USING POSTING TEMPLATES FOR ENHANCING STUDENTS' ARGUMENTATIVE ELABORATIONS IN COMPUTER-SUPPORTED COLLABORATIVE INQUIRY LEARNING

MORRIS S. Y. JONG[*,‡], WEIQIN CHEN[†,§], ALEX W. C. TSE[*,¶],
FONG-LOK LEE[*,‖] and JIMMY H. M. LEE[*,**]

[*]*Centre for the Advancement of Information Technology in Education*
The Chinese University of Hong Kong
Shatin, N. T., Hong Kong

[†]*Department of Information Science and Media Studies*
University of Bergen
Fosswinckelsgt. 6, Bergen, Norway
[‡]*mjong@cuhk.edu.hk*
[§]*Weiqin.Chen@infomedia.uib.no*
[¶]*alextse@cuhk.edu.hk*
[‖]*flee@cuhk.edu.hk*
[**]*jlee@cse.cuhk.edu.hk*

Learning Villages (LV) is a computer-supported collaborative inquiry learning (CSCIL) platform, which facilitates students' issue-based discussion in a massively multiplayer online role-play gaming (MMORPG) environment to attain the goal of argumentative knowledge construction. Regarding argumentative knowledge construction, it can be achieved only if students are able to make argumentative elaborations properly in the discussion process. This paper discusses a study of using posting templates to enhance students' argumentative elaborations in LV. Seventy-four fifth-grade students and two of their teachers from two Hong Kong elementary schools participated in this study. The results showed that the posting templates proposed in the study, to a certain extent, could empower the students to construct arguments containing reasons and grounds to rationalize and warrant their arguments. In addition to the provision of the posting templates, it was also found the students' face-to-face peer-sharing (facilitated by the teachers) could help them reach and retain a relatively higher level of attainment of argumentative elaborations in CSCIL.

Keywords: Argumentative knowledge construction; collaborative inquiry learning; game-based learning.

[‡]Address: Department of Curriculum and Instruction, Faculty of Education, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong.

1. Introduction

Knowledge cannot be separated from why and how it constructs (Dewey, 1938); for years, there has been advocacy of constructivist approaches to education (Bruner, 1960; Hein, 1992; Jonassen & Howland, 2003; Piaget, 1970; Otting & Zwaal, 2007). *Inquiry learning* (Papert, 1980; Rutherford, 1964), a constructivist learning approach, emphasizes students in the course of learning should discover or develop knowledge rather than being presented with information or doing paper-and-pencil exercises. Social-constructivist learning theorists (e.g. Lave & Wenger, 1991; Vygotsky, 1978) further that learning should not only be a "constructive" but also "collaborative" process. It is believed that students can be empowered if they pursue inquiry learning in a collaborative manner (Jonassen & Howland, 2003; Scardamalia & Bereiter, 1993, 1994). This kind of "enhanced" inquiry learning approach is termed *collaborative inquiry learning*, while the computer environments that support this sort of learning process are termed *computer-supported collaborative inquiry learning* (CSCIL) platforms.

One of the foci of CSCIL research has been on the facilitation of *issue-based discussion* to attain the goal of *argumentative knowledge construction* (Stegmann *et al.*, 2004; Weinberger & Fischer, 2006). In this kind of collaborative inquiry learning, students are usually divided into groups and each group is assigned to discuss an open-ended issue interactively and iteratively through a CSCIL platform. Each student in the group composes and posts their own arguments with respect to the issue to the platform where his/her peers can read the arguments and then give feedback (such as questions, refinements, critique, etc.). As for CSCIL platforms, typically, they function as online asynchronous discussion tools supporting text-based postings (e.g. Lee, 2006; Weinberger & Fischer, 2006) and providing various graphical representations that help students visualize the progress of their discussion (e.g. Muukkonen *et al.*, 1999; Scardamalia & Bereiter, 2003; Schwarz & Glassner, 2007).

Empirical evidence (Guzdial & Turns, 2000; Lee, 2006) has shown that the use of online discussion forum-like platforms to facilitate issued-based discussion might not be able to motivate students' proactive participation in the course of argumentative knowledge construction. The aim of the design and development of *LV — Learning Villages*[1] has been to address the matter concerned. Briefly speaking, LV is a game-based CSCIL platform that supports students to conduct issue-based discussion in a *massively multiplayer online role-play gaming* (MMORPG) environment. (A more detailed description of LV will be covered in Section 3.)

In a pilot run of adopting LV to facilitate issue-based discussion (Ip *et al.*, 2007), we got positive results in terms of motivating students to participate in the course of discussion. However, when looking at the discussion records in LV and interviewing with the students, we found that they usually made their arguments based on their

---

[1]http://www.learningvillages.com. Retrieved on 1 October 2010.

intuitive thoughts of the issues concerned. They were unable to construct "convincing" arguments with the provision of reasons or grounds behind their thoughts. This finding aligned with the claim made by Stegmann *et al.* (2004) who observed that students usually have difficulties in making *argumentative elaborations* in the process of discussion in CSCIL. They advocated for the provision of some sorts of prototypical elaboration script pre-implemented in CSCIL platforms so as to assist students in formulating and structuring their arguments in a right way.

