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Using Wikis for Collaborative Learning: a Case Study of an Undergraduate Students' Group Project in Hong Kong

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Abstract: This research investigates the use of wiki in a collaborative project by undergraduate students in a university in Hong Kong. The wiki contents and work patterns of undergraduate students who were engaged in a collaborative group project were examined and MediaWiki's potential for knowledge building was explored. Over a period of three months, 21 undergraduate students in a Knowledge Management course were divided into four groups. They used MediaWiki as a collaborative platform for communication and for working on a group project. After completion of the group projects, wiki log data were collected from MediaWiki, which included the number and dates of contributions, version changes, and discussions. Data obtained from the wiki logs were analyzed using a combination of quantitative and qualitative methods. The findings provided a deeper understanding of the usability of wikis in collaborative group projects in tertiary education.

Keywords: collaborative learning, knowledge building, web 2.0, MediaWiki, wikis, higher education

1. Introduction

Web 2.0 has become widely known through the spread of Internet applications such as blogs, wikis, social spaces and podcasting over the decade (Richardson, 2009). It has transformed not only the people's perceptions of the use of the Internet, but also the way information is organized on the web. More and more studies on Web 2.0 and its possible educational uses are being carried out, and there is evidence that Web 2.0 applications like blogs and wikis are potentially useful for teaching and learning across different educational levels (Churchill, 2007). Wikipedia is one of the examples of wiki use by the community and sets an example of how collaboration may work among people. Seeing the success of Wikipedia, there is a question of how education might benefit from using wikis for collaborative learning. Although wikis are widely used among ordinary Internet users, the specific benefits from wiki in relation to education are still not very clear and needs further exploration. Educational research could benefit much if a deeper understanding of how wiki can contribute to

collaborative learning is developed. This research study contributes to this area of inquiry, by examining the use of wiki in group projects among undergraduate students. Wiki logs and discussion boards are examined in this study for understanding how students use wiki in their learning process. This study also explores how using wiki can contribute to a learning community in higher education.

2. Literature Review

Wiki is derived from the Hawaiian word *wikiwiki*, which means quick. It was first introduced by Leuf and Cunningham in 1995 and was designed as a collaborative tool on the Internet (Leuf and Cunningham, 2001). Research studies on using wiki have been carried out for almost a decade and they revealed that wiki seems to be an effective tool for collaborative learning and writing (Bold, 2006; de Pedro et al., 2006; Lund, 2008), and also ideal for knowledge creation and management (Bruns & Humphreys, 2007; Nicol, Littlejohn, & Grierson, 2005; Raman, Ryan, & Olfman., 2005;). Moreover, wiki has the advantages of ease of use, and option for updates and editing by contributors with different access rights (Engstrom and Jewett, 2005). In recent years, more studies have focused on the use of wiki in collaborative writing, and it has been gradually extended to educational use (Churchill, 2007; Richardson, 2009). For example, Mak and Coniam (2008) studied the contents and the changes on wiki and measured the contributions by group members among junior secondary students in Hong Kong who wrote reports in wiki and concluded that students wrote better when writing collaboratively in wiki (Mak & Coniam, 2008). Even so, wiki is still relatively new in the academia (Chao, 2007; Schaffert et al., 2006). Trentin (2009) used version checking, tags and evaluated students' level of contributions in co-authoring through incidence matrices showing responses between group members with each element in the matrix weighted by quantity or quality (Trentin, 2009). The patterns of wiki activities and division of work among the group members over time were established.

On the other hand, some studies also revealed that wiki cannot be used successfully without proper prior training (Raman et al., 2005). Mackey (2007) argued that by using wiki alone, students did not necessary learn more effectively. Instead, the use of wiki should be balanced with face-to-face activities in order for communities of practice to function well (Mackey, 2007). Engstrom and Jewette (2005) also observed that interactions among students are not necessarily happening when they use wiki. Furthermore, teachers should set a good model in promoting critical thinking for students in using wiki (Engstrom & Jewett, 2005). Therefore, using wiki in education is not simply a question of using it or not. More importantly, it is associated with planning how to use it with careful consideration given to sound pedagogy.

Most of the studies on wiki in education utilized descriptive research methods using surveys and questionnaires to assess the potential uses of wiki (Bold, 2006; Chu, 2008; Nicol et al., 2005; Raman et al., 2005). Analysis of wiki contents through the change of versions that are automatically logged in the wiki system is rarely found in research studies. It appears that the recent research work on wiki have focused on co-writing of students in primary and secondary schools. Considering the research gap that have been seen to exist, the purpose of this study was to examine the wiki contents and work patterns of undergraduate students by using MediaWiki's system logs in order to understand how students use wiki as a collaborative tool in their group projects.

3. Research Method

Research Questions

This research has the following research questions:

1. How may wikis promote collaborative learning in higher education?
2. What are the roles and work distribution among the group members for wiki project?

Participants

This report is a case study of undergraduate students who are using MediWiki for their group project in a Knowledge Management course at the University of Hong Kong. A class of 21 students was divided into four groups and they conducted research on traffic black spots in Hong Kong as their final group project. Students were instructed to manage their collaborative work for the projects by using MediaWiki, an open source online wiki application for collaboration.

