# Chapter 7
# Case Studies on Peer Facilitation: How to Foster Higher Levels of Knowledge Construction

Up to this point, our focus has been on studies that examined possible ways to increase student contribution as well as sustain online discussions in peer facilitated forums. In this chapter, we would like to focus on possible ways that can foster higher knowledge construction levels. However, before we do that, it will be helpful to revisit what we mean by knowledge, as well as higher knowledge construction levels in this book. We consider knowledge as referring to information, procedures, facts, opinions, experiences, or ideas (Alavi and Leider 1999, 2001). This definition is consistent with the applied perspective of knowledge (Hew and Hara 2007).

We define higher levels of knowledge construction as the sum of the frequency of level II (exploration of dissonance, disagreement), level III (negotiation of meaning), level IV (testing and modification), and level V (application of negotiated ideas, and students' self-reflective statement of new knowledge construction) occurrences as measured by Gunawardena et al. (1997) interaction analysis model.

Although there are several different models that examine the levels of knowledge construction (De Wever et al. 2006), we decided to adopt Gunawardena et al. (1997) model because this particular model focuses on the "overall pattern of knowledge construction emerging from a conference, and is a relatively straightforward scheme" (Lally 2001, p. 402). It is also considered a relatively reliable and straightforward scheme (Lally 2001; Marra et al. 2004).

## 7.1 Investigating the Role of Group Size, Duration of Discussion, and Peer Facilitation Techniques

In this section, we describe and summarize the main findings of three studies. The first study examined the possible relationship between the frequency of higher level knowledge construction occurrences and group size, while the other two studies examined, the role of peer facilitation techniques, as well as the duration of

K. F. Hew and W. S. Cheung, *Student Participation in Online Discussions*,
DOI: 10.1007/978-1-4614-2370-6_7, © Springer Science+Business Media, New York 2012

**Table 7.1** Characteristics of studies 8, 9, and 10

| Characteristic | Study 8 (n = 28 forums) | Study 9 (n = 12 forums) | Study 10 (n = 40 forums) |
|---|---|---|---|
| Mode of learning | Blended with face-to-face and online components | Blended with face-to-face and online components | Blended with face-to-face and online components |
| Discipline of study | Education, engineering, science, business | Engineering, science, business | Education |
| Profile of students | Full-time undergraduate and full-time post-diploma students | Full-time undergraduate students | Part-time graduate students, full-time diploma students |
| Type of online component | Peer-facilitated asynchronous online discussion | Peer-facilitated asynchronous online discussion | Peer-facilitated asynchronous online discussion |
| Online task | Design task | Design task | Design task |
| Duration of online discussion | 3 weeks | 3 weeks | 6 weeks |
| Discussion requirement | Course credits given for contribution in the discussion, no number of posting quota or deadline imposed. | Course credits given for contribution in the discussion, no number of posting quota or deadline imposed | Course credits given for contribution in the discussion, no number of posting quota or deadline imposed |
| Data sources | Online posts | Online posts, reflections | Online post, interviews, reflections |

the online discussion. Table 7.1 provides a summary of these three studies. We describe each study first, followed by a cross-case discussion of the main findings.

*Description of Study 8*

Study 8 was conducted to answer the following two questions: (a) is there a relationship between the frequency of higher level of knowledge construction occurrences and the group size of discussion forums? and (b) what is the mean group size of the more successful forums versus the less successful forums? (Hew and Cheung, 2010b).

*Method*

Data were collected from 28 discussions forums. All 28 discussion forums were completely peer facilitated. We referred the group size of an online discussion to the number of people who posted messages in the discussion. Group size of the discussions varied from 1 to 12 people per forum. Students were required to design instructional materials to be used in education or training contexts. They were asked to upload their design projects into their own discussion forums. Students used the discussion forums to identify design problems of their peers' design projects, provide viewpoints for improvements, and respond to the comments raised. Students' online postings were coded in order to establish the levels of knowledge construction. Overall percent agreement of the coding was 80.6 %.

