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Year: 2000

Source: 3rd Western Australian Workshop on Information Systems Research, 27th November 2000, Perth, W.A.

Official URL: <http://wawisr01.uwa.edu.au/2000/WAWISR00.pdf>

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Participation and Reflection in Virtual Workshops

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ABSTRACT

Virtual educational environments, such as WebCT, provide a seamless interface for organising online learning and teaching activities. The rate of diffusion of these new technology-enabled environments in education, however, is so rapid that, quite often, they are adopted without a sound pedagogical basis. One area that is currently under-researched is an understanding of the factors that motivate students to participate. In this paper, we describe virtual spaces for computer-mediated communication, social interaction, and collaborative learning. We propose a pedagogical framework in which the web-based environment is used for both delivery of material and for reflective construction of knowledge. The proposed framework is based on a quantitative and qualitative analyses of student participation.

1. INTRODUCTION

In our changing society, with constant distractions from a myriad of advanced technologies, keeping the student motivated to participate in lectures and seminars is becoming increasingly difficult.

Each semester, the lecturer gazes at a growing number of empty seats in lecture theatres. Students are demanding, and receiving, higher quality teaching with access to a wealth of course materials and resources online. To some extent, our very commitment to making lecture materials available obviates the need for students to participate in the traditional classroom. It is not uncommon for slides, streamed audio and video of lectures to be accessible to students from a web-based course environment.

The extensive proliferation of computer media and networking opened new opportunities for fundamental changes in the methods, models and techniques employed to educate and train students and professionals. Web-based course environments, or virtual learning environments, provide an attractive interface for information dissemination, but are often adopted because of their technical innovativeness and social interest, and little thought is given to integrating the media with learning objectives and pedagogical strategies.

Most of the early Web-mediated online courses were designed to complement conventional methodologies for dissemination of course materials, connecting

students to various online multimedia learning materials. The web-mediated environments were regarded as tools for course delivery in which the students' role is primarily a passive one and their responsibility limited to daily monitoring of activities, downloading material, and contrived discussions on bulletin boards. These courses did not utilise the communication potential of internetworked computers and there were hardly any changes in the teaching and learning methodologies, including student monitoring and evaluation techniques.

However, more than any other teaching media, virtual learning environments have the potential to fully exploit theories of social and active learning through communication and collaboration.

In this paper we describe a learning scenario designed to facilitate student construction of knowledge through participation and reflection. The scenario uses a virtual learning environment for course structuring and communication. The current research develops a framework for evaluating the pedagogical impact of the learning scenario on student motivation and participation. New directions for data visualisation methods in virtual learning environments, which identify potential problems and bottlenecks during the course, are suggested.

2. VIRTUAL LEARNING ENVIRONMENTS

The term "virtual learning environment¹" is used to describe a server software, dedicated to the design, management and administration of computer-mediated learning, including delivery of course materials, support of course communications, student management, tracking and evaluation.

The environment for the learning scenario described in this paper is WebCT², which is one of the major commercial products of its type. WebCT integrates four types of learning tools: *resources* (lecture notes, assignment guidelines, readings, links to other web sites); *communication tools* (bulletin board, chat room, private email, calendar); *instructional tools* (glossary, surveys, quizzes); and *management tools* for tracking student progress and interactions. It is platform independent and is accessed using a web browser.

These new educational environments use extensive computer-mediated communication and collaboration during the learning process. However, the educational models used by the course developers in these environments are heavily influenced by the traditional distance education methodologies, based on exchange of documents - learning materials, project assignments and research work. The emphasis remains on the delivery of course materials and knowledge management through asynchronous communications. On the other hand, the computer media provides a means for extensive and detailed documentation of activities in the learning environment, including synchronous collaborative learning. This information can be employed for assisting student monitoring and evaluation.

According to Vygotsky (1978), for example, thinking and problem-solving skills are developed within a Zone of Proximal Development (ZPD). The ZPD is a

¹ Other terms used are "flexible learning environment", "on-line learning environment", web-based educational environments".

² Other products that offer similar sets of features are TopClass, FirstClass, BlackBoard, Lotus Learning Space.

zone of socio-interactive processes in which independent skills are developed through collaboration. He defines three types of skills: (i) those skills that are acquired without assistance, (ii) those skills that are never acquired even with assistance, and (iii) those skills that are learned with assistance. Expanding on Vygotsky's theories, Tiffin and Rajasingham (1995) interpret ZPD as the difference between what people can do on their own and what they could do with help from people more experienced than themselves. The purpose of educational methodology is to provide that assistance to the learner. The purpose of the educational environment is to enable that provision.

