

Chapter 2

Challenges: Findings from Previous Empirical Research

2.1 Sources of Data

A search of the literature was performed across the following six databases: Academic Search Premier, Business Source Premier, Communication and Mass Media Complete, ERIC, Library Information Science and Technology abstracts, and PsyARTICLES. The use of these six databases was deemed reasonable and sufficient because together these databases cover more than 11,000 journals, and have been often used by other scholars in their search for empirical articles (e.g., Hew and Brush 2007; Hew and Cheung 2010b; Luppigini 2007; Rinke 2008; Wang et al. 2008). In addition, Academic Search Premier is considered one of the most prominent databases in academic institutions (Blessinger and Olle 2004).

We limit our search for relevant empirical articles to study examining asynchronous online discussions in K-12 and higher education contexts. Non-educational uses of discussion forums such as political discussions, and patient support groups (e.g., mental health support forum) were excluded. Non-empirical descriptions of online discussion programs, or opinion papers were also discarded. As of end January 2012, our search revealed more than 110 articles. Appendix lists the articles which we included in our review of research. Appendix lists the articles we included in our review of the research literature. These articles are summarized—providing brief details of the authors, year of publication, research method, the purpose of the study, participants, and data sources. Please note that we make no claim that the identified publications represent an exhaustive list.

Next, we applied the constant comparative method (Lincoln and Guba 1985) on these articles: we examined each article to identify the factors leading to limited student contribution, as well as the strategies used to alleviate these factors (if any). The factors and strategies were subsequently grouped into a number of emergent categories. Data analysis continued until the categories were saturated, meaning that subsequent articles confirmed the existing categories, instead of identifying new ones.

Table 2.1 Summary of the factors that limit student contribution

Factors	Studies (representative example)
Not seeing the need for online discussion	Dennen (2005), Fung (2004), Zhao and McDougall (2005), Oliver and Shaw (2003), Xie et al. (2006)
Behavior/practice of instructor or participants (e.g., tone of postings—threatening, pontification on the part of others, lack of peer response, lack of instructor response, single-pass strategy)	Bodzin and Park (2000), (Hew and Cheung 2003b,c), Hew et al. (2005), Hewitt and Teplovs (1999), Hewitt (2003; 2005), Jeong (2004), Oliver and Shaw (2003), Xie et al. (2006), Zhao and McDougall (2005), Zhu (2006).
Personality traits (e.g., low degrees of curiosity, extraversion, agreeableness, openness)	Chen and Caropreso (2004), Khan (2005), Oliver and Shaw (2003)
Difficulty in keeping up with the discussion	Cheung and Hew (2006), Jones et al. (2004), Kear (2001)
Not knowing what to contribute	Fung (2004), Hewitt (2005), Khan (2005)
Lack of critical thinking skills	Hew and Cheung (2003b), Cheung and Hew (2006), Khine et al. (2003)
Being content in merely answering queries (low-level knowledge construction)	Cheung and Hew (2006), Gunawardena et al. (1997), Quek (2010)
Technical aspects (e.g., usability issues)	Hummel et al. (2005b), Murphy and Coleman (2004)
Lack of time	Fung (2004), Hammond (1999), Gerbic (2006)
Risk of being misunderstood	Murphy and Coleman (2004), Yeh and Lahman (2007)

2.2 Factors Leading to Limited Student Contribution

In this section we summarize previous research findings on the factors that could lead or contribute to limited student contribution. Ten main factors were identified: (a) not seeing the need for online discussion, (b) behavior or practice of instructor or participants, (c) personality traits, (d) difficulty in keeping up with the discussion, (e) not knowing what to contribute or the lack of meaningful comments to contribute, (f) the lack of critical thinking skills, (g) being content in merely answering queries, (h) technical aspects, (i) the lack of time, and (j) the risk of being misunderstood. Please note that these factors are not listed in order of priority or importance. The 10 factors described above are elaborated in the following sections and listed in Table 2.1.

2.2.1 Not Seeing the Need for Online Discussion

Previous research suggests that the failure to see the need for an asynchronous online discussion can limit student contribution. For example, students did not find it necessary to log on to a discussion forum and contribute in the online discussion

as the students and instructors were already meeting face-to-face four times a week in class (Xie et al. 2006). Students may also feel the discussion topics uninteresting or unattractive and therefore not worthy of discussion (Skinner 2009; Zhao and McDougall 2005). Examples of unsuccessful topics include answers to homework because students have little interest in discussing answers to homework after it is submitted (Guzdial and Turns 2000). Students also find it meaningless to contribute if there is no or little sense of connection between the online discussions and the face-to-face classes (Gerbic 2006). This often happens if what was discussed in the online forums was not applied to, or was in some way linked to the subsequent class activity. Consequently, students do not see the online discussions as being essential to their learning (Hammond 1999), but rather as a work that is done for the sake of itself, its purpose being merely to keep the students occupied for a certain length of time.