Following the completion of the coding, we tabulated the frequency of occurrences for each knowledge construction level in each of the 28 discussion forum. The sum of the frequency of levels II, III, IV, and V occurrences constituted the frequency of higher level knowledge construction. A Pearson product moment correlation coefficient was subsequently computed to examine if a statistically significant relationship existed between group size and the frequency of higher level knowledge construction occurrences.

To address the second question, "what is the mean group size of the more successful forums versus the less successful forums?", we first defined the more successful forums as discussion forums that had greater occurrences of higher knowledge construction levels (i.e., the sum of the frequency of levels II, III, IV, and V). Since the mean number of levels II to V occurrences was 4.75 for the entire 28 forums, we considered forums with 5 or more levels of II to V instances as the more successful forums. Fourteen such forums were found. The remaining 14 forums were considered to be the less successful ones. We then computed the mean group size of the 14 more successful forums. The answer to this question could provide an indication to a certain critical mass, possibly an optimum discussion group size which may be required to direct the discussion to higher levels of knowledge construction.

*Description of Study 9*

One of the main purposes of study 9 was to examine if certain facilitation techniques might foster higher knowledge construction levels (Hew and Cheung 2010a).

*Method*

Data were collected from 12 online discussion forums involving undergraduate students. As part of their course assignment, each student designed a project detailing the use of asynchronous online discussion as an instructional strategy within the primary or secondary school context. Students utilized the discussion forums to discuss design problems of their peers' design projects, provide viewpoints or suggestions for improvements, and respond to the comments raised. At the end of the course, the students completed their reflections that explained the facilitation techniques they had used, and how these might help foster higher level knowledge construction in an online discussion environment. Students' online postings were analyzed in order to establish the levels of knowledge construction as well as the types of peer facilitation techniques used in the discussions. The percent agreement of the knowledge construction and facilitation techniques coding were 80.4 and 82.5 %, respectively.

*Description of Study 10*

In order to further explore the research question on what factors may foster higher levels of knowledge construction in peer-facilitated online forums, as well as to test the findings in the earlier two studies (8 and 9), we conducted Study 10. Altogether, the following three questions were examined: (a) Is there a relationship between group size and the frequency of higher level knowledge construction

occurrences? (b) Is there a relationship between the duration of the online discussion and the frequency of higher level knowledge construction occurrences? (c) Are there any differences between forums that have more higher levels of knowledge construction occurrences and those that do not in terms of the types of facilitation techniques used, as well as the frequency in which the techniques were employed? (Hew and Cheung 2011a)

*Method*

Study 10 was organized into two sections. In the first section, we examined the relationship between higher level knowledge construction and group size, as well as the discussion duration. Data were collected through online observations of 40 peer discussion forums from three courses: course A (January 2007 semester, graduate level such as students pursuing a Masters or doctoral degree) with 12 forums, course B (January 2006 semester, non-graduate level such as students pursuing a diploma certification) with 12 forums, and course C (July 2005 semester, non-graduate level) with 16 forums.

Each discussion forum utilized the same discussion forum, which was the threaded discussion tool available in BlackBoard™. Participants in the online discussions, including the peer facilitators, were education major students. This was to minimize the risk of possible confounding variable due to the involvement of students from other disciplinary areas. The same instructor was overall responsible for the 40 forums. This was to minimize the risk of confounding variables due to the possibility of different online activities employed by different instructors.

All 40 forums had an ill-structured problem solving, specifically design task, as their discussion activity. The purpose of this criterion was to ensure that all forums shared a similar activity or task, so that the influence of group size and duration of the online discussion on knowledge construction (if any) would be easier to identify. The conceptual knowledge base of the design topic (e.g., principles of instructional design) was provided to students before the actual online discussion. Students in these forums were engaged in designing instructional materials for use in the schools or training institutes (e.g., a web-based instructional activity on the subtraction of whole numbers for grade two children). Students utilized the discussion forums to identify and determine the nature of the problems or issues related to their peers' projects, give comments, or develop viable solutions for improvements, and respond (e.g., agree or disagree accompanied by justifications or reasons) to the comments raised.