Tiffin and Rajasingham (1995) specified an extended ZPD as a four component model: (i) someone in the role of learner; (ii) someone in the role of teacher; (iii) something that constitutes a problem which the learner is trying to solve with the help of the teacher; and (iv) the knowledge needed to solve the problem. Consequently, the educational process can be regarded as a two-way interactive communication between people who have roles as teachers and people who have roles as learners. Such communication enables teachers to assist learners to solve problems that they would not be able to solve by themselves. In this paradigm, teachers are regarded as facilitators in the student active-learning process. Teaching is regarded as a team activity and learning as a group activity.

Studies using virtual learning environments as agents to traditional teaching techniques indicate mixed results. Ciba and Rakestraw (1998) used the communication tools in an unstructured way. Bulletin boards were used by faculty and students for notices and messages. Chatrooms were used for online office hours. Students considered these facilities were not useful. They did, however, find the online exam feature useful.

The results of a survey by Morss and Fleming (1998) were more favourable with 72% student satisfaction with the bulletin board, 49% satisfaction with the chat room, and 63% satisfaction with the quiz. Again, there was no structured use of the bulletin board and chat rooms. Although students were enthusiastic about virtual learning environments generally, they felt the environment did not increase, or even maintain, interest in the course subject matter.

These studies do indicate that new pedagogical strategies need to be devised to fully exploit the learning potential of web-based educational environments – strategies that are directed at developing reflective construction of knowledge and active participation. Used only as an adjunct to traditional teaching methodologies, these environments do little to enhance learning efficacy.

The potential of these environments is far from being fully exploited. Networked computer media challenges traditional education methods, bringing new course models and scenarios. Two specific areas that need to be exploited far more are:

(i) *Reflective learning through participation*

New pedagogical strategies need to be devised to fully exploit the learning potential of these educational environments – strategies that are directed at developing reflective construction of knowledge and active participation.

(ii) *Student evaluation through documentation*

The computer media provides a means for extensive and detailed documentation of activities in the learning environment. This information can be employed for assisting student monitoring and evaluation.

3. THE LEARNING SCENARIO

The learning scenario was developed initially for a postgraduate course at Sydney University in 1998 and evaluated with a number of quantitative analyses of communication (Simoff and Maher, 2000). It was modified and trialled for an undergraduate course at Murdoch University in 1999. Further modifications were made and the scenario was implemented again in 2000 at Murdoch University with a class of 105 undergraduate students in the Information Systems program.

The course design has two key components:

1. weekly virtual synchronous workshops; and
2. collaborative development of a portal as a shared resource.

Both components are designed to facilitate the students' construction of knowledge through participation and reflection. There are five areas of assessment:

1. participation in weekly workshops
2. moderation of one workshop
3. weekly reflective journal which includes:
 - a. critique of readings
 - b. comments on a weekly topic question on the workshop topic
 - c. URLs relevant to the topic question
 - d. reflection on the workshop discussions
4. project (research essay) on one journal question
5. exam

The course home page (Figure 1) was designed to simplify access and navigation. It features navigational links to the unit outline, the lecture schedule, the portal, unit materials, workshop rooms, bulletin board, email and calendar. The hub of the site is the Unit Material area where resources, learner support and assessment materials are archived (Figure 2).



Figure 1. The B230 Organisational Informatics Home Page.

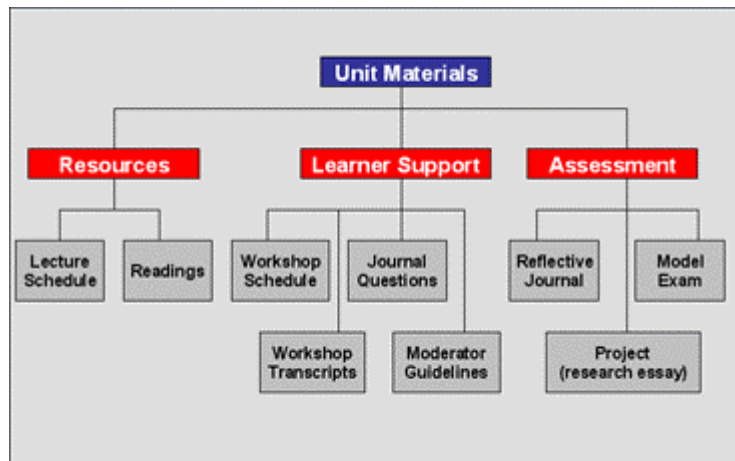


Figure 2. The hub of resources.