Even if students are motivated to pursue issue-based discussion by the gaming elements in LV, there is no guarantee of success in their argumentative knowledge construction. Students need to make argumentative elaborations properly in the discussion so as to benefit from the collaborative inquiry learning process. Echoing Stegmann *et al.*'s (2004) proposition, the research presented in this paper aimed at investigating to what extent *posting templates* ("script components" in Stegmann *et al.*'s terms) could enhance students' argumentative elaborations in LV. The followings are the two specific research questions addressed in the study:

(1) To what extent do posting templates affect students' argumentative elaborations in LV?
(2) How is the long-term retention effect of the posting templates on students' argumentative elaborations?

2. Argumentative Knowledge Construction

Argumentation is a verbal and social activity of reason that aims at advancing or declining "the acceptability of a controversial standpoint for the listener or reader, by putting forward a constellation of propositions intended to justify (or refute) the stand-point before a rational judge" (Van Eemeren *et al.*, 1996, p. 5). Regarding argumentative knowledge construction, it refers to the acquisition of both (1) knowledge about formulating argumentation, and (2) knowledge of the subject content considered or used when formulating argumentation (Andriessen *et al.*, 2003). In collaborative inquiry learning, argumentative knowledge construction takes place when a group of students engages in discussing an open-ended issue ["discourse activity" in Weinberger & Fischer's (2006) terms]. In the course of discussion, with respect to the issue, each member in the group needs to make argumentative elaborations in interaction with others. Each of them is responsible for knowing what needs to be known, and ensuring others to know the same; success of the group is attributed to all group members rather than merely the group leader (Scardamalia & Bereiter, 2003).

In CSCIL, students usually produce "text" (e.g. the threads recorded on CSCIL platforms) when pursuing issue-based discussion. Weinberger and Fischer (2006) developed a framework to analyse the text so as to assess the attainment of students' argumentative knowledge construction. The *argument* dimension, which is one of the critical dimensions of the framework, aims at examining whether students in the course of discussion are able to qualify and warrant their arguments

(i.e. making argumentative elaborations properly) until they converge toward a joint conclusion at the end of the discussion in collaborate inquiry learning. This dimension categorizes "CSCIL text" into four types, namely (1) simple claim, (2) qualified claim, (3) qualified and grounded claim, (4) non-argumentative move. *Simple claim* refers to a claim that advances one's position, neither with the provision of a qualifier (limitation of their validity) nor a ground (that warrant the claims). *Qualified claim* refers to a claim that advances one's position, with the provision of a qualifier. *Qualified and grounded claim* refers to a claim that advances one's position, with the provision of a qualifier and a ground. *Non-argumentative move* refers to a statement that coordinates a discussion move, such as a question, meta-statement, etc. The present research adopted the argument dimension of Weinberger and Fischer's framework as a basis to analyse to what extent posting templates could enhance students' argumentative elaborations in LV.

3. Learning Villages

Piaget (1964, 1970) regarded curiosity as the best driving force for learning. He argued that keeping learners curious by engaging them in play-like activities is the best approach to education, and thus games are an important avenue toward learning. Papert (1980, 1993), a proponent of Piaget, observed that gaming can foster students' deep learning. He highlighted that, in gaming, students are more conscious of the objects that surround them. When students interact with what goes on around them in a game, they begin to understand "what things are and how things work," and thus become more willing to spend time and effort on it.

Figure 1. Customization of the appearance of a student's avatar in LV.

Figure 2. A mini-game: Cooking in LV's café.

LV (Learning Villages), a CSCIL platform, operates in a form of massively multi-player online role-play game (MMORPG) in which each student can design his/her own virtual character (an avatar) to participate in this "virtual world" (as illustrated in Figure 1). There are various entertaining elements in LV, for example, playing a range of mini-games (see Figure 2 for an illustration). Participating in these mini-games, apart from earning the *passion* value for upgrading their own social status (see Figure 3), students can also earn *donuts* (the virtual money) for further participating issue-based discussion in LV (to be discussed in Section 3.1). In addition, there are various "hangout places" for students to meet one another. The interactions include real-time chat, making funny gestures and showing funny emotional icons to draw others' attention, etc. Figure 4 shows one of the hangout places in LV.

Figure 3. Passion, status, and donuts of a student's avatar in LV.

Figure 4. Hangout in LV.

3.1. *Two-tier issue-based discussion*

LV facilitates students' two-tier issue-based discussion. The first-tier is "village-level discussion," while the second-tier is "house-level discussion." Both levels of discussion can take place concurrently.

