Using online shared workspaces to support group collaborative learning

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A B S T R A C T
The ability to work collaboratively is highly valued in today's workplace. However, collaboration does not often naturally happen in a group. Certain strategies must be applied to coordinate individual efforts and monitor the learning process so that effective collaboration can take place. 34 groups from 4 PGDE (Post Graduate Diploma in Education) classes at NIE (National Institute of Education) in Singapore participated in this study. Each group of four members used an online shared workspace to collaborate. Results showed that about half groups actively used the workspaces to share resources, negotiate ideas, and coordinate their collaboration. On the other hand, using the workspaces helped the teacher to easily track and monitor the collaborative learning process, as the workspaces documented what group members did and how they gradually completed the assignment. The students were also required to write weekly progress reports. Results showed that writing progress reports helped group members to reflect on what they had done and also provided additional information for the teacher to confirm their individual contributions. Issues involved in coordinating and monitoring the collaborative learning process are discussed.

1. Introduction

In the current knowledge society, work is becoming more knowledge-based, interdisciplinary and complicated. Collaborative learning is not a buzzword any more but becomes a necessity. It is hardly possible for an individual to complete sophisticated tasks without the support of others. The ability to work collaboratively is hence highly valued in today's workplace (Barron, 2000).

Although much research literature in computer supported collaborative learning (CSCL) reports mixed or negative findings (Kreijns & Kirschner, 2004), numerous positive results have been demonstrated in research studies. For instance, group work has shown to be able to promote student critical thinking skills, problem solving skills, social skills and self-esteem (Gokhale, 1995; Li, 2002). It often leads to better learning outcomes than individual work (Barron, 2000; Lipponen, Hakkarainen, & Paavola, 2004; Neo, 2003). However, the positive benefits do not automatically happen in a collaborative learning environment. They call for sound instructional design.

Many challenges exist in the instructional design process of collaborative learning. One is how to effectively coordinate group members' individual efforts and build on their strengths so that they all work towards the same direction (Barron, 2000). Another is how to closely monitor the learning process and fairly assess students' individual contributions. Teachers cannot arbitrarily assume that each member makes an equal contribution to the group work and hence give the same marks to all members. Such challenges must be deliberately addressed so that effective collaboration can take place. It seems that technologies have great potential in addressing these issues. In the following section, the use of technologies for social collaborative learning, and challenges in coordinating and monitoring the collaborative learning process are to be elaborated.

2. Conceptual framework

2.1. Technologies for social collaborative learning

Collaboration has become a natural social part of daily life. People live in various communities, where they tend to approach friends for help when they encounter problems. Collaboration has existed before the computer is popularly used, meaning that collaboration may not need the support of the computer technology at all.
With the rapid development of ICT (information and communication technologies), however, technologies play an increasingly important role in collaboration. The complexity of tasks in the knowledge economy society requires people to work together as it is hard for individuals to possess all knowledge and skills. Collaboration becomes a necessary skill in the present society. Meanwhile, technologies have become an integrated part of our lives. People are using various technological devices such as computers and mobile phones to communicate and interact with others. Undoubtedly the use of technologies has made communication and collaboration more convenient and affordable than before. Nevertheless, technologies are not a necessary condition or a panacea for effective collaboration. It is not the mere presence or complexity of technologies that improves learning experiences, but the quality of match between technologies and the learning task (Jermann, Soller, & Lesgold, 2004).

One way of using technologies for social collaborative learning is a group of people use an online workspace to share ideas or resources. They may not necessarily work on the same document at the same time, but they can upload/download files, share information, and negotiate ideas in the workspace. Through communication and collaboration, they learn from one another and construct meaningful knowledge. Examples of such workspaces include discussion forums, Google Groups, and other social networking tools like Facebook.