Data Collection and Analysis

The group projects lasted for 13 weeks (from mid-September to early December 2008), and was divided into four phases. Each phase was about three to four weeks. Phase 1 is the preparation phase and the students were required to start data collection and review the literature for their projects. Students conducted their data analysis in Phase 2 and reported their findings in Phase 3. Finally each group submitted a final report of about 3,000 – 4,000 words in Phase 4. Students were encouraged to manage their work on Mediawiki for all phases. The course instructor provided comments and advice on the use of wiki throughout the study period. Moreover, the course instructor gave a template and examples on wiki for students to follow. The students were also instructed to construct their final reports collaboratively on wiki instead of other kinds of word processors.

A mixed methods research design was used to collect both qualitative and quantitative data for analysis. MediaWiki automatically kept track of the contributions made by each member, as well as the version changes of the students' work. By using the wiki logs, the following data were collected: number of contributions over a period of time, flow of the topics of discussion by each group members, level and degree of collaboration among members, division of labor, and interactivity among the group members.

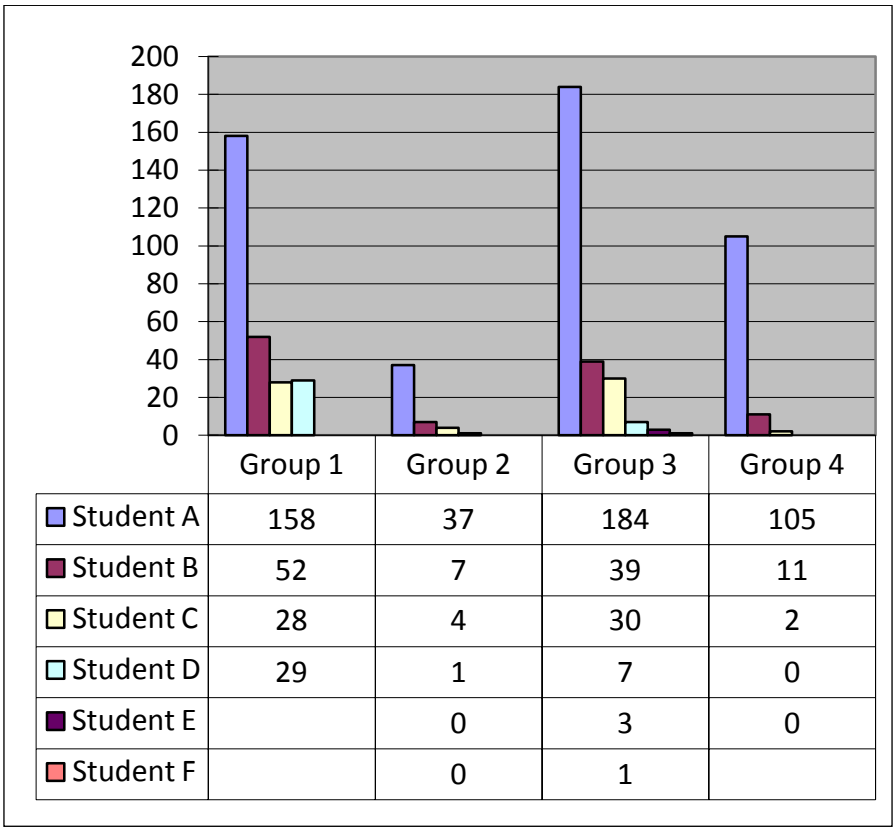
4. Findings and Discussions

Distribution of work

Each group had one group leader who was responsible for coordinating work among the members. Table 1 shows the number of entries contributed by each group member for Groups 1 to 4. The first member in the table is the leader of the group (i.e. student A) and they were the major and dominant contributors to the wiki project in the group. Their contributions ranged from 59% to as high as 89% of the total entries in wikis. In contrast, there were some members who made no contribution at all. In Group 1, although the group leader (student A) like the other group leaders contributed the most in their group, the rest of the group members altogether contributed 40% of the entries in wiki. The workload of Group 1 members were relatively more evenly distributed when compared with the other three groups.

Another interesting finding was that some group members did not have any contribution to the wiki at all. In both Groups 2 and Group 4, two members did not make any contribution to wiki. Further analysis is required to study how the division of work is like in these two groups.

In general, the contributions were not evenly distributed among group members and most of the entries were done by the group leaders.



	Group 1	Group 2	Group 3	Group 4
Student A	158	37	184	105
Student B	52	7	39	11
Student C	28	4	30	2
Student D	29	1	7	0
Student E		0	3	0
Student F		0	1	

Table 1: Number of contributions in wiki

Roles of group leaders and members

All the group leaders contributed to each session in the wiki. The group leaders not only contributed the most number of entries among the group members but also contributed to all the sessions in the wiki. They contributed the most on the "Front page" of the wiki and most of them also contributed more in the sections "Literature Review" and "Research Method" than the others. The rest of the members' contributions were scattered over the other sessions.

The "Front page" shows the overall structure of the wiki project. The "Literature Review" section provides an overview of previous research and states the research problem of the present study. "Research Method" involves the design of the research and describes how the data will be collected. The group leaders played a critical role in writing these three sections

With the exception of Group 1, group members only concentrated only on the sections that they were directly responsible for.