The dilemma, though, is how to facilitate and motivate student participation in a group activity such as the workshop. “Hitchhiking” is a common feature of team projects, where some team members do not fulfil their responsibilities yet they are awarded the same grade as their more responsible counterparts (Kaufman, Felder and Fuller, 1999). “Lurking” is a feature of discussion groups where some subscribers passively read posts but fail to contribute to the discussions. Similarly, in the virtual workshop, it is all too easy to log on and create a presence but take no part in the group activity.

The learning scenario (Figure 3) that is used to facilitate and motivate student participation is a cycle of interpretation, evaluation and reflection of content evolving into individual and shared knowledge.

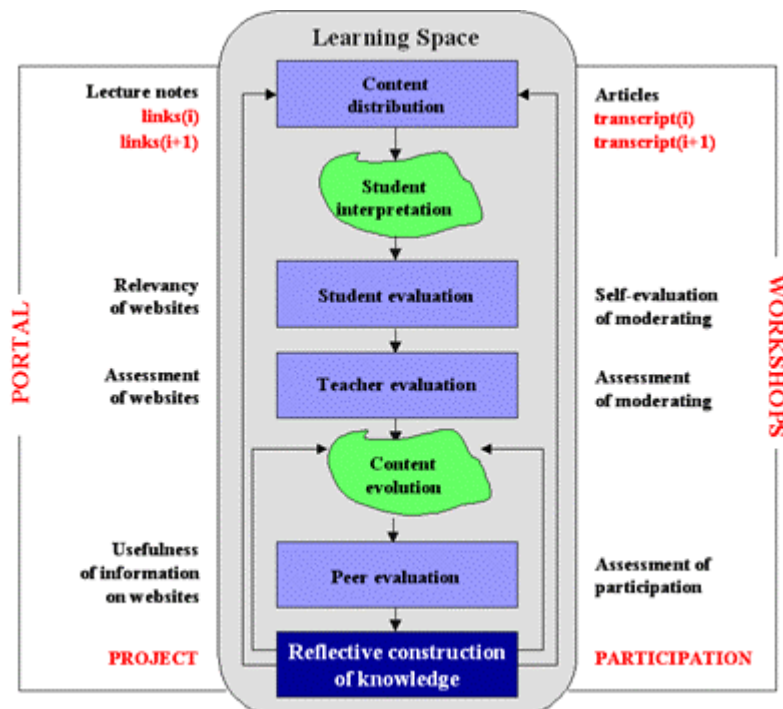


Figure 3. The learning scenario.

3.1. The Virtual Workshop

The course design includes a collection of papers dedicated to particular topics and a discussion series on the corresponding topics. Each workshop is devoted to a particular topic that is complementary to lectures and course materials. The WebCT chat rooms are used as virtual spaces (Harasim, 1999) for the weekly workshops.

Each week, each student is required to read two or three set papers related to that week's lecture topic and one student is selected to lead the discussions. The actors in the scenario, therefore, are the instructor (facilitator), the discussion leader (moderator), and the students. Guidelines for moderating, based on evaluation criteria, are available for the students to download from the web site. The students are asked to prepare a text file of a brief review of the articles, and to copy and paste a paragraph at a time into the chat room window. They are encouraged to read the articles critically and express their own opinions. Their review is interspersed with questions that bring out the main issues of the articles and are intended to stimulate discussions.

The workshop discussions are automatically logged in WebCT. At the end of each workshop, the logs are downloaded. Extraneous data, such as students practising the cut and paste facility, false entries, program bugs, are deleted. The cleaned file is then uploaded to the unit material archive.

Transcripts are then available for students to read and reflect on each week, and also available to students who were unable to attend the workshop.

The reflection on the discussions is an important feature of the workshop design as it reinforces the learning that occurred during the workshop, provides the opportunity for self-evaluation and thus improvement in subsequent weeks, and provides a feedback mechanism for the lecturer.

3.2. The Portal

The second major component of the course design is the development of an Organisational Informatics portal.

Each week, students respond to a topic question. The question is a controversial issue related to that week's lecture material. The students are required to research the question on the web and provide an online reference or relevant web sites. Example questions are:

"Do web cams in offices provide an unobtrusive means of maintaining communication and casual interaction among workers without mitigating privacy?"

"Are transnational communities likely to facilitate their countries of origin to 'catch up' with technological infrastructures? What effect will these communities have on their 'host' countries?"

The web references provided by the students are evaluated initially by the lecturer and added to the portal, then evaluated by students and used as research material for their project.