The use of technologies in collaborative learning has the potential to benefit students and teachers. Students can use ICT as a communication tool, a productivity tool, a repository, or a documentation tool (Jermann, Soller, & Lesgold, 2004; Kaptelinin, 1999). Teachers can use ICT to monitor and track the collaborative learning process, so that they can fairly assess students’ individual contributions and identify problems promptly (Chan & van Aalst, 2004; Pozzi, Manca, Persico, & Sarti, 2007).

2.2. Coordinating the collaborative effort

Individual accountability and positive interdependence are two salient features of collaborative learning (Wang, 2009). Individual accountability is the measurement of whether the contribution of a group member has helped to achieve the group’s overall goals, and positive interdependence aims to link group members together (Johnson, Johnson, & Holubec, 1998).

The occurrence of individual accountability and positive interdependence needs effective coordination. Coordination may happen in a face-to-face or an online setting. In a face-to-face setting, group members sit together to share information, discuss ideas, and negotiate plans. Although a face-to-face meeting is often effective for coordination, it has certain limitations. For instance, people at different places are hard to meet. Also, finding a commonly free time slot is often a challenge (Larsen, Urry, & Axhausen, 2008). In addition, people may not be able to reach a common consensus during a short meeting as some of them may have not been well prepared for the topic (Wang & Woo, 2007). Furthermore, a decision made during a face-to-face meeting might be biased as some members may not have an equal opportunity to voice their opinions up or the meeting may be dominated by a few vocal participants (Wang, 2008).

Comparatively, an online workspace provides a fairer space in which group members can freely express their thoughts. Nevertheless, coordination by using ICT tools has challenges as well. For instance, the email has the ability to ‘travel to different places on one journey’ (Larsen, Urry, & Axhausen, 2008, p. 653), and it does not demand immediate attention and responses. However, it is difficult to get an overall idea of discussions, as the information messages are usually spread out in an email box and not organized in a meaningful structure. Also, there might be too many information pieces bouncing back and forth. It is often hard to follow the evolution of the commitments (Divitini & Farschchian, 1999).

An effective way to facilitate coordination in an online setting would be to integrate the strengths of various communication tools such as the email and instant messaging into a shared workspace, where users can send and receive email messages, chat with others, and discuss ideas in a synchronous or asynchronous way.

Another way to facilitate coordination in a group is to involve leadership, as research often shows that ‘it is commonplace to attribute the success of a group to effective leadership’ (Lea, Rogers, & Postmes, 2002, p. 56). However, involving leadership in collaborative learning has certain drawbacks. It may undermine the goal of productive contributions by the whole group. Also, other members may wait for the leader to initiate ideas and lead the group, rather than all members take equal responsibilities (Lea, Rogers, & Postmes, 2002). In addition, a group with a strong dominate leader may focus their discussions excessively on the leader’s task and hence does not benefit from sufficient interaction (Thompson & Chisamore, 2007).

2.3. Monitoring the collaborative learning process

Learning is a highly interactive and dynamic process. For effective learning to take place, closely monitoring how students work together in a collaborative learning process is crucial (Wang, 2009). It enables students to identify what has been done, what needs to be improved further, or if they are on the right track. Also, keeping track of what has been established makes the learning process be carried out in a more organized and efficient way (Chan & van Aalst, 2004).

Monitoring the collaborative learning process can help teachers to keep track on students’ on-going performance so that any pitfall leading to potential failures can be immediately diagnosed and prompt support can be provided. Also, it enables teachers to discern students’ individual contributions and to assess them fairly (Wang, 2009). In addition, monitoring the learning process allows teachers to identify the strengths and weaknesses of the instructional design or the learning environment so that they can adjust the learning process promptly or improve the curriculum further in the future (Caballé, Juan, & Khafa, 2008; Pozzi et al., 2007).

Some challenges exist in monitoring individual and collaborative learning processes. It is relatively easier for students to monitor their own learning process as they are actual participants. For teachers, however, effectively monitoring the learning process becomes harder. On the one hand, they need detailed information to understand what is going on and how students work collaboratively. On the other hand, teachers should not force students to carry out excessive work just for the purpose of monitoring the learning process. Ideally the learning process is automatically recorded and documented. Using a shared workspace seems to be a sound solution. It allows students to share information, negotiate ideas and get the work done collectively. Meanwhile, their learning processes have the possibility to be automatically recorded. Therefore, students do not need to do much additional work just for the sake of monitoring the learning process.