Types of activities in wikis

Group members are authorized to perform various types of editing activities in MedaWiki which can be identified by using the wiki log history.

Table 2 was extracted from the wiki history of Group 4 recorded on September 29, 2008. Two students (group leader and one group member) were working on wiki at the same period of time. They were editing the "Literature Review" chapter together although the group leader still worked for a longer period of time than the group member.

(cur) (prev)	15:49, 29 September 2008	Shelleytsao (Talk | contribs)	(4,237 bytes)	(→BSIM0006 Knowledge Management --Noddy Ng Group's Report)
(cur) (prev)	15:48, 29 September 2008	Shelleytsao (Talk | contribs)	(4,247 bytes)	(→Literature Review (Example))
(cur) (prev)	15:41, 29 September 2008	Shelleytsao (Talk | contribs)	(4,244 bytes)	(→Literature Review (Example))
(cur) (prev)	15:41, 29 September 2008	Shelleytsao (Talk | contribs)	(4,221 bytes)	(→Literature Review (Example))
(cur) (prev)	15:40, 29 September 2008	Shelleytsao (Talk | contribs)	(4,244 bytes)	(→Literature Review (Example))
(cur) (prev)	15:38, 29 September 2008	Shelleytsao (Talk | contribs)	(4,243 bytes)	(→Literature Review (Example))
(cur) (prev)	15:37, 29 September 2008	Shelleytsao (Talk | contribs)	(4,241 bytes)	(→Literature Review (Example))
(cur) (prev)	15:35, 29 September 2008	Shelleytsao (Talk | contribs)	(4,220 bytes)	(→Literature Review (Example))
(cur) (prev)	15:33, 29 September 2008	Wylai5 (Talk | contribs)	(4,203 bytes)	(→Literature Review (Example))
(cur) (prev)	15:31, 29 September 2008	Shelleytsao (Talk | contribs)	(4,227 bytes)	(→Literature Review (Example))
(cur) (prev)	15:27, 29 September 2008	Wylai5 (Talk | contribs)	(4,227 bytes)	(→Literature Review (Example))
(cur) (prev)	15:26, 29 September 2008	Wylai5 (Talk | contribs)	(4,228 bytes)	(→Literature Review (Example))
(cur) (prev)	15:24, 29 September 2008	Shelleytsao (Talk | contribs)	(4,226 bytes)	(→Literature Review (Example))
(cur) (prev)	15:17, 29 September 2008	Shelleytsao (Talk | contribs)	(4,205 bytes)	(→BSIM0006 Knowledge Management --Noddy Ng Group's Report)
(cur) (prev)	15:13, 29 September 2008	Wylai5 (Talk | contribs)	(4,166 bytes)	(→Literature Review (Example))

Table 2: History log extracted from Group 4

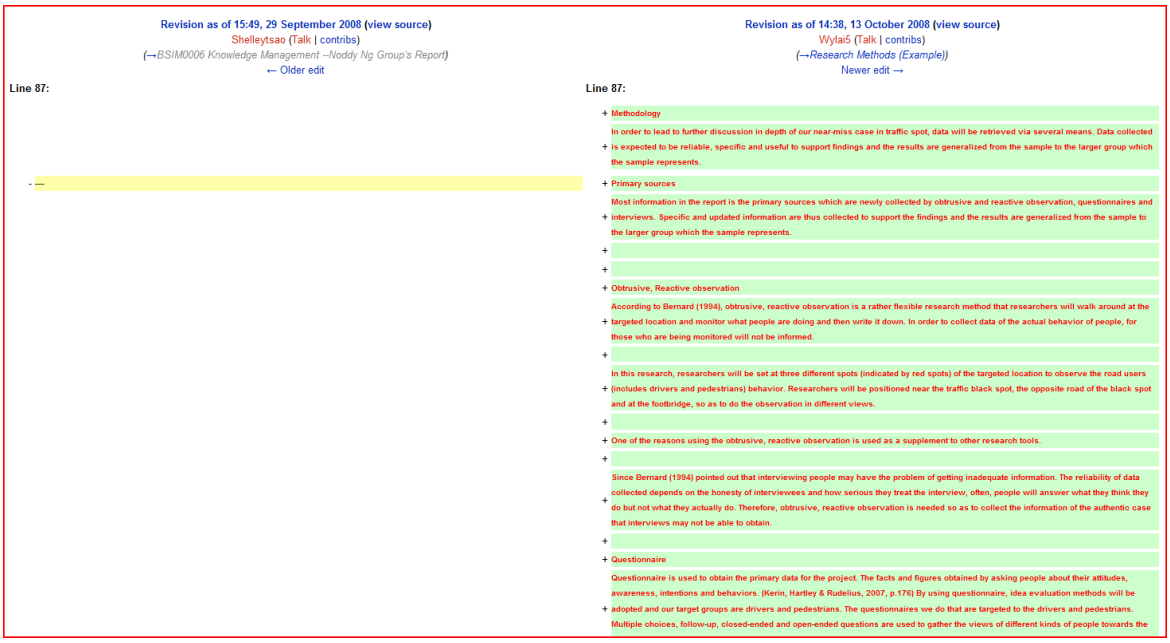
By seeing the change of file size indicated in the wiki history, the "Front page" has grown from 4,205 bytes at 15:17 to 4,237 bytes when it was finished at 15:49. More contents were added in the "Front page" thus increasing the file size. The same thing happened in the "Literature Review". At 15:13, the file size was 4,166 bytes and it increased to 4,247 bytes at 15:48. However, if we go through the changes of file size for "Literature Review", we find that it was editing by both group leader and member during 15:24 and 15:48 that was responsible for the increase in size. Therefore, collaborative editing and working in the same session happened in Group 4 as illustrated above.