4. ANALYSIS OF VIRTUAL WORKSHOPS

The proposed framework for the analysis and evaluation of virtual workshops is based on:

1. quantitative analysis of participation,
2. visualisation of collaborative activities
3. correlation of a quantitative analysis and a peer assessment
4. survey

The triangulation methodology and evaluation framework develops further the research work done in the Virtual Campus at the University of Sydney (Simoff and Maher, 2000).

The transcripts of the course discussion sessions can be viewed both as quantitative and qualitative data sets. Sudweeks and Simoff (1998) introduced the Complementary Explorative Data Analysis (CEDA) methodology, which combines quantitative and qualitative methods for doing research in internet-mediated communications. CEDA employs quantitative methods to extract reliable patterns, whereas qualitative methods are incorporated to capture the essence of phenomena. In this methodology, statistics of the utterances in the topic discussions can be combined with a content analysis of the actual content of the utterances.

Data mining deals with the examination of a data source for implicit information and recording this information in explicit form (Fayyad et al., 1996). The process that was developed for mining of seminar data is shown in Figure 4. Data mining involves the identification of potentially useful and understandable patterns in these data.

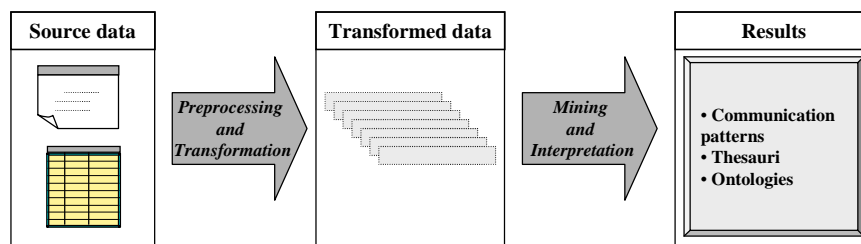


Figure 4. Mining of seminar data.

4.1. Quantitative Analysis of Participation

At the stage of preprocessing and transformation, the transcripts can be represented as a sequence of activities, as shown in Figure 5. In the general case each activity is described by an expression. An expression consists of a subject, who performs the action or the utterance in the activity and an object towards whom the action is directed. The transmission includes (i) a verb, which describes the action or utterance, and (ii) the content of the action.

Using this formalism we can represent, analyse and compare synchronous seminars implemented in different underlying environments. In this paper, we consider only text-based synchronous workshops, conducted in chat-room style facilities provided by WebCT. As all the utterances in a WebCT room are of the type “say” and the utterances are addressing the whole audience, the model {Subject; Content; Verb; Object} in Figure 5 is reduced to the model {Subject; Content; Object} in Figure 6.

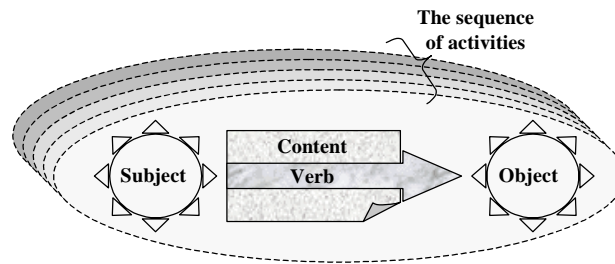


Figure 5. Formal model for representing synchronous seminars.

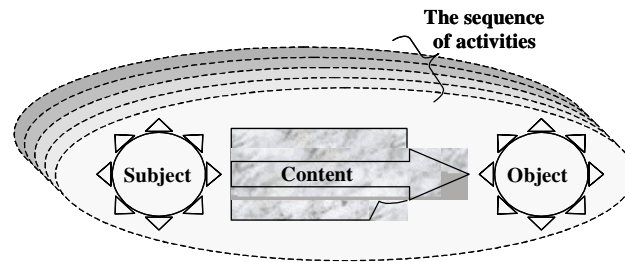


Figure 6. Formal model in Figure 5 adapted for representing synchronous workshops.

Preprocessing and transformation for virtual workshops include:

- Cleaning: all headers and service information are deleted and spelling errors corrected.
- Formatting: The transcript are imported into a spreadsheet in a way that each line corresponds to a single activity.
- Reference normalisation: each participant is represented by only one name spelling in the seminar.
- Role coding: the reference to each participant is coded with his/her formal role in the seminar.

A typical fragment of a workshop discussion after preprocessing is shown in Figure 7. The basic role categories for course seminars include *student*, *moderator* and *facilitator*, described earlier in the paper.