A number of ICT tools can be integrated into a shared workspace to monitor the learning process. For instance, PBworks (http://pbworks.com/) is a useful wiki tool for a group of students to share information, work on the same web page, and collect feedback from others. Also,
the page history can help the teacher to easily track how the page was evolved. Drop.io (http://drop.io) is another useful online tool for students to easily share notes and files.

3. Methodology

3.1. Context

This research was conducted during the July 2009 semester in the course entitled ICT for meaningful learning, which was a core module for the NIE (National Institute of Education) trainee teachers (called students in this paper) who were pursuing post-graduate degrees in education in Singapore. They would be teaching at secondary schools after a one-year study. This course ran once a week of two hours each and lasted for 12 weeks. A major objective of this course was that after graduation students would be able to conduct collaborative learning by using ICT in schools. Through the course, they learned the meaningful learning framework proposed by Jonassen, Howland, Marra, and Crismond (2008), instructional strategies to engage students in collaborative learning activities, and ways to support collaborative learning by using ICT.

To further promote student collaborative learning, the final group assignment was that the students in groups of four were to design ICT-based lesson ideas, which were similar to lesson plans but in less details. The students only needed to present the major learning activities without detailed information like ‘in the first 5 min the students will do … in the following 10 min, the students will…’. This assignment started from the sixth session until the last week. This assignment carried 45% of the total marks.

The total number of students taking this course in the semester was about 1100. They were divided into 37 tutorial classes of about 30 students each. The average age of the students was about 25. All classes followed the same assessment criteria. 23 groups in the four classes taught by the author participated in this study.

3.2. Coordinating and monitoring strategies

When the students in a group were doing the final assignment, they were required to create and use a shared workspace to support their collaboration. Four tools (Drop.io, Google Groups, PBworks, and Facebook Group) were introduced and demonstrated to them in class. They were allowed to use any of the tools or other tools to support their collaboration. In order to leave sufficient evidence on collaboration, the students in each group were encouraged to use their workspace to collaborate as much as possible. Occasionally the teacher visited some groups to check what was going on and gave encouragement or comments.

There were two major purposes of using a shared workspace in this assignment. One was that the members in a group could coordinate their collaboration by using the workspace. They had a platform to share information resources and discuss ideas. Also, they could reflect on what they had already completed and plan for the following week.

The other purpose was that through the use of the workspace, certain evidence such as discussion threads created, resources collected and comments given would be recorded automatically. This information would enable the teacher to identify students’ individual contributions to the final assignment and the progress of the assignment as well.

In addition to the use of a shared workspace, other strategies were also applied to coordinate students’ collaborative efforts and to monitor the learning process. As not all activities such as face-to-face meetings would be automatically recorded in the shared workspace, the students were required to produce weekly progress reports to document what they had done in the previous week and what they were going to do in the following week. They were allowed to write progress reports in groups or individually.

Additional strategies included making the group size bigger, and grouping them based on friendship and the subject. In the previous study (Wang, 2009), the group size of two was shown to be small as they could easily communicate by using phone calls or face-to-face meetings rather than by using online tools. In this study, the group size was increased to four as suggested by Moallem (2003). Research indicates that friends are usually easier to work together as they do not need to negotiate rules or regulations (Vass, 2002). Also, they often show greater sense of intrinsic motivation, and autonomy support (Ciani, Summers, Easter, & Sheldon, 2008). The strategy of friendship worked well in the prior research (Wang, 2009) and the same strategy was applied in this study. No leader was assigned in each group.

3.3. Research questions and instruments

This study aimed to answer the following research questions:

1. How did the students in each group use the shared workspace to support their collaboration?
2. How did the students in each group coordinate with one another?
3. Did the use of the workspace enable the teacher to monitor the collaborative learning process?