When we take a closer look at the "Literature Review" by comparing different versions the group leader and group member contributed, we will know the details of the changes they had made in wiki. For example, Table 3 is extracted from the revisions done by a group member and the group leader of Group 4 recorded on September 29, 2008. This extract shows that the group leader had added the section heading and an image in the "Literature Review".

Revision as of 15:13, 29 September 2008 (view source) Wylai5 (Talk | contribs) (→Literature Review (Example)) ← Older edit	Revision as of 15:24, 29 September 2008 (view source) Shelleytsao (Talk | contribs) (→Literature Review (Example)) Newer edit →
(One intermediate revision not shown)	
Line 35:	**Line 35:**
---	---
	+
	+ ===[[Literature Review (Example)]]===
"Definition of Near Miss"	"Definition of Near Miss"
Line 41:	**Line 43:**
By presenting Near Miss in diagram, they comprise the lower portion of the safety pyramid.(James, 2003) That is, "these incidents have the potential to, but do not, result in loss." James(2003) further defines near misses are often less obvious than accidents and have little immediate impact on individuals or environment.	By presenting Near Miss in diagram, they comprise the lower portion of the safety pyramid.(James, 2003) That is, "these incidents have the potential to, but do not, result in loss." James(2003) further defines near misses are often less obvious than accidents and have little immediate impact on individuals or environment.
-	+ [[Image:pyramid.jpg]]
"The Possible Near Misses"	"The Possible Near Misses"

Table 3: Revisions in Group 4

Table 4 was again extracted from the wiki history of Group 4. It shows that a group member has added new contents in the "Research Methods" chapter which was created by the group leader before.



Revision as of 15:49, 29 September 2008 (view source) Shelleytsao (Talk | contribs) (→BSIM0006 Knowledge Management --Noddy Ng Group's Report) ← Older edit	Revision as of 14:38, 13 October 2008 (view source) Wylai5 (Talk | contribs) (→Research Methods (Example)) Newer edit →
Line 87:	Line 87:
- ---	+ Methodology
	In order to lead to further discussion in depth of our near-miss case in traffic spot, data will be retrieved via several means. Data collected is expected to be reliable, specific and useful to support findings and the results are generalized from the sample to the larger group which the sample represents.
	+ Primary sources
	Most information in the report is the primary sources which are newly collected by obtrusive and reactive observation, questionnaires and interviews. Specific and updated information are thus collected to support the findings and the results are generalized from the sample to the larger group which the sample represents.
	+
	+
	+ Obtrusive, Reactive observation
	According to Bernard (1994), obtrusive, reactive observation is a rather flexible research method that researchers will walk around at the targeted location and monitor what people are doing and then write it down. In order to collect data of the actual behavior of people, for those who are being monitored will not be informed.
	+
	In this research, researchers will be set at three different spots (indicated by red spots) of the targeted location to observe the road users (includes drivers and pedestrians) behavior. Researchers will be positioned near the traffic black spot, the opposite road of the black spot and at the footbridge, so as to do the observation in different views.
	+
	+ One of the reasons using the obtrusive, reactive observation is used as a supplement to other research tools.
	+
	Since Bernard (1994) pointed out that interviewing people may have the problem of getting inadequate information. The reliability of data collected depends on the honesty of interviewees and how serious they treat the interview, often, people will answer what they think they do but not what they actually do. Therefore, obtrusive, reactive observation is needed so as to collect the information of the authentic case that interviews may not be able to obtain.
	+
	+ Questionnaire
	Questionnaire is used to obtain the primary data for the project. The facts and figures obtained by asking people about their attitudes, awareness, intentions and behaviors. (Kerin, Hartley & Rudelius, 2007, p.176) By using questionnaire, idea evaluation methods will be adopted and our target groups are drivers and pedestrians. The questionnaires we do that are targeted to the drivers and pedestrians. Multiple choices, follow-up, closed-ended and open-ended questions are used to gather the views of different kinds of people towards the