Group sizes, excluding the peer facilitators, ranged from 2 to 10. The duration of the online discussions ranged from 6 to 41 days. We referred the group size of an online discussion to the number of students (excluding the peer facilitator) who made postings in the discussion. We referred the duration of the online discussion to the period (in number of days) between the first and the final messages posted in the discussion. For example, we deemed the duration of an online discussion to be 19 days if the first and final postings were made on September 1, 2008 and September 20, 2008, respectively. The percent agreement of the knowledge construction coding was 93 %.

In the second section, the types of peer facilitation techniques were examined. A further analysis of the data was carried out. Since the mean number of levels II–V occurrences was 7.86 for the entire 40 forums, forums with eight or more levels II–V were considered to be the more frequent forums in terms of higher knowledge construction levels. Specifically, of the 40 forums, 14 more frequent forums were identified. Fourteen less frequent forums were randomly selected from the remaining forums. The entire peer facilitators' postings in these two groups of forums were examined and coded. The percent agreement of the facilitation technique coding was 90 %. The types, as well as the frequency of facilitation techniques used were subsequently examined to see if any differences occur between these two groups.

## 7.2 Major Findings of Studies 8, 9, and 10 Regarding Possible Ways to Foster Higher Knowledge Construction Levels

In this section, we offer the following six findings learned (see Fig. 7.1) from the aforementioned three studies with regard to possible ways of fostering higher levels of knowledge construction in peer facilitated online discussions.

### *7.2.1 Split the Online Discussion Into Groups of About 10 People Each*

The results of Studies 8 and 10 showed a significant positive correlation between group size and the frequency of higher level knowledge construction occurrences. This suggests that higher level knowledge constructions (phases II–V) tend to occur in forums that have larger number of participants who made postings in the discussion. Although it may be difficult to predict the number of students required for each discussion, the results of Study 8 suggested that groups of about 10 participants (mean group size) achieved significantly more number of higher knowledge construction levels. This therefore suggests that groups of about 10 participants may be an optimum discussion size that is required to direct the discussion to higher levels of knowledge construction.

Why do groups of 10 exhibit more higher levels of knowledge construction in online discussions? One possible reason is that participants in groups of 10 have access to a wider range of perspectives when compared to participants in smaller groups such as groups of 5 or 6. This provides a greater opportunity for participants in groups of 10 to identify the differences between the contributions, to consider all the opinions, and to negotiate the various meanings of ideas or comments raised, as compared to their counterparts in smaller groups. Such activities would help foster the attainment of advanced levels of knowledge

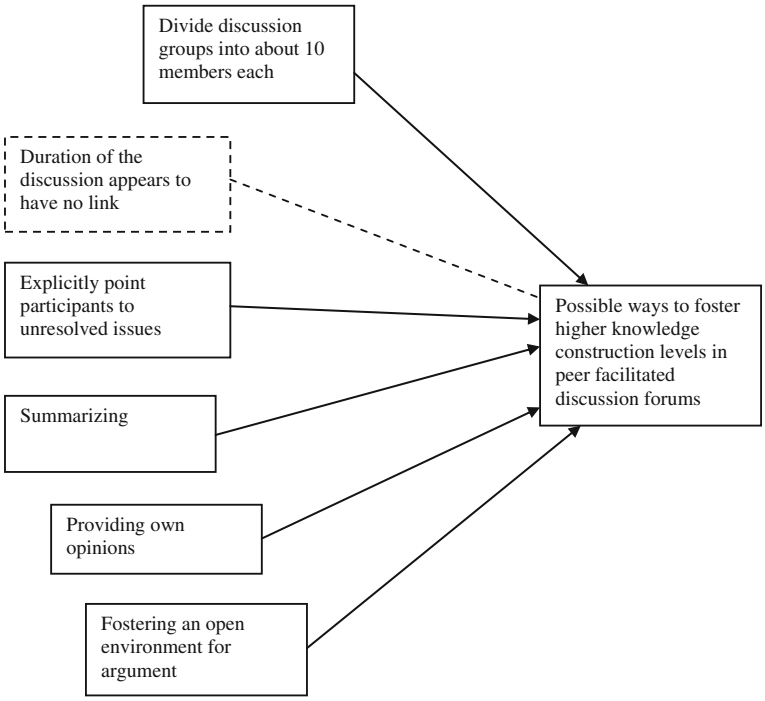


**Fig. 7.1** Major lessons learned regarding possible ways to foster higher levels of knowledge construction

construction. It would also be reasonable to expect that discussions in larger groups to reach saturation level much slower than those in smaller groups.