The major instrument used for data collection was the posts in each workspace. The posts showed the resources students shared, the messages they exchanged, and the files they produced. Also, the progress reports uploaded to the workspace were further analyzed to identify how group members coordinated with one another and how the final assignment was completed gradually.

The coding process of the posts in a workspace was as follows. All entries in a workspace were sorted out in a chorological order. The numbers of notes and files in each workspace were counted. The entries were browsed through to check if they were posted on different days, which implied if the groups used the workspace regularly and frequently. When a note or file was read through, it was tagged with certain keywords such as reporting progress or sharing web resources. Meanwhile, the flow of completing the final assignment and the ways of writing progress reports were summarized.

For answering the research questions, the author read through the summary of each group’s posts several times to identify essential information. Often times certain information was missing in the summary. The author had to go back to the original workspace to further check if the information could be found.
4. Results

4.1. How did the students in each group use the shared workspace to support their collaboration?

Among all groups, 13 used Drop.io, 5 used wikis (4 used PBworks and 1 used Wetpaint), and 5 used Facebook Group to support their collaboration. The analysis of the posts revealed three levels of using the workspaces to support collaboration were involved. They were progress reporting, one-way information sharing, and two-way interaction, as shown in Fig. 1.

On the level of reporting progress, group members reported what they had done individually or as a group, and what they were going to do. They posted their progress reports online, but did not further share other resources or ideas. It seems that the major purpose of putting their reports online was for the teacher to know their progress. Five groups stayed on this level. No evidence showed that these groups used the workspaces effectively to support their collaboration.

On the level of one-way information sharing, group members shared resources and reported their progress online. The common resources they shared included: i) online materials such as content-related web pages; ii) PDF files or Word documents, such as curriculum syllabuses, journal papers, or the teacher’s emails responding to their questions; and iii) self-made files, such as draft presentation files or worksheets. In total, five groups shared information on this level. Very few comments or feedback were posted to the workspaces. To a certain extent, the workspaces were solely used as repositories, and the activities happened in the workspaces were limited to one-way publication.

On the level of two-way interaction, group members extensively shared resources, negotiated meanings and discussed ideas. They did not only post their progress reports or learning resources online, but also gave feedback or comments. Group members often addressed others by names like what they did in email messages. 13 groups were using their workspaces to interact with their members.

Table 1 shows the numbers of notes and files posted onto the workspaces, which further confirmed that more interaction was involved in higher levels of collaboration. The number of notes posted by the reporting groups was 22 with an average of 4.4; it increased to 54 in the sharing groups with an average of 10.8; and it further increased to 219 with an average of 16.8 in the interactive groups. Similarly, the number of files increased from the reporting groups to two-way interaction groups as well. In addition, it seems that the groups that received teacher’s comments in their workspaces (such as the group using http://drop.io/3men_agirl) or had email exchange with the teacher (such as another group using http://drop.io/girlspower) put more efforts than the groups that seldom interacted with the teacher. These groups shared more resources and ideas in their workspaces, and they were obviously at the two-way interaction level. Also, the student who exchanged emails with the teacher often put the teacher’s replies to their workspaces for the whole group to view.

4.2. How did the students in each group coordinate with one another?

This study shows that the groups used different ways to coordinate. Within a group they used a variety of tools to coordinate their collaboration. Table 2 summarizes the communication tools used in the participating classes.

All groups in the classes heavily used face-to-face meetings and progress reports to coordinate their collaboration. 15 groups had face-to-face meetings. Some of these groups used the workspaces to negotiate when and where they would have face-to-face meetings. They put discussion issues to the workspaces before the meeting and minutes after the meeting. The minutes listed down the issues they discussed and the roles they were going to play.

Altogether 14 groups explicitly put their progress reports to show what they had done in the previous week, what they were going to do in the following week, and what roles they were going to play. The students were told that if the posts in the workspace could clearly indicate their individual contributions and progress, they did not need to write additional progress reports. Nevertheless, 5 of the 11 groups who had two-way interaction still produced progress reports regularly.