Each *village* in LV represents a discussion issue (as illustrated in Figure 5). A student can create a village, taking the role of *chieftain* by initiating an issue for discussion. Any other students in LV who are interested in that issue, can become *villagers* by building houses in that village. They can use houses to elaborate, for example, their perspectives, arguments or some related concepts with respect to the issue. In addition, the villagers can build roads between the houses to interconnect
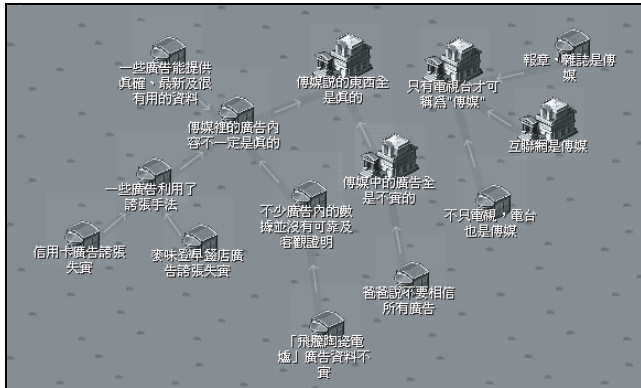

Figure 5. Village-level discussion.

Figure 6. Road building between houses.

different perspectives, arguments or concepts delineated in the village (see Figure 6). They can make use of different types of roads, namely, "Explanation," "Evidence," "Problem," "My Reply," "Solve This First," "Another View," "Compare With," and "Others" to reflect the different relationships between the elaborations represented by those houses. This is called village-level (the first-tier) discussion.

In the village, actually, every house is "enterable," and it functions as an individual forum to facilitate discussion on a specific perspective, argument or concept raised in the village-level discussion. In LV, the term "postings" is used to represent the discussion threads inside houses (as illustrated in Figure 7). This is called house-level (the second-tier) discussion. The more postings there are in a house, the larger its size and the higher its modernity level will be.

Figure 7. House-level discussion.

Figure 8. Pet buying in LV's shop.

The advantage of the 2-tier design in LV is that, major perspectives, arguments and related concepts, as well as their relationships with respect to a discussion issue can be arranged neatly in the form of mind mapping at the village level. However, it is still handy for students to review the details of a particular perspective, argument, or concept discussed at the house level.

In order to encourage students to participate in quality issue-based discussion, the invest-and-reward mechanism is implemented in LV for the purpose. Every time when a student creates a village, or builds houses in existing villages created by others, he or she has to pay donuts. Nevertheless, when the number of quality houses and postings in the villages (that he or she has "invested" in) reaches a certain amount, the village will be upgraded by either the LV system administrator or their learning facilitators (usually their teachers). Benefits brought about by the upgrade include donut reward, higher social status conferment for enjoying extra privileges (such as pet keeping, see Figure 8) in LV.

3.2. *Posting templates*

As for argumentative knowledge construction, it can be achieved only if students are able to make argumentative elaborations properly in the course of issue-based discussion. However, Stegmann *et al.* (2004) observed that the quality of students' discussion in CSCIL is often weak, and it is usually due to the reason that students do not know how to make argumentative elaborations properly. They advocated for the provision of some sorts of prototypical elaboration script ("script components") pre-implemented in the CSCIL platforms for guiding students to formulate and structure their arguments rightly. The introduction of posting templates to LV was to echo Stegmann *et al.*'s proposition.

One month prior to the conduct of the learning experiment (discussed in Section 4), the first and third authors of this paper formed a working group with

Figure 9. Posting templates.

five General Studies[2] teachers in Hong Kong. All of them were well-experienced in supporting students to pursue collaborative inquiry project work in their schools. The working group aimed at designing some positing templates to assist students at elementary fifth-grade level in making argumentative elaborations in issue-based discussion in LV.

According to the teachers' experiences, students were usually weak in rationalizing or warranting their claims in discussion. Based on the working group's understanding of students' weaknesses in argumentative elaborations, we constructed 2 posting templates (see Figure 9) to be adopted in this study. The first one was designed for elaborating on new arguments, while the second one was designed for responding to arguments made by others. Basically, the posting templates contain the same three components: (1) *a claim*, (2) *reason*, and (3) *source of evidence.*

4. Research Design

Two classes of fifth-graders from two elementary schools (hereafter referred as *School A* and *School B*) located in different districts in Hong Kong were the subjects of the study. It was a convenient sample with 74 students (at the age of 11.2 in average, 35 males and 39 females), 36 students from School A and 38 students from School B.

4.1. *Inter-school teaming*

Preceding the learning experiment, the students in each class were divided into nine roughly equal-size groups so that the groups are equivalent in the distributions in gender and academic performance. After that, every group in School A, on a

---

[2]General Studies is a core subject in elementary education in Hong Kong. Collaborative inquiry project work is one of the compulsory learning activities in the subject curriculum.

random basis, was further paired up with a group in School B to form an inter-school collaborative learning team (hereafter referred as a "team") to conduct issue-based discussion in LV in the learning experiment. Hence, 9 teams were formed, each composed of around 8 students, half from School A and half from School B.

4.2. *Learning experiment*

The experiment was composed of two phases. The first phase, which was a treatment check, aimed at studying to what extent the proposed posting templates could affect the students' argumentative elaborations in LV (i.e. the first research question, see Section 1). The second phase was designed to investigate how the long-term retention effect of the posting templates on the students' argumentative elaborations (i.e. the second research question, see Section 1). In both phases, the students were assigned to work in teams in the inter-school fashion as described Section 4.1). All of the learning facilitation activities in the experiment were co-conducted by two teachers, one from School A and one from School B. Within the process, the teachers were allowed to give "just enough" assistance to help the teams pursue their issue-based discussion when necessary. For instance, at the beginning of the discussion, the teachers would create one or two "initial houses" in each of the villages for stimulating each team to frame the possible directions of inquiries on their own discussion issue.