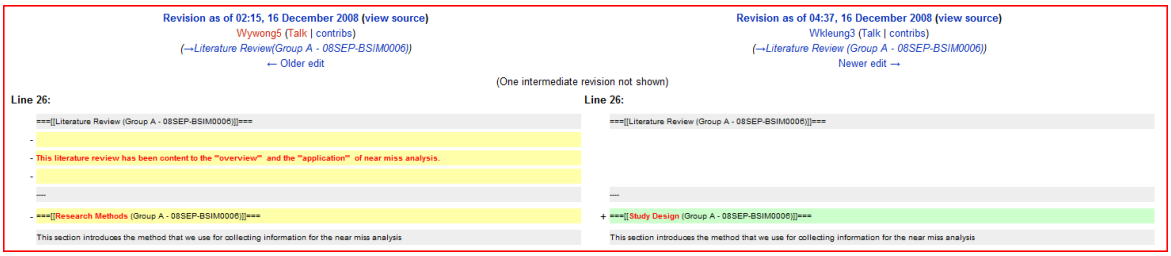
Table 4: Add new contents in Group 4

Table 5 is the wiki history of Group 1 recorded on December 16, 2008. The group leader (WKL3) and one of the group members were working on the final version of the research on wiki. Again, the group leader was more active than the other and the group leader worked on more sessions than the group member. Like the case shown in Group 4 above, only two members in the group were working together at the same time. Different kinds of editing activities were taking place from 00:44 to 04:37. Group members usually just worked on the individual sections that they were responsible for. However, there were occasions when group members worked on the same section by editing each others' work. Such collaborative editing happens in "Literature Review" and "Executive Summary" only.

- (cur) (prev) 04:37, 16 December 2008 Wkleung3 (Talk | contribs) (1,061 bytes) (→Study Design (Group A - 08SEP-BSIM0006))
- (cur) (prev) 04:37, 16 December 2008 Wkleung3 (Talk | contribs) (1,164 bytes) (→Literature Review (Group A - 08SEP-BSIM0006))
- (cur) (prev) 02:19, 16 December 2008 Wywong5 (Talk | contribs) (1,281 bytes) (→Research Methods (Group A - 08SEP-BSIM0006))
- (cur) (prev) 02:15, 16 December 2008 Wywong5 (Talk | contribs) (1,285 bytes) (→Literature Review(Group A - 08SEP-BSIM0006))
- (cur) (prev) 02:14, 16 December 2008 Wywong5 (Talk | contribs) (1,284 bytes) (→Executive summary (Group A - 08SEP-BSIM0006))
- (cur) (prev) 01:35, 16 December 2008 Wywong5 (Talk | contribs) (1,284 bytes) (→Introduction)
- (cur) (prev) 01:34, 16 December 2008 Wywong5 (Talk | contribs) (1,257 bytes) (→Literature Review)
- (cur) (prev) 01:33, 16 December 2008 Wkleung3 (Talk | contribs) (1,231 bytes) (→Executive summary (Group A - 08SEP-BSIM0006)
- (cur) (prev) 01:33, 16 December 2008 Wkleung3 (Talk | contribs) (1,230 bytes) (→Executive summary)
- (cur) (prev) 01:31, 16 December 2008 Wkleung3 (Talk | contribs) (1,204 bytes) (→Results and Analysis (Example))
- (cur) (prev) 01:30, 16 December 2008 Wkleung3 (Talk | contribs) (1,187 bytes) (→Recommendations)
- (cur) (prev) 01:30, 16 December 2008 Wkleung3 (Talk | contribs) (1,160 bytes) (→Acknowledgements (Group A - 08SEPT-BSIM0006))
- (cur) (prev) 01:29, 16 December 2008 Wkleung3 (Talk | contribs) (1,161 bytes) (→Acknowledgements)
- (cur) (prev) 01:28, 16 December 2008 Wkleung3 (Talk | contribs) (1,133 bytes) (→Limitations and Further Study (Group A - 08SEP-BSIM0006)
- (cur) (prev) 01:27, 16 December 2008 Wkleung3 (Talk | contribs) (1,132 bytes) (→Limitations and Further Study)
- (cur) (prev) 01:27, 16 December 2008 Wywong5 (Talk | contribs) (1,106 bytes) (→Research Method)
- (cur) (prev) 01:26, 16 December 2008 Wywong5 (Talk | contribs) (1,078 bytes) (→Research Methods (Draft))
- (cur) (prev) 01:25, 16 December 2008 Wywong5 (Talk | contribs) (1,087 bytes) (→Acknowledgements (Example))
- (cur) (prev) 01:23, 16 December 2008 Wywong5 (Talk | contribs) (1,097 bytes) (→Recommendations (Example))
- (cur) (prev) 01:23, 16 December 2008 Wkleung3 (Talk | contribs) (1,107 bytes) (→Conclusions (Example))
- (cur) (prev) 01:21, 16 December 2008 Wkleung3 (Talk | contribs) (1,090 bytes) (→References (Group A - 08SEP BSIM-0006))
- (cur) (prev) 01:21, 16 December 2008 Wkleung3 (Talk | contribs) (1,091 bytes) (→References (Group A - 08BSIM-0006))
- (cur) (prev) 01:21, 16 December 2008 Wkleung3 (Talk | contribs) (1,087 bytes) (→References)
- (cur) (prev) 01:20, 16 December 2008 Wkleung3 (Talk | contribs) (1,063 bytes) (→Appendix (Group A - 08SEP-BSIM0006)
- (cur) (prev) 01:20, 16 December 2008 Wkleung3 (Talk | contribs) (1,062 bytes) (→Appendix)
- (cur) (prev) 01:16, 16 December 2008 Wkleung3 (Talk | contribs) (1,036 bytes) (→Literature Review)
- (cur) (prev) 01:13, 16 December 2008 Wkleung3 (Talk | contribs) (1,044 bytes) (→Limitations and Further Study (Example))
- (cur) (prev) 01:12, 16 December 2008 Wywong5 (Talk | contribs) (1,054 bytes) (→Introduction (Example))
- (cur) (prev) 01:07, 16 December 2008 Wkleung3 (Talk | contribs) (1,064 bytes) (→Executive Summary)
- (cur) (prev) 00:58, 16 December 2008 Wkleung3 (Talk | contribs) (1,081 bytes) (→References (In progress))
- (cur) (prev) 00:46, 16 December 2008 Wkleung3 (Talk | contribs) (1,095 bytes)
- (cur) (prev) 00:45, 16 December 2008 Wkleung3 (Talk | contribs) (1,105 bytes) (→BSIM0006 Knowledge Management - Group A's Report)
- (cur) (prev) 00:44, 16 December 2008 Wkleung3 (Talk | contribs) (1,095 bytes) (→BSIM0006 Knowledge Management - Group A's Report)

