorized users while all users who authorized to access to the board can access opened conference.

Any course material, which should be accessed and responded by all students, should be posted in the opened conference. In the contrary, discussion among peers in a group should be done in a private conference. As shown in Figure 5, a problem solving is done by individual group at their

private conference and then presented to the whole class through class conference.
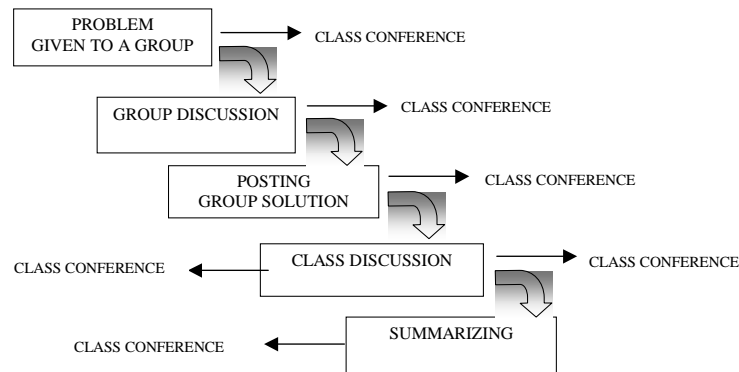

Figure 5. Division between private and opened conference for problem **solving**

As in a real classroom situation, social interaction for social chat and discussion should be facilitated in this virtual realm. A social forum by setting-up a dedicated opened conference just for that purpose ought to be considered. The outlook for such conference and virtual discussion is shown on Figure 6.

Students share and discuss for certain topics of interest through this threaded discussion media. They can reply a message that has been posted to give their comment, or if a new topic of discussion needed to be brought up, they could also post a new message. Threaded discussion has played a prominent role in this collaborative learning and sharing activities. The idea of this learning situation is to learn from each other through posting any finding, difficulty, opinion and critic.

Any activity such as brainstorming, case study, group critique or simply

question and answer should be bounded by timeline. The instructor must give specific due date for a particular activity. This time limit forces students to start working as soon as possible. Other student cannot duplicate the work from the student who has posted his/her opinion earlier on the board. This fact eventually influences student to participate in any activity as early as possible.

As the students need to communicate synchronously they should first make an appointment with their peers to conduct such a virtual chat. They should select a chat room as part of their discussion arrangement.

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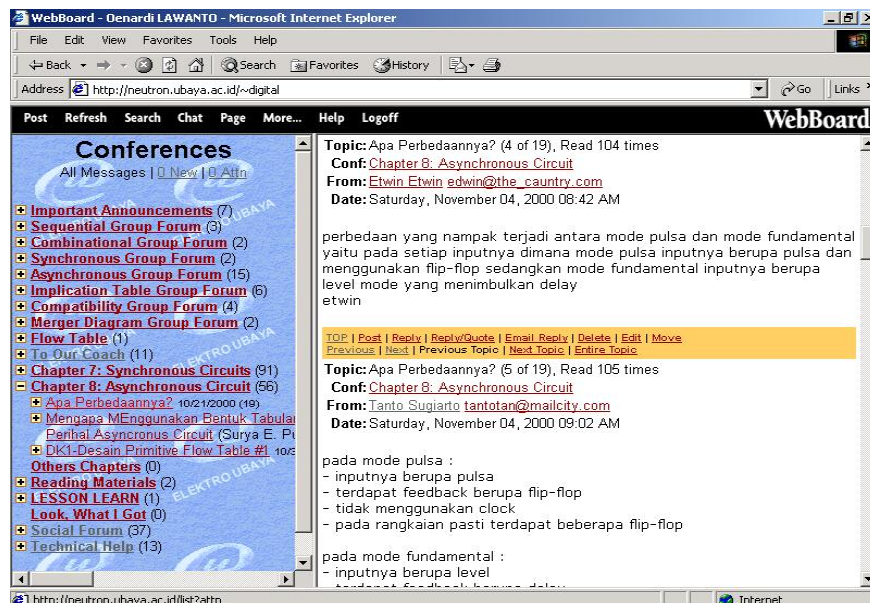
MOTIVATING THE STUDENTS: COMPETITION AND INCENTIVES

Successful web-based training courses rely on the self-discipline and

focus of motivated learners (Horton, 2000). As this course is designed to be student-led learning therefore student's motivation plays an important role to student's success. Web-based learning indeed demands high level of motivation, but we cannot depend on learners bringing all the required motivation with them. I have to build motivators in the course design.

There are two motivators that had been purposely implanted in the design. First, it was the recognition given by student to student. Others evaluate any accomplishment or good response or answer posted on the board. Students are invited and encouraged to post and shared idea to their friends. Second, to boost their spirit to compete among groups and among themselves, I provide several gifts for two categories. For the best group poster – each member of the group will be rewarded. In addition, each student is evaluated for his/her own poster – and he/she will be rewarded for the accomplishment.

Students do the selection and nomination for the best group poster and the best individual poster. I give opportunity to students to evaluate each of them whom they feel have contributed greatly for their learning process throughout the semester.

DISCUSSION AND CONCLUSION

The instructional approach used in this course has the following principal features:

1. Minimizing the instructor's role as the source of all knowledge and putting more of the burden of learning in the students.
2. Varying the types of questions: usual quantitative problems, brainstorming and ask questions routinely requiring explanations of course concepts.

As the course started, students need to be informed in regards of this combination delivery method used in the course. Since in this teaching methods, the students need to know each other more closely to enable them

interact successfully in their learning process. This session is given first before they come into the non-verbal communication. By this way, the students will have an exact description about other members whom they communicate with through the non-verbal communication. This session is important to enable the students to know their friends better. Thus, by having face-to-face interaction, they are expected to get acquainted and ready for their future virtual learning activity. For that reason, I suggest to schedule a few of face-to-face session prior to the distance mode learning activity.

Through web based learning, the interaction between instructor and students is done privately- it implies that the instructor should spend more effort and time to each student individually. As more students have participated in the discussion, I have to read and give comment, if necessary, to each one of them. The fact that I had to work harder had been said by David Iadevaia – lacking face to face contact with instructor, learners demand more virtual contact with the instructor (1999). This fact has completely removed the "image" that implementing web-based learning would lessen the instructor's work. Generally speaking, I needed to spend 1 up to 2 hours a day to check and response to the students' entire interaction.

Students expected quick response from the instructor, this expectation has made me to response as soon as possible to whatever it requires me to comment. More than two days in delay seems not to be acceptable by them. Being late in responding their inquiries can somehow lower their motivation to participate in the discussion.

Communication through web is mostly done in text – it requires certain degree of good reading and writing skill. Interactivity among students depends mostly on these skills. Thus, extra training in expressing ideas writtenly to all early year students might have to be considered in the future. Conducting a special writing training can do this effort.

Nevertheless, I am convinced that the students in this class communicated to each other at higher level than any traditionally taught class I have ever observed. For one topic of discussion there were more than 80 discus-

sions had been conducted in a week. 64% of the total students had participated in the discussion throughout the semester. They became more open to listen and give comment to their peers. The students were also more collaborative in nature as this "new culture" could be noticed through several conferences. They had helped each other by sharing knowledge and information openly. Moreover, I had also noticed that attendance rate during face-to-face session is much higher (96%) compared to the previous semester where this hybrid learning model had not been applied. This fact showed that the student made use of the face-to-face session for their interest more efficiently and effectively than ever before.

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