4.2.1. *Phase 1*

This phase took four weeks (namely *Week 1*, *Week 2*, *Week 3*, and *Week 4*) to complete, in which each team pursued online discussion on a real-life open-ended issue through LV. There were three discussion issues[3] adopted in this phase. Thus, every three teams were assigned to discuss the same issue; however, every team conducted the discussion separately in different villages. Every week, in School A and School B respectively, the teachers conducted a 30-minute face-to-face lesson to facilitate the sharing of their own class's learning experience in LV. Each of the lessons held in the respective schools was observed by the first and third authors of the paper. After each lesson, a number of the students were selected and interviewed in a friendly and informal manner for gaining more understanding of their learning process.

　　At the beginning of Week 2, the teachers introduced the posting templates described in Section 3.2 to the students in the lesson, and displayed the templates on an *electronic notice board* (a clickable on-and-off window) in each of the villages

---

[3]The discussion issues adopted in Phase 1 were:
  — Should an elementary fifth-grade student bring his/her mobile phone to school?
  — Should an elementary fifth-grade student make use of instant messaging software to communicate with others?
  — Should we trust the advertisements in electronic media?

for the students to have easy reference in LV. The templates were displayed until the end of Week 4.

4.2.2. *Phase 2*

Three months after Phase 1 had completed, Phase 2 of the experiment was executed. This phase was a delay investigation, in which each team worked in the same way as Phase 1. They were assigned to conduct another discussion on another issue[4] in LV. This phase duplicated the experimental procedures carried out in Phase 1, except in two aspects. The first aspect is the teachers neither mentioned the posting templates in the face-to-face lessons nor displayed them in the villages in LV. In addition, since one month before the start of Phase 2 and until its end, all of the villages created in Phase 1 were made hidden in LV. Thus, the students were unable to refer to the style of their previous elaborations. The second aspect is the duration. This phase was shortened from four weeks to two weeks. It was because the remaining time of the semester was not sufficient to implement a 4-week phase.

4.3. *Analysis*

An adjusted version of the argument dimension in Weinberger and Fischer's original framework (2006) was adopted to analyze the postings in this study. As discussed in Section 2, the original argument dimension categorizes argumentative elaborations into *simple claims*, *qualified claims*, *qualified and grounded claims*, as well as *non-argumentative moves*. In the adjusted version, the categories that contain the component of "qualifiers" were modified.

Qualifiers refer to statements that limit the validity of a claim to specific circumstances (Weinberger & Fischer, 2006). In other words, a claim becomes a "qualified" one if the qualifiers concerned are delineated therein. Nevertheless, the purpose of the posting templates designed for this study was to assist elementary students in elaborating on arguments with claims, reasons for rationalizing their claims, and grounds (i.e. evidence) for warranting their claims properly. Enabling them to make qualified claims was not the research focus. Thus, modification to the argument dimension in the original framework was necessary. The categories of "qualified claims" and "qualified and grounded claims" were revised into *rationalized claims*, as well as *rationalized and grounded claims*, respectively. The adjusted version of the argument dimension is described in Table 1. In the table, the left-most and middle columns show the claims' categories and the respective descriptions. The right-most

---

[4]The discussion issues adopted in Phase 2 were:
- Do you have other suggestions of the form and mode of torch relay in the Olympic Games?
- If it was not the Olympic Equestrian Events, which events could Hong Kong co-host in the Beijing 2008 Olympic Games?
- How should one be qualified to be selected as a torch bearer in the Olympic Games?

Table 1. Adjusted version of the argument dimension.

Category	Description	Example[a] (*extracted from LV*)
Simple Claims	Claims that advance ones' position(s), neither with the provision of reasons nor grounds	Most advertisements in electronic media are not trustable.
Rationalized Claims	Claims that advance ones' position(s), with the provision of reasons to rationale the claims	I don't think all advertisements on the Web are trustable, because everyone can post anything on the Web easily and without any cost.
Rationalized and Grounded Claims	Claims that advance one's position(s), with the provision of reasons to rationalize the claims, and grounds to warrant the claims	I think the advertisements shown in TVB [*the largest commercial television station in HK*] are more trustable, because the manager of TVB should evaluate the content of each advertisement before broadcasting it. Source of Evidence: http://hk.knowledge.yahoo.com/question/question?qid=7010100100631
Non-argumentative Moves	Statements that coordinate the discussion moves, such as clarifications, requests for others' clarifications, etc.	I don't quite understand what you are saying. Could you please explain it in detail?

Note: [a]These examples were written in Chinese originally.

column shows actual examples of the claims (in different categories) found in the present study.

5. Findings

There were 757 and 371 postings in the villages in Phases 1 and 2 of the learning experiment, respectively. Within 1 month after each phase, with the use of the argument dimension discussed in Section 4.3, all students' postings were categorized into the *Simple-Claims*, *Rationalized-Claims*, *Rationalized-and-Grounded-Claims*, as well as *Non-argumentative-Moves*. The categorization work was conducted by the first author of this paper. The categorization results were verified further by the third author of this paper.