Table 5: History log extracted from Group 1

In the "Literature Review" of Group 1 as shown in Table 6 below, the group leader deleted the content contributed by a group member and renamed the section heading from "Research Methods" to "Study Design". All of these activities were recorded and highlighted in the wiki history log by revisions comparison.



Revision as of 02:15, 16 December 2008 (view source) Wywong5 (Talk | contribs) (→Literature Review(Group A - 08SEP-BSIM0006)) ← Older edit	Revision as of 04:37, 16 December 2008 (view source) Wkleung3 (Talk | contribs) (→Literature Review (Group A - 08SEP-BSIM0006)) Newer edit →
(One intermediate revision not shown)	
Line 26:	Line 26:
===[[Literature Review (Group A - 08SEP-BSIM0006)]]===	===[[Literature Review (Group A - 08SEP-BSIM0006)]]===
-	
- This literature review has been content to the "overview" and the "application" of near miss analysis.	
-	
---	---
- ===[[Research Methods (Group A - 08SEP-BSIM0006)]]===	+ ===[[Study Design (Group A - 08SEP-BSIM0006)]]===
This section introduces the method that we use for collecting information for the near miss analysis	This section introduces the method that we use for collecting information for the near miss analysis

Table 6: Revisions in Group 1

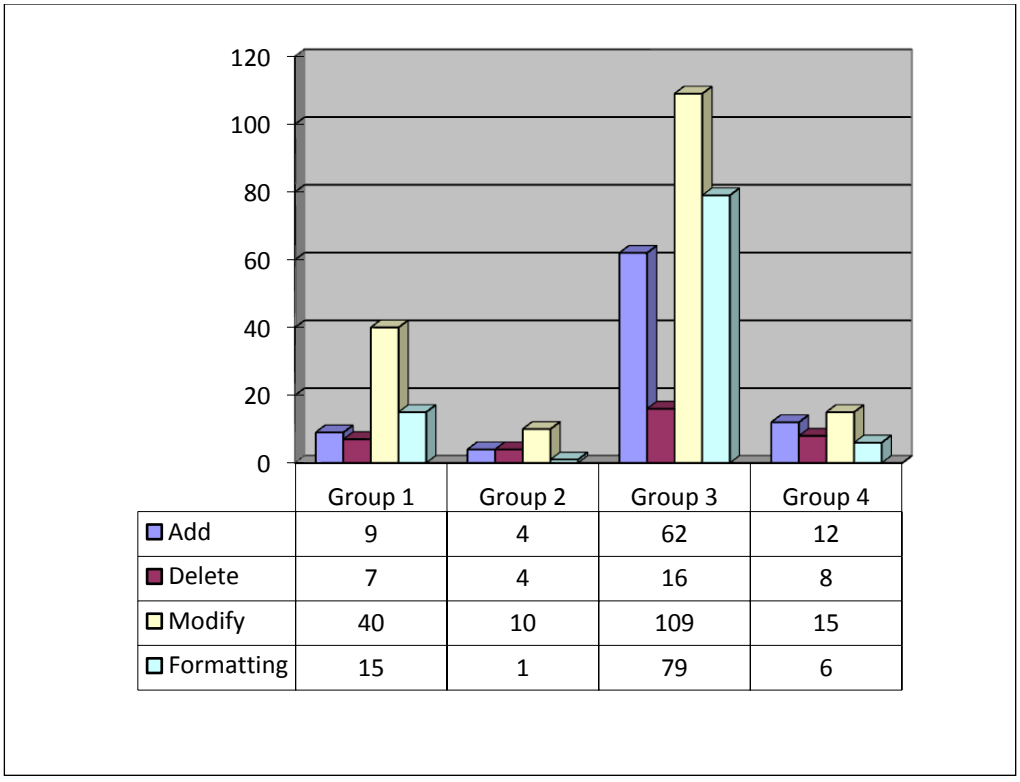
To summarize the activities in wiki, different kinds of editing activities (i.e. add, delete and modify) were found in the wiki history among different groups to a certain extent. The types of wiki editing activities are as follows:

Types of activity	Add	Delete	Modify	Formatting
Definition	Add some text	Delete existing text	Modify existing text	Format paragraph or layout

.