Evaluation is based on various data analysis procedures. There are a number of numerical characteristics, which describe some quantitative aspects of the seminar that can be easily computed from the preprocessed data. The assumption is that the level of activity of each participant is properly related to the number of utterances (action of type “say”). Consequently, the intensity of the seminar is reflected in the ratio:

$$\frac{\text{Number of lines with utterances}}{\text{Total number of lines}}$$

Course: | Seminar: 1

248 MODERATOR>>"Senior managers could claim they were re-engineering their firms, while leaving this to the consultants. The consultants could claim that they had re-engineering methodologies while using their current techniques, and the third interested party, the computer vendors, could sell the new hardware and software essential to the re-engineering process. This seemed to be a win-win situation for all involved."

249 MODERATOR>>does anyone else find that strangely amusing?

250 STUDENT_12>>me! me!

251 MODERATOR>>got any comments about it?

252 STUDENT_5>>win-win situations always make me suspicious

253 MODERATOR>>common guys...make this easy for me :)

254 STUDENT_12>>makes it sound like they're all fibbing to one another!

255 STUDENT_14>>it takes quite a bit of time to digest this win-win situation ...:)

256 STUDENT_5>>hear, hear STUDENT_12

257 STUDENT_12>>and surely a win-win situation for all involved would take a LONG time to make happen?

258 STUDENT_12>>and where is the mention of the plebs?

259 STUDENT_12>>are they winning?

260 MODERATOR>>huh?

261 STUDENT_6>>back to reality guys...chances of win-win situations are low...risk are involved no matter what

262 FACILITATOR>>good point STUDENT_12

263 STUDENT_12>>everybody else involved...

264 MODERATOR>>ohh okay :)

265 STUDENT_12>>i use that word lightly too... :) workers... etc

Figure 7. Preprocessed fragment from a synchronous seminars.

Figures 8 and 9 illustrate individual participation within a group. Estimates are based on utterances after the beginning of the workshop (i.e. they do not include the social “warming-up” period before the seminar). The relatively low participation of the facilitator in both cases indicates good moderation. A visual balance towards the students-moderator part on the radial graphs would have indicated even better moderation.

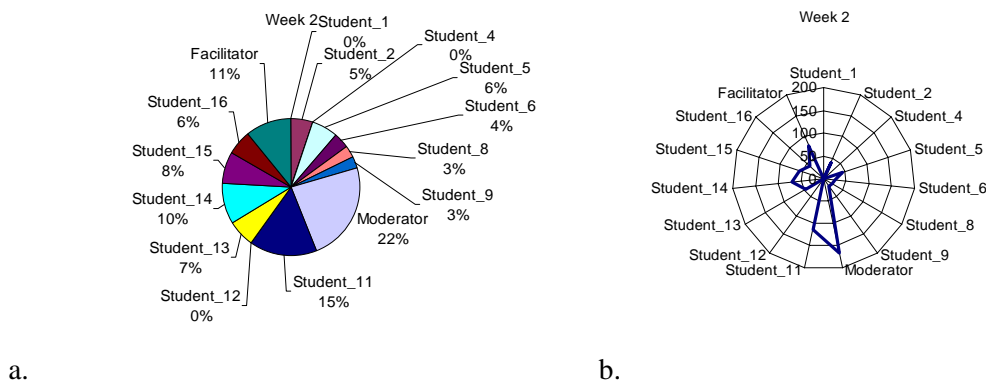


Figure 8. Results for Week 2

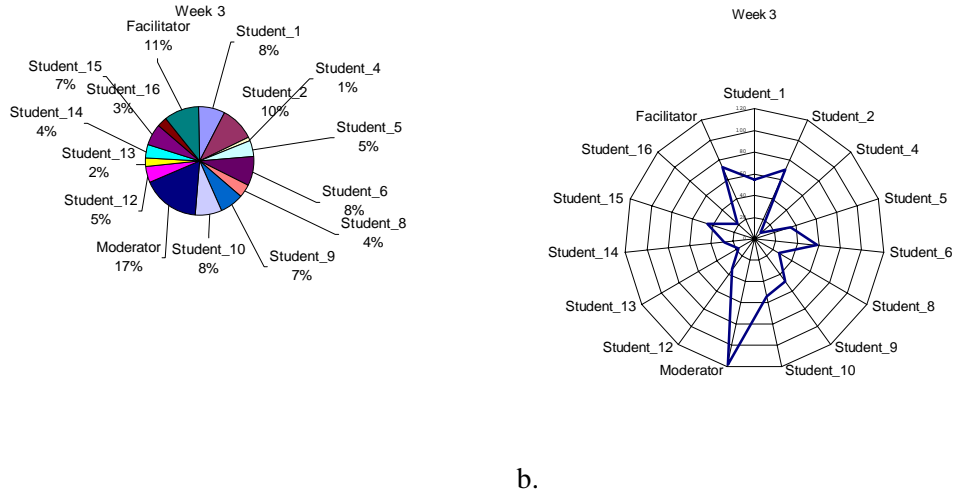


Figure 9. Results for Week 3

Figures 10 and 11 illustrate the individual pattern of two students over the whole series of workshops. The student in Figure 10 maintained a relatively high participation rate throughout the series, whereas the student in Figure 11 dropped her participation dramatically after moderating the workshop. Such on-line visualisation can assist the course coordinator in identifying problems during the course.