5.1. *Effect of the posting templates* (*Phase 1*)

Table 2 shows the number of the students' postings and their proportional percentage among different categories in the four weeks (Week 1, Week 2, Week 3 and Week 4) in Phase 1. "S" stands for Simple-Claims, "R" stands for Rationalized-Claims, "RG" stands for Rationalized-and-Grounded-Claims, and "N" stands for Non-argumentative-Moves. Figure 10 shows a graphical presentation of their proportional distribution across the weeks.

The posting templates were introduced to the students in Week 2. Compared to Week 1, the categorical distribution of Week 2's postings changed.

Table 2. Number of postings among 4 categories in each week in Phase 1.

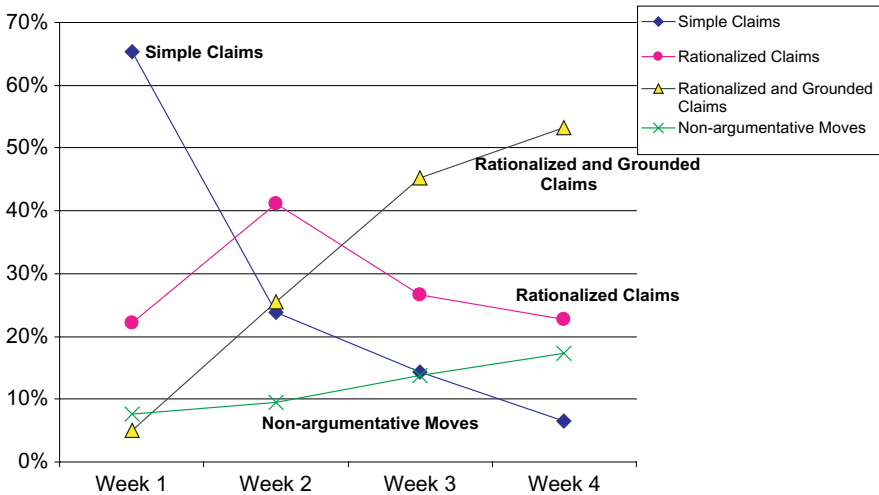| Week		Category				
		S	R	RG	N	Total
1	Count	*145*	49	11	17	222
	% within Week	**65.3**%	22.1%	5.0%	7.7%	100.0%
2	*Count*	**43**	*74*	**46**	17	180
	% within Week	23.9%	**41.1%**	25.6%	9.4%	100.0%
3	Count	27	50	*85*	26	188
	% within Week	14.4%	26.6%	*45.2%*	13.8%	100.0%
4	Count	11	38	*89*	29	167
	% within Week	**6.6**%	**22.8**%	**53.3**%	17.4%	100.0%

Figure 10. Proportional distribution of postings among 4 categories in each week in Phase 1.

Rationalized-Claims dominated (41.1%) in the week. The proportional percentage of Simple-Claims dropped around 40%, whereas the proportional percentage of Rationalized-and-Grounded-Claims increased by 20% approximately. In Week 3 and Week 4, Rationalized-and-Grounded-Claims became dominant, with the proportional percentage of 45.2% and 53.3%, respectively. In addition, compared to Week 1 and Week 2, there were relatively small number of Simple-Claims found in these two weeks.

Was the increase of the students' postings of Rationalized-and-Grounded-Claims in the latter weeks SOLELY due to the provision of the posting templates? In order to answer this question, during the study, we conducted interviews with a number of the students for gaining more understanding of their learning process in LV. Before each interview, we extracted the interviewee's postings made in different weeks. We let the interviewee read the postings again. After that, we asked him/her with the

following 2 questions and then let him/her unfold the answers: (1) What are the differences among these postings? And (2) Why did you make those differences?

Student X who started to make Rationalized-and-Grounded-Claims in Week 2 (but not in Week 1) elaborated:

> *I started to elaborate on my arguments with reasons, and some sort of evidence after my teacher had introduced the posting templates to us in the face-to-face lesson. When I was creating a new posting in the village, I would look up the templates for reminding myself about what I need to include in this new posting . . .*

In fact, all Rationalized-and-Grounded-Claims found in this phase were in the style of the templates. Besides, many other students who started to make Rationalized-and-Grounded-Claims in Week 2 gave similar comments as Student X did. This showed that, to a certain extent, the positing templates could function as intended. However, the increase of the students' Rationalized-and-Grounded-Claims could not be attributed at all to the direct provision of the posting templates.

According to a student (namely, Student Y) who started to make Rationalized-and-Grounded-Claims in Week 3 or Week 4 (but not in Week 1 and Week 2):

> *My team didn't pay much attention to the posting templates at the beginning. We just wrote our postings as what we used to do in other discussion forums . . . In Week 3's face-to-face lesson, the teacher invited different teams to share their learning experience in LV with others. We realized that some classmates could make convincing arguments for what they wanted to advocate. They mentioned that the posting templates did help them a lot. My teammates and I started to refer to the templates when composing arguments in our village . . .*

Student Y's comment aligned with our observations made in the face-to-face lessons. In fact, not all students could benefit simply from the direct provision of the posting templates. In the study, the peer-sharing in the face-to-face lessons facilitated by the teachers was another important intervention to enable the students to distinguish between good and bad examples of arguments, and help them improve their argumentative elaborations.