Table 7: Types of activities between different versions

Table 8 presents all the editing activities for four groups. Among all the activities, the most frequent activity is the modification of existing contents in wiki. Group 3 had 109 modifications of the content and 79 formatting activities. Group 3 had the most number of entries and editing activities compared with other groups. In general, all groups had the modification the most and followed by formatting and addition. Deletion was the least for all the groups.



	Group 1	Group 2	Group 3	Group 4
Add	9	4	62	12
Delete	7	4	16	8
Modify	40	10	109	15
Formatting	15	1	79	6

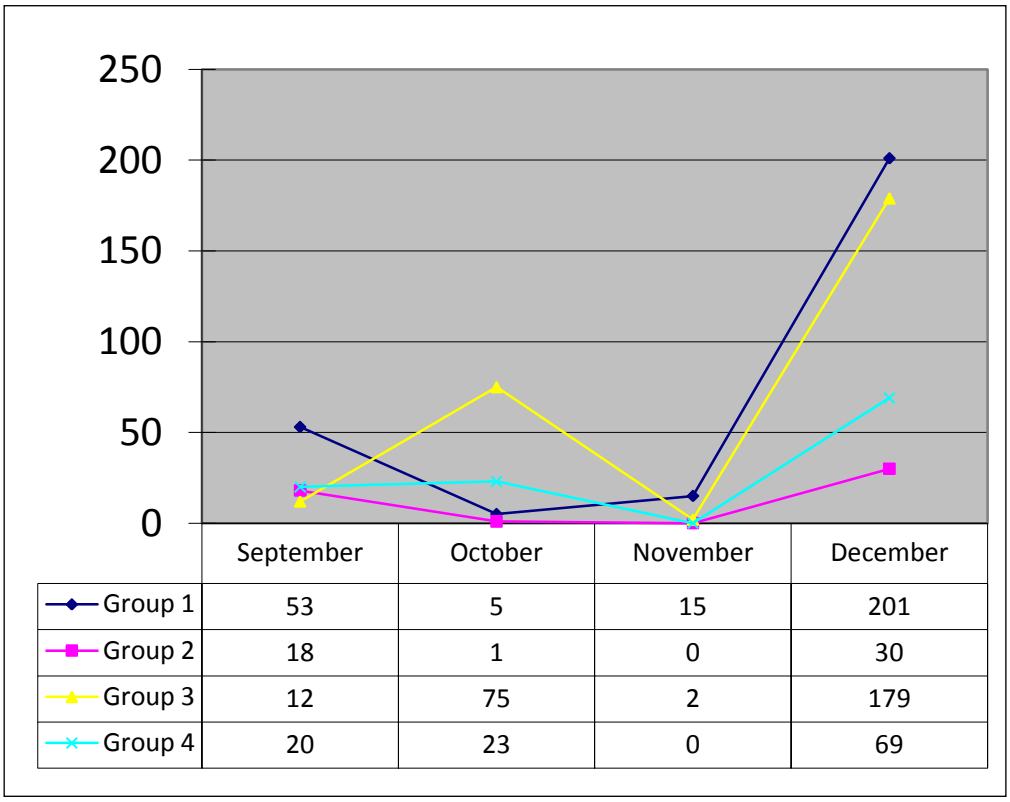
Table 8: Types of activities for four groups

Work Intervals

The project was carried out in four phases and there were deadlines for each phase. The students were required to meet the deadlines accordingly. For example, the students had to submit the literature review by September 29 and the study design by October 13 (Phase I). Each group should make an appointment with the course instructor to present and discuss the analysis of the project by November 5 (Phase II). In Phase III, each group presented their

findings in the class by November 25. Finally, each group completed and submitted the report by December 2 (finally, this deadline was postponed to December 16) in Phase IV.

The students should work according to the schedule assigned throughout the course period of three months. All groups worked the most in December to meet the deadline (December 16) of the submission of their group reports. In Table 9, it shows a sharp increase for all groups in December and it reveals the students did the job at the last minute. Except Group 3, the other three groups had the least number of entries in November. Among them, both Group 2 and Group 4 even had done completely nothing in November although they had to present their findings in November 25. It is quite obvious to find that all groups worked the most when the deadline approached.



	September	October	November	December
Group 1	53	5	15	201
Group 2	18	1	0	30
Group 3	12	75	2	179
Group 4	20	23	0	69

Table 9: Distribution of works in time intervals

Discussions in wiki

MediaWiki provides a discussion feature which allows the participants to post their messages and discuss among the group members. All the four groups used this discussion feature to certain extent. However, from the messages and responses posted on the wiki discussion, they communicate via emails in addition to face-to-face meetings more often than using the wiki discussion.

The group leader of Group 1 expressed his views on using wiki discussion:

> "I think it is a good idea to make use of Mediawiki to discuss this issue and issues afterwards. There are 2 benefits,
>
> 1. Keep track on the conversation record

2. Allow "offline discussion" - No need to bother the problem of members' availability.

In the group, it's better for us to have these things recorded.