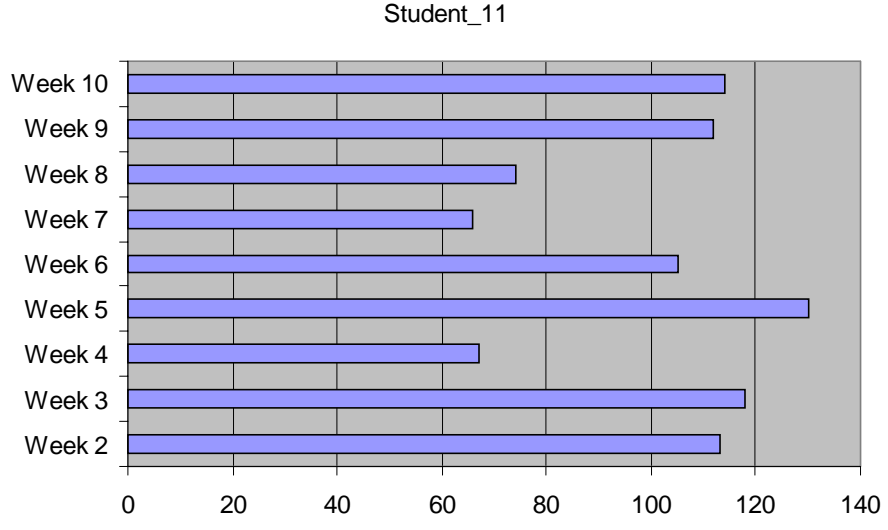


Figure 10. Individual pattern of a student (moderator during Week 2).

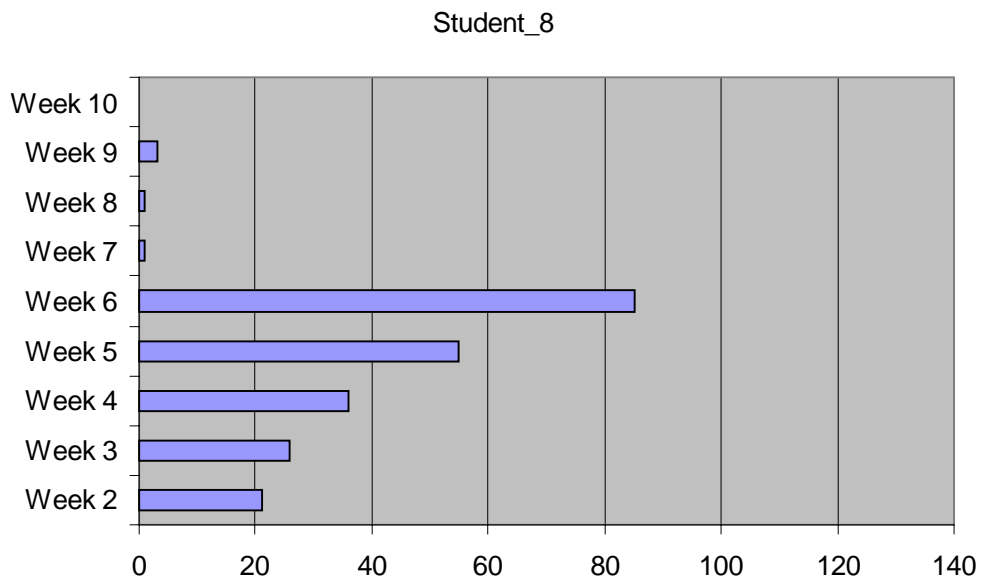


Figure 11. Individual pattern of a student (moderator during week 6).

Line-based estimators of participants' activity could be biased in cases where participants use either very short expressions (1-2 words) or very long expressions (approximately more than 10-15 words). The estimators can be corrected by introducing weights, based on the average length of expressions and length variance. In general, word-based estimators, derived from the total amount of words, alphanumeric and other characters provide an accurate idea about individual and group activities. We illustrate this approach by using directly the number of words in the workshops.