Although the students were not required to use MSN or other chat tools to communicate, 3 groups used MSN to chat and put chatting records to their workspaces. One additional group shared their MSN accounts in the workspace but did not put their chatting records online. It is most likely that they had online chats as well.

Four groups used the discussion forums in Facebook Group or Wetpaint to discuss ideas and coordinate their collaboration. However, it seemed that they did not frequently use the discussion forums as the number of posts was low. Altogether there were 27 threads created in the forums and 44 posts were created in the threads.

Table 2 also shows the specific ICT tools used by the six groups in a specific class. All groups had face-to-face meetings. Three groups regularly wrote progress reports. One group used MSN to communicate, and no groups used discussion forums to coordinate.

The students were informed that it was not compulsory for a group to have a leader. The use of the workspaces showed that at the beginning of the assignment, group members played equally important roles and everyone was responsible for certain tasks. No evidence showed who was coordinating the initial learning process. After they had completed their share of work, they compiled their shares together and integrated them into a final version. At this stage, it seemed that someone in a group often played a more important role. For example, Weiheng who wrote the following message seemed to play a leader role near the end of the assignment.

Fig. 1. Levels of collaboration in the workspaces.
Hey people,
I’ve uploaded the powerpoint slides we’ll be using for the ICT presentation. Please download it and add notes for your own section. The notes should be a detailed write-up on each slide, covering the content of each slide.

You will also be presenting on the section you’ll be writing on, so as you write, do note some of the points you wish to speak on during the presentation (note: you do not need to cover ALL the points you write).

Content (slide 1–6) – Weiliang
Pedagogy (slide 7–9) – Shi Jia
Technology (slide 10-19) - Yong Yao
Synthesis and conclusion (20–22) – Weiheng (Weiheng)

4.3. Did the use of the workspace enable the teacher to monitor the collaborative learning process?

The use of shared workspaces in this study helped to reveal how the final assignment was gradually completed. The sequence of the posts in the workspaces indicated that the process of completing the final assignment among the groups was similar. All groups started with topic selection, but in slightly different ways. For example in a group, a member firstly proposed a topic of ‘acid and bases’ and briefly explained his reasons. Another member agreed with the topic in the following message and supplied with her reasons. The remaining two members agreed with the choice. For this group, the decision making process of topic selection was smooth and straightforward. However, in the first meeting of another group, the members did not make a consensus and they proposed five topics to explore. A few days later, they used an online poll tool to determine a topic. Results showed that the majority of groups managed to decide topics within one week.

After deciding topics, the next step all groups followed was task distribution. Group members discussed on how many lessons would be covered in the topics. Each member was then in charge of a lesson or a specific task. For instance in a group, a member was in charge of searching for content-related web resources, another was finding pedagogy-related resources, and the others were exploring various ICT tools for concept mapping, collaborative learning, and assessment.

In the following weeks when group members were working on their individual part, they shared ideas and resources through the shared workspaces or face-to-face meetings, and eventually posted their share of work and progress reports to the workspaces for comments. As there would be a group presentation at the end of the course, the majority of groups (N = 21) uploaded their presentation drafts and final files online for others to add on or revise.

In addition, the use of the workspaces and progress reports helped the teacher to fairly assess students’ individual contributions. By looking at the resources, notes, and comments posted by individual members into the workspaces, the teacher managed to identify what each member had done for the assignment. The progress reports listed down the roles they played and the tasks they were going to do, which enabled the teacher to further confirm their individual efforts.

Two ways of writing progress reports were found in this study. One was that group members wrote progress reports as a group. About half groups wrote progress reports in this way. In the progress reports, they reported what each member had done in the previous week and what each of them was going to do in the following week. It was most likely that a member wrote and posted the progress report on behalf of the whole group. The other way was that group members posted their own progress reports individually. In their reports, they presented what they individually did in the week. In either way the progress report helped to reveal the collaborative learning process and individual contributions.