In addition, students have little interest in contributing to a discussion if no clear expectations are set, or if no incentives (e.g., grades) are awarded for their contribution (Dennen 2005; Gerbic 2006). For example, Dennen (2005) found that in cases where instructor expectations were not clear, student contribution floundered because students did not know how much they were expected to contribute, or how their messages should look like. The results of Dennen's (2005) study also suggested that when grades were not awarded for the use of and contribution to the discussion forum, many students did not post a single message for the entire semester.

2.2.2 Behavior or Practice of Instructor or Participants

Previous research has also suggested that the behavior or practice of participants (e.g., students, instructors) can limit student contribution in asynchronous online discussion. First, students cease contributing if they receive no immediate response to, or comments on their posts from other students (Arend 2009; Chapman et al. 2008; Cheung and Hew 2004; Feenberg 1987; Jeong 2004; Jeong and Frazier 2008). For example, Cheung and Hew (2004) found that some students procrastinated in responding to other people's questions, resulting in great frustrations for those students who were waiting for replies. The delay caused the students to feel that they were speaking into a vacuum (Feenberg 1987)—that no one was responding to them, and so they see no point in writing messages. Chapman et al. (2008) found that students felt devalued and excluded when they did not receive any responses to their posts. Jeong (2004) found that overall, the response rates declined at a rate of 17 % per day in wait time across all messages. Together, these findings suggest that the longer students wait for a response, the less likely a response will elicit reciprocating responses from other students (Jeong and Frazier 2008).

Second, previous studies also suggest that students stop contributing if they perceive that other students pontificate in the online discussion (e.g., giving their opinions about something as though they know everything about it), or if they feel

threatened by other students or if the tone of the discussion becomes too emotional (Hewitt 2005), or rude (Murphy and Coleman 2004).

Third, students may cease to contribute if the instructor does not show interest or involvement, such as giving encouragement or feedback. Xie et al. (2006), for example, reported that students were less motivated to contribute if they perceived little involvement on the part of their instructor in the online discussion.

Fourth, the practice or habit of focusing attention on *unread* messages can unintentionally cause a discussion to cease. Hewitt (2005) found that students on average tended to read messages that they had not read before (these messages were typically marked with an unread flag or set in bold typeface), and largely ignored messages they had previously examined. Describing this approach as a single-pass strategy, Hewitt (2003) found that it could lead to two unexpected and problematic side effects: (a) unintended thread abandonment, (b) unintentional changes in discussion topic.

First, single-pass strategy could cause unintentional thread abandonment because threads that did not contain unread messages were not examined and were easily forgotten. Consequently, discussions that were important could be unintentionally neglected and abandoned. Second, single-pass strategy could also lead to unintentional changes in topic because participants who tend to review the latest unread messages may forget key ideas introduced earlier in the discussion (Hewitt 2001). As a result, important issues or topics may be trivialized unintentionally. For example, Hewitt (2003) reported in his study that instead of persisting with a difficult question such as (“What is the role of computer technology in schools”, p. 40), participants ended up reflecting on the decision to allow children playing games during school recess.

2.2.3 Student Personality Traits

Students' personality traits could also affect their contribution in an online discussion. For example, Chen and Caropreso (2004) explored the influence of three personality traits in 70 undergraduates majoring in educational psychology on their online discussion participation rates. The three personality traits investigated were: (a) extraversion—a tendency to seek out and engage in social interactions, (b) agreeableness—reflecting the quality of continuing interaction, and (c) openness—reflecting an interest in intellectual and imaginative experiences. Students scoring at or above the 67th percentile of the sample on the three traits were identified as “high”, and those scoring at or below the 33rd percentile were classified as “low”. High-profile students include those who are sociable, friendly, helpful, and broad-minded; low-profile students include those who are withdrawn, selfish, uncooperative, and conventional. Chen and Caropreso (2004) reported that students in the low-profile group tended to post (one-way) messages that discouraged replies or contributions from other students. Furthermore, these messages were totally unrelated, or at best only marginally related to the discussion topics.