4.2. Visualisation of collaborative activities

The dynamics of the communication can be visualised over the one-hour timeline of the workshop to illustrate individual patterns of participation. The graphs in Figures 12 and 13 represent parallel timelines where each time point corresponds to an utterance. Figure 12 represents the workshop in Week 2 and Figure 13 represents the workshop in Week 3. The graphs illustrate that, throughout the time period of the workshop, there was more even participation in Week 3 than in Week 2, which indicates that moderation was better in Week 3.

Such visualisation of collaborative activities have the capacity of becoming an intrinsic part of the next generation of virtual learning environments and enhance considerably the ongoing assessment and evaluation process.

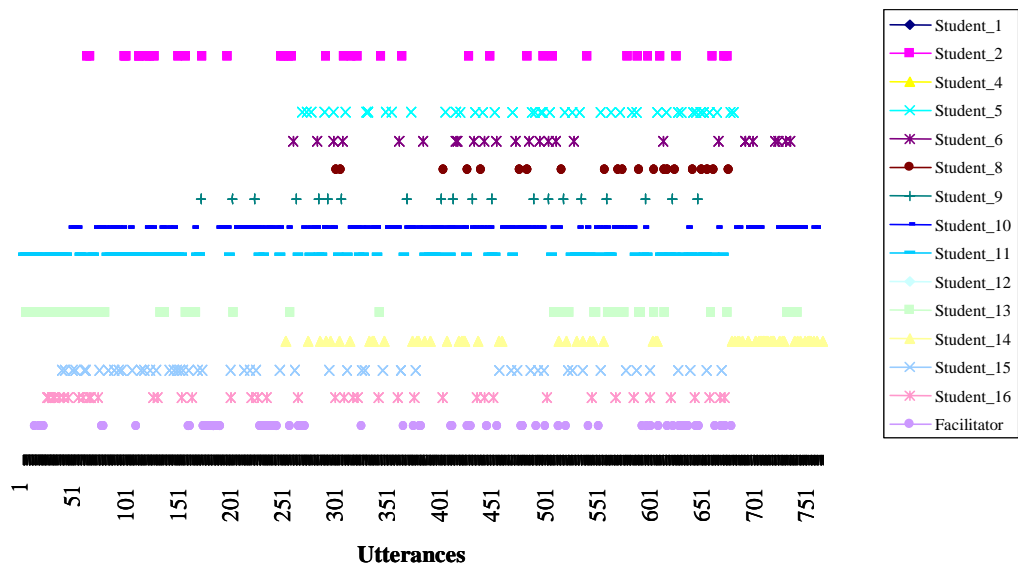


Figure 12. Communication patterns of individual students during Week 2 workshop where student 10 is moderating.

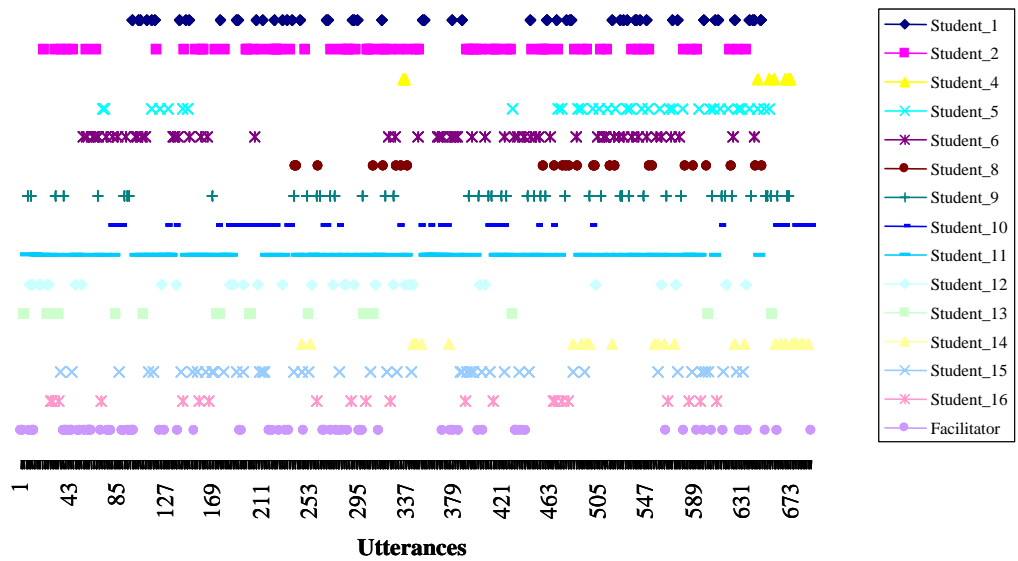


Figure 13. Communication patterns of individual students during Week 3 workshop where student 11 is moderating