5.2. *Long-term retention (Phase 2)*

Table 3 shows the number of the students' postings and their proportional percentage among different categories with respect to the two weeks (Week A and Week B) in Phase 2. Rationalized-and-Grounded-Claims still dominated in Week A and Week B, with proportional percentage of 41.4% and 53.5%, respectively.

Table 3. Number of postings among 4 categories in each week in Phase 2.

	Week	Category				
		S	R	RG	N	Total
A	Count	23	58	**77**	28	186
	% within Week	12.4%	31.2%	***41.4%***	15.1%	100.0%
B	Count	21	43	***99***	22	185
	% within Week	11.4%	23.2%	***53.5%***	11.9%	100.0%

Although the posting templates were not provided in this phase, the format (a combination of a claim, a reason and a source of evidence) of the Rationalized-and-Grounded-Claims was quite similar[5] to that of the templates provided in Phase 1. The proportional percentage of Simple-Claims was at a relatively low level in both weeks (12.4% in Week A, and 11.4% in Week B).

After examining other evidence gathered from the lesson observations and student interviews in this phase, the respective increase and decrease of Rationalized-and-Grounded-Claims as well as Simple-Claims from Week A to Week B could be explained by the effect of the peer-sharing (as described in Section 5.1) facilitated by the teachers at the beginning of Week B, and the students' experience re-collection. In order to further investigate the long-term retention effect of the posting templates, comparisons between (1) *Week 4 and Week A*, as well as (2) *Week 4 and Week B* were conducted.

5.2.1. *Week 4 vs Week A*

Since Week 4 was the ending week of Phase 1, its categorical distribution of the students' argumentative elaborations could be treated as the students' learning attainment in Phase 1. As for Week A, it was the beginning week of Phase 2, and there was a 3-month time lag between Week 4 and this week. Thus, by comparing the categorical distributions of these 2 weeks, the extent of the long-term retention effect of the posting templates on the students' argumentative elaborations in LV could be examined. Figure 11 shows a graphical presentation of the respective proportional distributions of Week 4's postings and Week A's postings among the 4 categories.

Although Rationalized-and-Grounded-Claims dominated in both weeks, Week 4's proportional percentage was around 12% higher than Week A's. Regarding Simple-Claims, the proportional percentage in Week 4 was around 6% lower than Week A. A Pearson chi-square test indicated that there was significant difference between the categorical distributions of Week 4's postings and Week A's (chi-square = 8.22, *p*-value = 0.04). According to the results, without the provision of the positing templates, there was no guarantee that the attainment of the students' argumentative elaborations in LV, after a period of time (3 months in the present

---

[5]Some Rationalized-and-Grounded-Claims founds in Phase 2 started with claims, sources of evidence, and finally, the reasons.
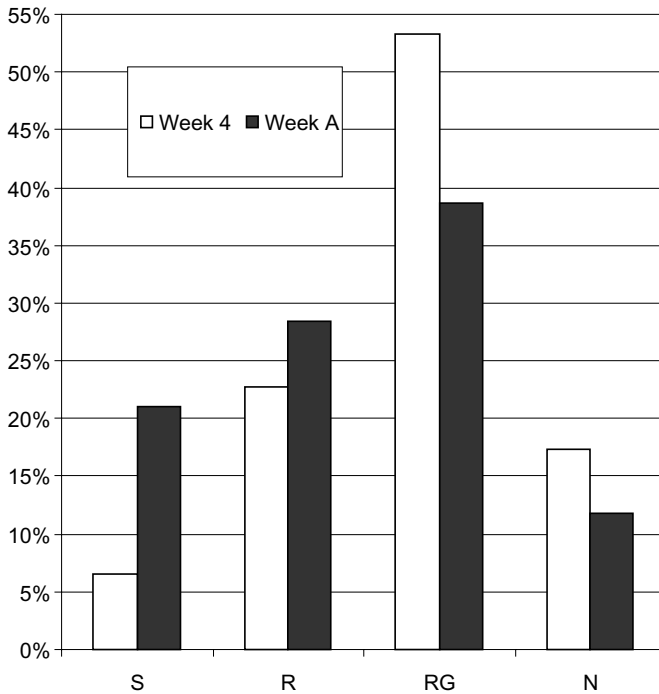
Figure 11. Proportional distribution of postings among 4 categories in Week 4 and Week A.

study), could reach "immediately" to a comparable level to the attainment with the introduction of the templates.

5.3. *Week 4 vs Week B*

We investigated further whether the students' attainment of argumentative elaborations in Week B (the ending week of Phase 2) could reach eventually a comparable level to that they achieved in Week 4 (the ending week of Phase 1). Figure 12 shows a graphical presentation of the proportional distribution of the postings among 4 categories in Week 4 and Week B.