2.2.4 Difficulty in Keeping Up with the Discussion

An asynchronous online discussion allows multiple conversations, where a student can interact with more than one student at the same time. However, such an attribute can also create confusion among students, especially if the discussions are diverse and robust. Students, for example, may find it difficult to keep track of the multiple threads of discussion in the asynchronous online discussion. This is because some students might post to a wrong thread, or introduce various different ideas in a single posting. In the latter situation, if other students respond to each of these various different ideas in the same posting, it is likely that one or more of the ideas will spawn various subdiscussions which, if pursued, can veer sharply off-course and develop in a radically different direction as the initial discussion topic. In such cases, it then becomes increasingly difficult to manage and keep up with these numerous subdiscussions (Winiecki and Chyung, 1998) and as a result, the entire discussion breaks down—it becomes incoherent and eventually student contribution ceases (Thomas 2002).

Another reason for the difficulty in keeping up with the discussion is due to information overload on the part of the students. Information overload usually occurs when there is a high frequency of postings, so that individuals are unable to process them and respond adequately (Whittaker et al. 1998). For example, Jones et al. (2004) found that individuals are more likely to end contribution if information overload occurs. Ng and Cheung (2007) reported that participants found it tiring to read many messages. Chen et al. (2012) similarly found that students who encountered information overload tended to post less in the online discussions.

2.2.5 Not Knowing What to Contribute/Lack of Worthwhile Comments to Contribute

Limited student contribution in asynchronous online discussions may also be due to students being at loss of what to contribute or having a lack of constructive comments to contribute (e.g., Arend 2009; Chapman et al. 2008; Fung 2004; Dennen 2005; Guzdial and Turns 2000; Khan 2005). Guzdial and Turns (2000) suggested that students may experience a writer's block, in the same way that an empty word processing document may be intimidating to a green writer.

The problem of students having difficulty in knowing what to contribute was also due to the use of discussion problems or questions that called for a single, fact-based answer. This is because there really is no need for further contribution from the other students after a student responds correctly (Dennen 2005; Nandi et al. 2011). Insisting on student contribution will only result in messages that sound alike to one another. For example, Arend (2009) found that students disliked online posts that were repetitions of one another, because the discussion became

very limited, being close-ended and having only one distinct solution. Hence, students found it very difficult to find anything new to say.

2.2.6 Exhibiting Surface-Level/Lower Order Critical Thinking

Critical thinking has received considerable attention over the past several years. Critical thinking may be defined as the ability to evaluate the reasonableness of ideas in order to decide what to believe or do (Schafersman 1991; Swartz and Parks 1994). Critical thinking is considered important to students because it allows them “to deal effectively with social, scientific and practical problems” (Shakirova 2007, p. 42). In short, students who possess the ability to think critically will be able to solve problems in an effective manner (Lim et al. 2011).

Critical thinking may be categorized according to a dichotomy of surface- or low- versus in-depth, deep-, or high-level information processing (Bradley et al. 2008; Cheung and Hew 2006; Henri 1992; Newman et al. 1995). Various content analysis models or schemes have been formulated to measure and evaluate this dichotomy of critical thinking. For example, Newman et al. (1995) developed a content analysis scheme to measure critical thinking based on 10 categories: relevance, importance, novelty, outside knowledge, ambiguities, linking ideas, justification, critical assessment, practical utility, and width of understanding. For each category, a number of positive and negative indicators are provided. For example, a positive indicator of relevance (R^+) is “relevant statements”, while a negative indicator (R^-) would be “irrelevant statements, diversions”. A critical thinking ratio is then calculated for each critical thinking category: $x = (x^+ - x^-) / (x^+ + x^-)$, where x represents the critical thinking category (e.g., relevance, importance, novelty, and so on), with a minimum of -1 for all uncritical thinking, all surface-level and a maximum of +1 for all critical thinking, and all deep-level.

Another content analysis model is that formulated by Cheung and Hew (2006). The researchers created a framework to assess 38 university students’ quality of critical thinking by leveraging on and synthesizing the best features of work done by Henri (1992), Swartz and Parks (1994) and Newman et al. (1995). Surface level critical thinking includes: (a) making conclusions or judgments without offering justification; (b) sticking to prejudices or assumptions (such as forming an irrational attitude of dislike against an individual, a group, or their ideas); (c) stating that one shares the conclusions or judgments made by others but without taking the idea further; and (d) failure to state the advantages or disadvantages of a suggestion, conclusion, or judgment.

In-depth level critical thinking, on the other hand, involves: (a) making conclusions or judgments supported by justification; (b) setting out the advantages or disadvantages of a suggestion, conclusion, or judgment; (c) stating that one shares the conclusions or judgments made by others and supporting them with relevant facts, proof, experience, or examples; and (d) making valid assumptions based on the available indicators.