4.3. Correlation of quantitative analysis and peer assessment

To determine how accurately the lecturer assessed student participation, the grades were correlated with a peer assessment. Using a peer rating system developed at RMIT (Brown, 1995), students confidentially rated their peers on workshop participation. The students chose from a prescribed list of nine terms ranging from

“excellent” to “no show”. Figure 14 shows a high correlation not only with the lecturer’s assessment but also with the quantitative analysis of workshop discussions.

| | <i>Lecturer Assessment</i> | <i>Participation Statistics</i> | <i>Peer Evaluation</i> |
|--------------------------|--------------------------------|-------------------------------------|----------------------------|
| Lecturer Assessment | 1.00 | | |
| Participation Statistics | 0.72 | 1.00 | |
| Peer Evaluation | 0.93 | 0.74 | 1.00 |

Figure 14. Correlation of lecturer’s assessment of participation, participation statistics, and peer evaluation.

4.4. Survey

At the end of the course, students were asked to complete a survey rating of their perceptions of the virtual workshops for effective learning. According to Deci and Ryan’s (1985, 1991) theory of cognitive evaluation, an individual’s motivation is mainly determined by needs of self-determination, competence and affiliation. Feelings of self-determination are founded on an individual’s perception of autonomy. Feelings of lack of self-determination are founded on an individual perception of external induction of normative behaviour. The stronger the perception of self-determination, the more positive impact on motivation. An individual’s perception of self-competence and affiliation similarly affects motivation.

Preliminary results from the survey indicate a high level of satisfaction and motivation. The students reported increased self determination as they could choose their workplace and thus have greater autonomy in time management:

“The good point about having workshops online is that we don’t have to rush to university to attend class, we can just log in from anywhere we are.”

“I was a bit hesitant in the beginning when I found out we had the discussion group exercises. I am very busy in my business and wondered how I would fit in the scheduled interruptions. This week I have found that I am actually enjoying the interruption to my routine and the chance it gives to see others in lively discussion. Others in the office gathered around during this week’s discussion and even one of our long time clients, who dropped by for a chat, became enamoured at the goings on.”

Students felt that the workshop discussions facilitated learning and promoted confidence:

“I realised that after attending these few weeks of workshop sessions, I am actually learning and gaining a lot of valuable knowledge and information. The discussion topics for this unit are very wide and often debatable. Therefore, it provides my group members and me the chance of voicing out our ideas and opinions of the discussed topic after we had done our research and readings.”

"I find the online discussion is a good place to ask questions when you are confused with something. I will never dare to ask questions in an ordinary tutorial class because I am so worried that others may look down on me and feel that I am asking stupid questions ..."

And finally, students also expressed a high degree of affiliation, despite being in a virtual environment. They did not feel removed from peers but felt the virtual environment was more friendly, more comfortable and less threatening:

"I notice that the rest of the group members are getting into participation more ... I feel so proud of my group to have achieved our workshop aims, to learn as we explored topics together ..."

"Although I never see any of our group, or might not get to know anyone personally, I feel that the bond here is better than my other tutorials."

"One thing I found with these workshops is that everyone is much friendlier with each other. Whenever someone enters the chat session, everyone would start to acknowledge each other but this may not be the situation when it is a face-to-face tutorial."

5. DISCUSSION

The results indicate that when virtual learning environments are incorporated into a course design with sound pedagogical foundations, they can assist in the development of students' motivation to learn. Through a cyclical process of interpretation, evaluation and reflection, the collaborative activities enhance the students' construction of knowledge.

The framework of evaluation analyses presented in this paper has the capacity of becoming an intrinsic part of the next generation of collaborative learning environments.

Depending on the course and assessment criteria, workshop transcripts can be extended further. For example, we can consider the ratio of "gestures", abbreviations, etc., over direct speech utterances. A higher percentage of "nod" and "agree" type of communication patterns in activities of particular student can signal that the student is not prepared well for the topic of the discussion.

Further refinement of the evaluation framework involves a content analysis of workshop discussions and the introduction of a coding scheme for separating the utterances related to the topic of the workshop from the social and other utterances, which are not focused on the topic. Simoff and Maher (2000) proposed an open hierarchical coding schema, designed to conduct investigations on an increasing level of detail and utilised the results obtained on previous levels. This technique operates over lines. For example, the workshop activities can be divided initially into two categories - related and unrelated to the discussion, and tagged according to this categorisation. Individual statistics are based only on the lines related to the workshop. Statistically normalised estimates of topic related and social utterances estimates and ratios between them can draw quick pictures about the workshop.

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