1. What you have done for the project on the day when you forwarded the attachment via email.
2. Minutes recording the main point of meeting and tasks to be followed up.
3. Raise questions when you have any comments or problems referring to the project." (Group 1)

The group leader coordinated and gave directions to the group members. He understood the benefits of discussions in wiki, and he encouraged the members to use wiki for logging their discussions. Follow up messages were posted on wiki among the group members and they used wiki as a communication platform to exchange ideas and report progress between group members. For example, one group member posted the following:

> "Conducted findings (in pdf format) from the observation of a black spot at a busy place in Kowloon. There is also a set of newspaper clippings that includes news about the accidents occurring in that black spot from 7 years ago to the present."

It is understandable that wiki is not used as the only channel for communication. Apart from using wiki, the group members had discussions through other means (e.g. by emails, over the phone or face-to-face) as mentioned in the following messages posted on wiki:

> "Having been discussed by *student B and student C* at 1:30 am today, they have decided to study NMA in the busy place in Kowloon." (Group 1)

> "I contacted interviewee yesterday. Moreover, I will follow up the interview time and the contents. Before that, please discuss and confirm whether the cost is suitable or not. Details are sent to your email.
>
> For other questionnaires, questions were set and sent to your email. Please look at the details and edit if necessary. Moreover, email with comments should be sent to all members before 8th Oct 2008, so I can make adjustment.
>
> Additionally, I sent the details of "Study Design" to you. We will discuss it at the next meeting, so please take a look before the meeting. If you have any question, just feel free to call me." (Group 1)

They used email to communicate, exchange ideas and share their findings. After they worked out the details, they uploaded it to wiki for the sake of the course requirement. The following were messages posted in wiki by Group 2 and Group 4 respectively showed that this mode of communication is quite common in other groups:

> "The Lit. Review has been combined and uploaded to wiki. If there is/are anything to be amended, please feel free to edit it/them. Thank you." (Group 2)

> "I've drawn the floor plan of the site w/ cutie cartoons and animation. You can take a look in our g-mail account!" (Group 4)

Students used email to share files they worked on and to comment on each others' work but they used the wiki discussion to post the messages for notification. Students work on their own and share their work with others for comment or editing before they post it on wiki.

Collaborative learning

Students work individually and collaboratively during the learning process. Collaborative learning happens when they comment and edit each other's work and reflect on what they have learnt. It happens not only in using wiki but also in emails and face-to-face discussions. Students' perception of wiki will affect how they use wiki for collaborative learning. It is found that students in these four groups used wiki as collaborative tools. They were requested to post their research studies on wikis as one of the course requirement. When doing their work, the students used different means they thought appropriate to supplement wiki. Collaborative learning happens in the learning process but not limited to using wiki. One of the reasons of limited use of wiki among students perhaps is the absence of file sharing and commentary feature in wiki. Wiki alone could not make collaborative learning happen but students' willingness to use wiki in a collaborative way is influenced by their perception of wiki.

According to the wiki logs and discussion boards, students work on their own most of the time but they also edit the others' contributions if necessary. They regard wiki as a publishing tool more than a collaborative tool. However, they modified the contents the most in the wiki and these modifications imply polishing of their works before they were published.

Wiki helps in the processing of group projects. Students post the message for group discussion and comment on each other's work in the wiki platform. The content contributed by one member is visible and can be edited by the others. Since wiki is used together with other means including face-to-face and email communication, it is used to supplement other publishing and communication tools in the process of collaborative learning. Wiki is both an online synchronous and asynchronous tool depending on how students use it.

5. Planning of Future Work

This research in progress reported the use of wiki by 21 undergraduate students for one course in a university in Hong Kong. To a certain extent, it showed us how undergraduate students used wiki. From this research study we know how they used wiki but we still do not know why they did so. In order to have a deeper understanding of how students use wiki, it is suggested that a more in-depth investigation be conducted about their perceptions of wiki and their learning experience while using wiki. In addition, it is recommended that students be interviewed before and after their use of wiki in the course. Moreover, since the group leaders had done most of the work in wiki for all groups, it is recommended to have further analysis of the group leaders and members on the actual division of works in the group.

In future wiki studies, it is recommended that students be provided training sessions on using wiki before they are asked to start using it. Wiki is different from traditional word processors as students have to follow the syntax and format when editing the contents in wiki. This research study shows that some groups had frequently edited and formatted the paragraphs in wiki. This may be due to their low familiarity with using the wiki syntax.

Moreover, it will be more productive if the instructor can explain the objectives of the study and illustrate why using wiki is important in the research process. Four groups did not have many added entries in wiki and perhaps they worked out their ideas and drafts on word processors rather than writing on wiki online. After they have finished their paragraphs or chapters, they copied and pasted the contents to wiki. In order to encourage more collaborative works on wiki, it will be helpful if students receive explanations and are shown the advantages of wiki.

6. Conclusions

This study contributes to the understanding of the use of wiki in collaborative learning for undergraduate students through an analysis of the wiki logs. Wiki history logs and discussions were analyzed to examine how students used wiki in group projects. This study revealed that limited collaboration is found among the group members. Further research on students' perceptions of using wiki for learning is recommended.

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