5. Discussion

The primary purpose of this study was to examine whether using shared workspaces together with writing progress reports could help to coordinate individual contributions and monitor the collaborative learning process. In this concluding section, some issues involved in this study are to be discussed.

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<tr>
<th>Table 1</th>
<th>Numbers of notes and files posted by groups.</th>
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<tbody>
<tr>
<td></td>
<td>Total (average)</td>
</tr>
<tr>
<td></td>
<td>Notes</td>
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<tr>
<td>Reporting (N = 5)</td>
<td>22 (4.4)</td>
</tr>
<tr>
<td>One-way sharing (N = 5)</td>
<td>54 (10.8)</td>
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<tr>
<td>Two-way interaction (N = 13)</td>
<td>219 (16.8)</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Table 2</th>
<th>The use of different ways to communicate by all classes and a specific class.</th>
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<tbody>
<tr>
<td></td>
<td>All classes (N)</td>
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<tr>
<td></td>
<td>G1</td>
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<tr>
<td>F2F meetings</td>
<td>15</td>
</tr>
<tr>
<td>Progress reports</td>
<td>14</td>
</tr>
<tr>
<td>MSN</td>
<td>3</td>
</tr>
<tr>
<td>Discussion forums</td>
<td>4</td>
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</table>

5.1. Levels of collaboration in the workspaces

The result of this study showed that the use of shared workspaces had the potential to support group coordination. However, not all groups in this study actively used their workspaces to support two-way interaction and about half of the groups used the workspaces for reporting progress and one-way information sharing only. This result confirms that effective collaboration may not naturally happen in a group and students may not use ICT spontaneously to support their collaboration either (Barron, 2000; Hämäläinen, 2008; Kreijns and Kirschner, 2004).

Certain strategies are therefore needed to promote more active use of ICT for collaboration. It seems that teacher's monitoring, encouragement and moderation could be helpful for stimulating student's frequent use of the workspaces. In this study, it was hardly possible for the teacher to interact with all groups every week. But the groups the teacher often interacted with put more resources or ideas into their workspaces. This result is consistent with the findings of other researchers such as Caballé et al. (2008) who found that once students knew that their performance was closely monitored by the teacher, they were often more engaged in their work. This finding further implies that closely monitoring the learning process would not only enable the teacher to identify students' individual contributions, but also encourage students to more actively participate and contribute.

5.2. Ways of communication

This study shows that synchronous communication by using the face-to-face meeting or instant messaging plays a crucial role in coordinating collaboration. Although the face-to-face meeting has certain limitations, it was still commonly adopted by many groups in this study. One major reason might be that the students took the same courses on campus, which provided them additional opportunities to meet each other. Also, the face-to-face meeting enabled them to discuss and clarify conveniently (Wang & Woo, 2007). In addition, even though the students were not instructed to use instant messaging, some groups spontaneously used MSN to discuss and coordinate. This finding indicates that instant messaging has been an alternative e-communication tool among young people as it allows multi-tasking students to do several things at the same time (The EDUCAUSE Learning Initiative, 2005), and also enables them to keep connected when they cannot meet each other physically (Cunliffe, 2006).

In the previous study where students were in groups of two, they heavily used mobile phones to communicate (Wang, 2009), as a mobile phone affords flexible and instant communication on the move, and enables them to organize an unscheduled meeting in the near future (Ling, 2004). In this study where students were in bigger groups of four, however, very few groups used mobile phones to communicate. This finding confirms that mobile phones become less effective for bigger groups as all members cannot talk at the same time (Larsen, Urry, & Axhausen, 2008).