Rationalized-and-Grounded-Claims dominated in both Week 4 and Week B, with the proportional percentage of 53.3% and 53.5%, respectively. Also, the proportional percentage of Simple-Claims was at a relatively low level in both weeks (6.6% in Week 4 and 11.4% in Week B). A Pearson chi-square test showed that there was no significant difference between the categorical distributions of Week 4's postings and Week B's postings (chi-square $= 4.02$, p-value $= 0.26$). According to the results, although the posting templates were not provided in Phase 2, the students could achieve eventually a comparable level of attainment to the level attained with the access to the posting templates in LV. This resumption was attributed to the students' peer-sharing facilitated by the teachers and their experience re-collection.
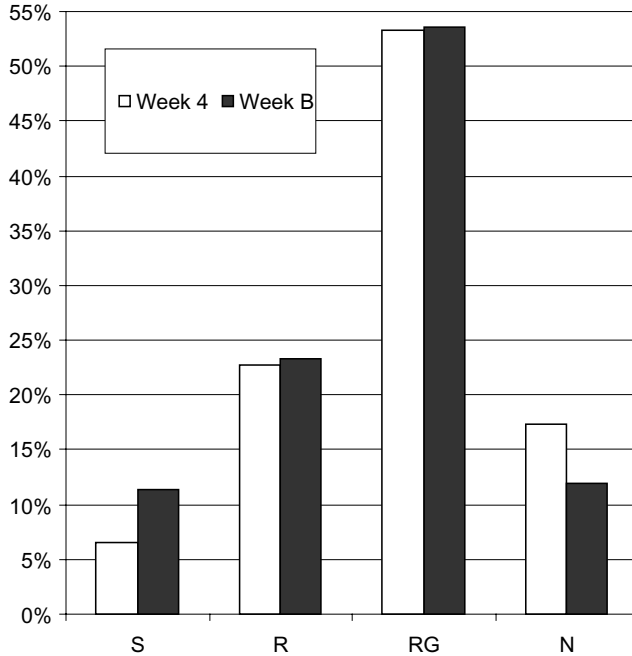
Figure 12. Proportional distribution of postings among 4 categories of Week 4 and Week B.

6. Discussion

No control group[6] in the research setting was a critical limitation of the present study. All of the comparisons were done within the same group of the students' performance in different weeks of the different phases in the learning experiment. Thus, the quality enhancement of the students' postings could not be attributed at all to the direct provision of the posting templates. On the other hand, the qualitative data gathered in the student interviews and lesson observations highlighted the significance of the teacher facilitation for supporting the students in their discussion process. This insight echoed Vygotsky's (1978) scaffolding conception in the context of constructivist learning.

Scaffolding refers to a process by which a teacher assists students so that they can solve problems or perform tasks that would otherwise be out of reach (Vygotsky, 1978). Although constructivist learning emphasizes strongly an active student role (Papert, 1993; Piaget, 1970), upon this learning paradigm, it is still believed that teachers are always the best at seeing when, what and why students are confronted with puzzles arising in the process of learning, and supporting them to solve the puzzles constructively (Darling-Hammond & Bransford, 2005; Jonassen & Howland,

---

[6]A group has issue-based discussion in LV without the provision of the posting templates in Phase 1.

2003; Howard, 2002). In the present study, we found that the peer-sharing facilitated by the teachers was an important intervention for assisting the students in realizing how a good argument looked like, and improving their argumentative elaborations.

Nevertheless, the quality of the grounds (evidence) that the students provided to warrant their arguments in the study aroused another concern. We noticed that a certain portion of the cited evidence in the postings came from *Wikipedia*[7] and *Yahoo! Answers*[8]. The content in these Web 2.0 references has been raising doubts about their authenticity (McIlroy, 2008). The worry is that students use "unwarranted grounds" to substantiate their arguments. In view of the concern, it opens up the need of research on the issue of how to empower students to evaluate and use authentic grounds when participating in issue-based discussion.

7. Conclusion and Future Work

This study attempted to investigate the effect of the provision of posting templates for enhancing elementary fifth-grade students' argumentative elaborations in the course of issued-based discussion in LV — a game-based CSCIL platform. Two posting templates, which consist of three major components — *a claim*, *reason*, and *source of evidence*, were proposed. We found that, in the presence of the posting templates, the students could achieve a certain level of attainment of argumentative elaborations (i.e. constructing arguments with reasons and grounds to rationalize and warrant their arguments in LV). In the absence of the posting templates, there was no guarantee that all of them could reach "immediately" the same level of attainment, but the students' peer-sharing (facilitated by the teachers) and their experience re-collection could help them resume a comparable level of attainment. Nevertheless, the findings of the study have yet to be confirmed due to the reason that there was no control group in the research setting. Repeating the same experiment with the presence of a control group is our future work.

It should be noticed that Weinberger and Fischer's (2006) complete framework is composed of four dimensions that describe the overall attainment of students' argumentative knowledge construction in issue-based discussion. Apart from the argument dimension adopted in this study, there are *participation*, *epistemology*, and *social modes of co-construction* dimensions. The participation dimension focuses on describing whether students in a group participate throughout the course of discussion and they participate on an equal basis. The epistemic dimension concerns whether students' on-discussion and off-discussion epistemic activities assist them in participating in the progress of discussion in an adequacy manner. The social modes of co-construction dimension describes to what extent students refer to their group members' contributions in the process of discussion. In order to gain a comprehensive understanding of other aspects of argumentative knowledge construction in LV,

---

[7]http://www.wikipedia.org. Retrieved on 10 December 2009.
[8]http://answers.yahoo.com. Retrieved on 10 December 2009.

it is worth additional research efforts on harnessing other dimensions in Weinberger and Fischer's framework to investigate further the course of students' issue-based discussion in LV.