Should we then keep on increasing the group size of a discussion? Most probably not, due to the following two reasons: First, too large a group may encourage the problem of lurking on the part of the participants. Kollock and Smith (1996) described lurkers as free riders, that is noncontributing, resource taking members of a group. Nonnecke and Preece (2000) suggested that as the number of members increases, the need for any given group member to contribute may decline.

Second, too large a group can invoke extraneous cognitive load onto the participants (Schellens and Valcke 2006) as they need to potentially deal with large quantities of postings; this could to reading fatigue, and cause the participants to cease from contributing in the discussion altogether. Our current research finding suggests a group size of about 10 participants may be required to form a critical mass to direct the discussion to higher levels of knowledge construction. However, more work is required to confirm this finding.

### 7.2.2 Higher Level Knowledge Construction Occurrences Not Linked to the Duration of the Online Discussion

The results of Study 10 revealed no correlation between the duration of online discussion and the frequency of higher level knowledge construction. This is shown by the dotted box and line (without arrow) in Fig. 7.1. This finding is somewhat counterintuitive because one may expect that higher level knowledge construction takes time to form as one needs to read the various opinions posted by others, reflect, and negotiate the different ideas raised. Our finding suggests that merely extending the length of a discussion per se may not be a sufficient condition for higher level knowledge construction to occur. While the precise reason for this is currently unclear, the occurrences of higher knowledge construction levels may be dependent on other host of factors including group size and the facilitation techniques employed by the students in the discussion forums.

### 7.2.3 Need to Explicitly Point Participants to Unresolved Issues

Results from case study 9 indicated that students in discussion forums that had more higher levels of knowledge construction used the facilitation technique of pointing statistically significantly more frequently than their counterparts in lower-performing forums. Pointing refers to directing the participants of an online discussion in appropriate directions such as by explicitly highlighting unanswered questions, unresolved issues, or differences in opinions. Highlighting unresolved issues could help participants discover and explore disagreements among various viewpoints because it specifically helped participants focus on unresolved issues which they might have otherwise missed or overlooked during the course of the discussion. Candy, one of the participants, stated:

> A participant suggested that I do not give any assessment rubric to students. However, I had a different viewpoint on it. I highlighted this unresolved issue or matter. For example, I commented, 'In that case, does it mean the students would have lesser direction than when they are given a set of rubric?' This helped in exploring the disagreements that we had

Sally, another participant, echoed Candy's reflection:

> It happened when one participant suggested using peer evaluation as a way to assess a student's performance in my lesson. However, another participant felt that it was unnecessary as it would cause distress and pressure amongst the students. I pointed out this unresolved issue and this led to other participants joining in the discussion. In this case, this (pointing) technique worked quite well as the participants gave their suggestions and views. It (pointing) helped people to negotiate the various perspectives, and in the end I was able to come up with a conclusion that peer evaluation should be used in my lesson plan, but not as a major assessment criterion.

We provide the following excerpt (extracted from Hew and Cheung 2010a, pp. 51–52) of an online discussion that developed higher levels of knowledge construction to further illustrate how pointing might be used:

In this particular discussion, participant Y had uploaded his online lesson design plan into the online discussion forum for other participants to critique. In his design plan, participant Y advocated the setting of a ground rule which required secondary two school learners to reply to one another's postings within 24 h.