Research shows that leadership is crucial for online learners to take a meaningful approach to learning (Garrison & Cleveland-Innes, 2005) and for group members to effectively coordinate (Lea, Rogers, & Postmes, 2002). This study revealed how leadership was formed naturally in a group in the learning process. A learning group usually begins with no formal leadership structure since the members are typically peers with fairly equivalent levels of knowledge in the topic area (Graham & Misanchuk, 2004). With the learning process going on, it is most likely that the member who has contributed more or shown higher technical competencies dominates or leads the learning process and thereafter becomes a leader eventually (Curtis & Lawson, 2001; Lea, Rogers, & Postmes, 2002).

5.3. Progress report

This study reveals that writing progress reports can be an additional strategy to effectively coordinate group members' collaborative efforts and monitor the learning progress. In this study, although the workspace had the potential to record group members' activities, however, not every activity could be documented automatically. Some activities had to be recorded down manually, such as face-to-face meeting minutes. The progress report provided additional information to further confirm what group members had done and what they were going to do. Writing progress reports helped group members reflect on the task they had completed and also enabled the teacher to monitor the learning process and individual contributions. This finding reinforces the results of other similar studies done by Barron (2000) and Wang (2009).

However, certain issues need to be carefully addressed when students are writing progress reports. Students should be clearly informed that writing progress reports is not solely for the teacher to track their progress, but also for them to summarize and reflect on what they have done. They may be more willing to write progress reports once they realize that writing progress reports can benefit them as well and it is not an additional burden. This probably could help to explain why about half of the groups that had two-way interaction in their workspaces still kept writing progress reports regularly.

The way of writing progress reports also needs to be deliberate. Writing progress reports individually may create a tension between group members, as some members reported every detail they did but actually they did less than others. It may give a wrong impression that these members did more than others as they wrote more or reported more often. Therefore a teacher should not judge individual contributions by simply looking at the number of progress reports an individual member produced. To fairly assess students, the teacher should further identify the nature of the task that each member has carried out.

5.4. Limitations and future research

This study faced some limitations. Additional marks could not be given to the participating classes in this study as all classes followed the same assessment criteria. This limitation might discourage the students to put more effort in the shared workspaces. Another similar constraint was that the teacher could not give additional marks to the groups who participated more than other groups. Educators alert that too much focus on marks would alienate students from education and teachers (Attwood, 2008). However, assessment is the engine that drives students' learning activities (Swan, Shen, & Hiltz, 2006). To a certain extent, giving marks would stimulate students to put more effort...
on a learning task. In the future, further research will investigate the extent to which giving students rewarding marks stimulates them to use a workspace more frequently.

In addition, the students had opportunities to meet each other during the period of completing the assignment. Certainly having opportunities to meet would enable them to coordinate and collaborate conveniently. However, it became a limitation in this study, as it reduced the necessity of using a shared online workspace to collaborate. A future study will focus on students who are located at different places and have no opportunities to meet physically. In this case, using a shared workspace to support collaboration becomes more essential.

6. Conclusion

Collaboration becomes essential in the new information age. Using online shared workspaces has the potential to support group collaboration in terms of coordinating students’ collaborative efforts and monitoring the learning process. However, students may be reluctant to use the workspaces to collaborate. Some strategies such as giving encouragement or moderation are often needed.

Coordination is crucial for group collaboration as it enables group members to consolidate their strengths and hence work effectively. Among the possible communication channels such as face-to-face meetings, MSN, emails, and phone calls, this study revealed that the students still preferred face-to-face meetings if they had chances to meet. Monitoring the collaborative learning process is critical for identifying student difficulties and assessing individual contributions. This study discovered that the use of shared workspaces could automatically record certain evidence, from which the teacher could track the developmental process of the assignment and also judge individual contributions.

Using online shared workspaces alone might not be sufficient for coordinating and monitoring the collaborative learning process, as the workspaces may not be able to capture all activities the students have carried out. This study reveals that getting students to write progress reports could help to reflect on what they have done. On the other hand, the progress reports provided additional information for the teacher to track the collaborative process and confirm their individual contributions. This study concludes that the way of using online shared workspaces together with writing progress reports has great potential to coordinate and monitor the collaborative learning process.

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