Facilitating issue-based discussion within a MMORPG gaming environment is one of the unique aspects of LV. Moreover, the invest-and-reward mechanism implemented in LV is one of the innovative approaches to engage students in the course of argumentative knowledge construction. However, the evaluation of these areas had yet to be done in the present study. We have put all these down on our further-study agenda.

References

Andriessen, J. E., Baker, M., & Suthers, D. (2003). *Arguing to learn: Confronting cognitions in computer-supported collaborative learning environment.* Utrecht: Kluwer.

Bruner, J. S. (1960). *The process of education.* Cambridge: Harvard University Press.

Darling-Hammond, L., & Bransford, J. (2005). *Preparing teachers for a changing world* (pp. 40–87). San Francisco, CA: Jossey-Bass.

Dewey, J. (1938). *Experience and education.* New York: Macmullan.

Guzdial, M., & Turns, J. (2000). Effective discussion through a computer-mediated anchored forum. *Journal of the Learning Science*, *9*, 437–469.

Hein, G. (1992). Constructivist learning theory. *Developing museum exhibitions for lifelong learning* (pp. 30–34). London: The Stationery Office.

Howard, J. (2002). Technology-enhanced project-based learning in teacher education: Addressing the goals of transfer. *Journal of Technology and Teacher Education*, *10*(3), 343–364.

Ip, C. W. H., Luk, E. T. H., Cheung, K. K. F., Lee, J. H. M., & Lee, F. L. (2007). A game-based computer supported collaborative learning environment: Learning Villages (LV). *Proceedings of the 11th Annual Global Chinese Conference on Computers in Education* (pp. 289–292). 26–30 May, Guangzhou, China.

Jonassen, D. H., & Howland, J. (2003). *Learning to solve problems with technology: A constructivist perspective.* Upper Saddle River, N.J.: Merrill Prentice Hall.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge: Cambridge University Press.

Lee, F. L. (2006). *Report on the project of global learning community among primary education through 3-I project learning.* Hong Kong: Center for the Advancement of Information Technology in Education, CUHK.

McIlroy, D. (2008). Wikipedia criticism is unwanted. *Collegiate Times*, 11 June 2008.

Muukkonen, H., Hakkarainen, K., & Lakkala, M. (1999). Collaborative technology for facilitating progressive inquiry: The future learning environment tools. *Proceedings of the CSCL '99 conference* (pp. 406–415). December 12–15, Palo Alto. Mahwah, NJ: Lawrence Erlbaum and Associates.

Otting, H., & Zwaal, W. (2007). The identification of constructivist pedagogy in different learning environments. In M. K. McCuddy, H. van-den-Bosch, W. B. Martz, A. V. Alexei & K. O. Morseb (Eds.), *The challenges of educating people to lead in a challenging world* (pp. 171–196). Netherlands: Springer.

Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas.* New York: Basic Book.

Papert, S. (1993). *The children's machine: Rethinking school in the age of the compu* ters. New York: Basis Books.

Piaget, J. (1964). Development and learning. *Journal of Research in Science and Teaching, 2*, 176–186.

Piaget, J. (1970). *Science of education and psychology of the child*. New York: Oxford University Press.

Rutherford, F. J. (1964). The role of inquiry in science teaching. *Journal of Research in Science Teaching, 2*, 80–84.

Scardamalia, M., & Bereiter, C. (1993). Technologies for knowledge-building discourse. *Communications of the ACM*, *36*, 37–41.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge building communities. *The Journal of the Learning Science, 3*, 185–213.

Scardamalia, M., & Bereiter, C. (2003). Knowledge building. *Encyclopedia of education* (pp. 1370–1373). New York: Macmillan Reference.

Schwarz, B. B., & Glassner, A. (2007). The role of floor control and of ontology in argumentative activities with discussion-based tools. *Computer-supported Collaborative Learning*, *2*, 449–478.

Stegmann, K., Weinberger, A., Fischer, F., & Mandl, H. (2004). Scripting argumentation in computer-supported learning environments. In P. Gerjets, P. A. Kirschner, J. Elen, R. Joiner (Eds.), *Instructional design for effective and enjoyable computer-supported learning* (pp. 320–330). Tübingen: Knowledge Media Research Center.

Van Eemeren, F. H., Grootendorst, R., Henkenmans, F. S., Blair, J. A., Johnson, R. H, Krabb, E. C., Plantin, C., Walton, D. N., Willard, C. A., Woods, J., & Zarefsky, D. (1996). *Fundamentals of Argumentation Theory: A handbook of historical background and contemporary developments*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Vygotsky, L (1978). *Mind and society*. Cambridge: MIT Press.

Weinberger, A., & Fischer, F. (2006). A framework to analyze argumentative knowledge construction in computer-supported collaborative learning. *Computer and Education*, *46*, 71–95.