1. Participant Y: I would prefer a timeframe of 24 h instead of a longer time period for (secondary two) the students to reply. This would be enable students to critically think within that time schedule to ask questions and to post what they learn during class.
2. Participant R: If the discussion is only to span between 1–2 weeks, then 24 h is not too stringent if we want to have a well established online discussion. This is to prevent the posting of only 3–5 replies in the discussion if students are allowed to take their time to reply only within 3 days.
3. Participant C: I disagree. I feel that 24 h is a bit too short. It sort of forces the student to come out with posting under time constraint and the postings may not be of high quality. Why not you set it to be 2 or 3 days? (Highlighting differences of opinions/unresolved issue)
4. Participant Y: (Disagreeing) My stand was that it is for the purpose of students being active learners and receptive of what they learn on the same day, thus allowing them to be more critical when they post their discussion online as compared to a 2–3 day period where their ideas might turn dull.
5. Participant J: To be frank, I really don't think a 24 h rule is feasible because students typically have so many other subjects to study. If you set a 24 h deadline, students may just post very superficial comments which would not help in the discussion. (Highlighting differences of opinions/unresolved issue)
6. Participant Y: Ok. How about if I implement a 48 h rule instead? This is a way to compensate for the different timing we both believe on? The time of 48 h is neither too long nor short for students to post their comments.

In discourse #1 Participant Y shared his rationale for imposing a 24 h rule for students to response to one another in the online forum. This is similar to Gunawardena et al. (1997) phase I which is sharing of opinion. Participant R (#2) shared her agreement of using a 24 h reply (reminiscent of phase I). However, in discourse #3, Participant C countered this claim (reminiscent of phase II, a higher level of knowledge construction: challenging people's ideas, discovering dissonance of opinions). He had a different viewpoint on the ground rule and pointed out that a 24 h reply rule could produce poor replies or comments as students might simply respond due to the pressure of the deadline but not necessarily with serious thoughts or enthusiasm. Participant Y disagreed (#4, phase II) by explaining that learners should be asked to reply within 24 h as the issues under discussion would still remain fresh in their minds. This was again countered by participant J (#5, phase II) who pointed out that students might be overburdened

with other school work, and hence not being able to give thoughtful responses within 1 day. The use of the pointing technique to highlight an unresolved issue thus far had led people to giving their various opinions and it helped participant Y negotiate the different perspectives (#6, phase III, a higher level of knowledge construction) and come up with a possible compromise of a 48 h reply rule.

### *7.2.4 Summarizing*

The technique of summarizing may help achieve higher levels of knowledge construction because the summarizers have to first identify the different or contrasting opinions posted in the discussion, then describe which of the contributions hold similar points of view, and finally indicate contradictions and make some provisional conclusions (Schellens et al. 2005). Such tasks or activities relate to higher-level phases such as phase II and III.

### *7.2.5 Providing Own Opinions*

The facilitation technique of providing own comments or opinions may help foster higher-level knowledge constructions in two possible ways. First, providing own opinions helps keep the discussion alive. Thom described it in the following way:

> Due to the lack of physical interactions, participants' contribution may wane during the discussion. It is important [for the peer facilitator] to keep spirits up and encourage discussion from other students by agreeing or disagreeing with their points or sharing personal opinions.

Of course, the activity of keeping a discussion going per se may not guarantee that higher-level knowledge constructions would occur. However, we believe that it is a necessary, if not sufficient, condition for higher-level constructions to take place. If students' contribution in an online discussion wane and eventually stop altogether, the results would be no higher level knowledge constructions at all.

Second, providing own opinions may serve as a starting point to help students in an online discussion move forward to higher-levels of knowledge construction. Schellens et al. (2005) suggested that individuals need a certain amount of such postings before they can move forward to the higher levels of knowledge construction. Schellens et al. (2005) emphasized that a certain number of comments or opinions-related postings are necessary in order to function as a starting point to ground the rest of the online discussion. However, what exactly this number is not ascertained at yet.

### 7.2.6 Fostering an Open Environment for Argument

Finally, we posit that argumentation or challenging other people's ideas serve as an important starting point to move the discussion forward to higher knowledge construction levels. For example, if no participant in the online discussion is willing to argue or challenge another person's ideas or assumptions, level II (discover of dissonance or disagreement) would not take place. This is similar to Liu et al. (2008) observation that participants in online discussions find it hard to reach higher knowledge construction levels such as the negotiation phase (level III) because they lacked the motivation to challenge or argue with one another.

Typically, in an online discussion, participants are hesitant to challenge other people's ideas because it may be perceived as being confrontational (Liu et al. 2008). Students who wish to challenge other participants' viewpoints may be afraid that their postings be taken negatively by the party that is being challenged which could lead to conflicts—hence they hold back their postings. Therefore, to overcome this problem, it is important to foster an open environment for people to challenge or argue with one another.

Peer facilitators as well as participants could foster an open environment by acknowledging the contributions made by others, including the dissenting viewpoints, as well as encouraging people to contribute. Together such messages help to create a conducive atmosphere for people to discover dissonance and negotiate differing viewpoints.

## References

Alavi, M., & Leidner, D. E. (2001). Knowledge Management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly, 25*(1), 107–136.

Alavi, M., & Leider, D. E. (1999). Knowledge management systems: Issues, challenges, and benefits. *Communications of the Association for Information Systems, 1*(7), 1–37.

De Wever, B., Schellens, T., Valcke, M., & Van Keer, H. (2006). Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review. *Computers and Education, 46*, 6–28.

Gunawardena, C. N., Lowe, C. A., & Anderson, T. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal Educational Computing Research, 17*(4), 397–431.

Hew, K. F., & Hara, N. (2007). Knowledge sharing in online environments: a qualitative case study. *Journal of the American Society for Information Science and Technology, 59*(14), 2310–2324.

Hew, K. F., & Cheung, W. S. (2010a). Fostering higher knowledge construction levels in online discussion forums: An exploratory case study. *International Journal of Web-based Learning and Teaching Technologies, 5*(4), 44–55.

Hew, K. F., & Cheung, W. S. (2010b). The relationship between group size and advanced level knowledge construction in asynchronous online discussion environments. In C.H. Steel, M.J. Keppell, P. Gerbic & S. Housego (Eds.), Curriculum, technology & transformation for an unknown future. Proceedings ascilite Sydney 2010 (pp.428–432). Sydney.

Hew, K. F., & Cheung, W. S. (2011). Higher-level knowledge construction in asynchronous online discussions: An analysis of group size, duration of online discussion, and student facilitation techniques. *Instructional Science, 39*(3), 303–319.

Kollock, P., & Smith, M. (1996). Managing the virtual commons: cooperation and conflict in computer communities. In S. Herring (Ed.), *Proceeding of Computer-Mediated Communication: Linguistic, social, and cross-cultural perspectives* (pp. 109–128). Amsterdam: John Benjamins.

Lally, V. (2001). Analysing teaching and learning interactions in a networked collaborative learning environment: issues and work in progress. In *Euro CSCL 2001* (pp. 397–405). Retrieved on August 7, 2008 from http://www.ll.unimaas.nl/euro-cscl/Papers/97.doc

Liu, X., Doore, B., & Li, L. (2008). Scaffolding Knowledge Co-Construction in Web-based Discussions through Message Labeling. In K. McFerrin, et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2008* (pp. 3041–3046). Chesapeake, VA: AACE.

Marra, R., Moore, J., & Klimczak, A. (2004). Content analysis of online discussion forums: a comparative analysis of protocols. *Educational Technology Research and Development, 52*, 23–40.

Nonnecke, B., & Preece, J. (2000). Lurker demographics: counting the silent. In CHI 2000: *Proceedings of the SIGCHI conference on Human factors in computing systems,* pp. 73–80.

Schellens, T., Keer, H. V., & Valcke, M. (2005). The impact of role assignment on knowledge construction in asynchronous discussion groups. *Small Group Research, 36*(6), 704–745.

Schellens, T., & Valcke, M. (2006). Fostering knowledge construction in university students through asynchronous discussion groups. *Computers & Education, 46*, 349–370.