Many previous studies have found that students tend to exhibit surface-level critical thinking in online discussions (Arend 2009; Bradley et al. 2008; Burt et al. 1994; Bullen 1998; Cheong and Cheung, 2008; Hew and Cheung 2003b; Khine et al. 2003).

Cheung and Hew (2006), for example, found that almost half of the thinking exhibited by the students was of surface-level information processing. Most of the surface-level thinking was due to students making conclusions or judgments without offering any justification; proposing solutions with little details or explanations; and stating that one shares the conclusions or judgments made by others without taking these further. Students appeared to regard knowing “what to do” as more important than knowing “why they were doing it”.

Arend (2009) sorted an initial list of 60 courses based on student mean scores on the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al. 1991) that indicated students’ self-reported use of critical thinking, as well as instructors’ rating of student critical thinking (based on a 7-point scale, 1 = never, 7 = always). Arend (2009) then selected five courses with the highest critical thinking scores and four courses with the lowest. Comparisons between these two groups were made, and the findings were used to yield information about the ways in which online discussions could influence different levels of critical thinking among students. Arend (2009) found that instructors in the lower critical thinking group provided comments that clearly showed their preferred view of an issue, rather than being impartial in their comments. Students were observed to be challenged by the instructor but in a manner where they were directed toward a preferred, correct answer. This led to students changing their thinking pattern and even apologizing for their views that were not consistent with those held by the instructor. Such instructor facilitation failed to foster a conducive environment for higher critical thinking to occur.

2.2.7 Displaying Low-Level Knowledge Construction

One key factor in determining the success of online collaborative learning can be identified through an investigation of the quality of the knowledge constructions that students engage in (Hew and Cheung 2010b). Although there are many different understandings of what knowledge could be, in the context of this book we consider information, procedures, facts, opinions, experiences, or ideas as knowledge. Such a definition is consistent with the notion that emphasizes an applied perspective of knowledge (Hew and Hara 2007a), where knowledge is viewed as information possessed in the mind of individuals related to procedures, facts, concepts, or ideas that can help an individual take action (Alavi and Leider 1999, 2001).

The quality of knowledge construction can be assessed by examining the different levels it occurs. Similar to the case of critical thinking, various content analysis models have been formulated to characterize and measure these different levels of

Table 2.2 A possible comparison between Gunawardena et al.'s (1997) and Garrison et al.'s (2001) models

Gunawardena et al. (1997)	Garrison et al. (2001)
Phase I—sharing and comparing information	Stage 1—triggering event
Phase II—exploration of dissonance, identifying areas of disagreement	Stage 2—exploration of ideas
Phase III—negotiation of meaning	Stage 3—integration of ideas
Phase IV—testing and modification	Stage 4—resolution of dilemma
Phase V—application of ideas, and students' self-reflective statements	

knowledge construction. Two of the most widely used models of online knowledge construction are that of Gunawardena et al. (1997)'s and Garrison et al. (2001)'s.

Gunawardena et al. (1997)'s interaction analysis model was one of the earliest frameworks to characterize knowledge construction during online collaboration. The kinds of knowledge being referred to by Gunawardena et al. (1997) include information, facts, specific examples or experiences, opinions, concepts, or ideas. It describes knowledge construction as having five phases: (a) phase I—sharing and comparing of information, (b) phase II—exploration of dissonance, identifying areas of disagreement, (c) phase III—negotiation of meaning, (d) phase IV—testing and modification, and (e) phase V—application of ideas, and students' self-reflective statement(s) that illustrate their knowledge or opinions have changed. According to Gunawardena et al. (1997), students constructed knowledge by moving from “lower to higher mental functions” (p. 415) where they first share and compare information before negotiating, testing, and applying ideas collaboratively. Thus, phase I may be considered low-level knowledge construction, while phases II–V the higher or advanced levels.

Garrison et al. (2001) proposed that knowledge construction occurs through four stages: (1) Triggering event, (2) Exploration of ideas, (3) Integration of ideas, and (4) Resolution of dilemma. This model suggested that triggering events occur within the shared world of an online learning community, whereas the exploration, integration, and resolution of ideas may occur either privately or collaboratively. In their conception, students construct knowledge by toggling between private reflection and social reflection. According to Koh et al. (2010), Gunawardena et al.'s (1997) model is more oriented toward collaborative knowledge construction, while Garrison et al. (2001)'s model can be used to address both individual and collaborative knowledge construction. However, both models assume that the quality of students' knowledge construction became more advanced in the latter stages. Hence, Garrison et al. (2001)'s stage 1 may be considered low-level knowledge construction, and stages 2–4 the higher or advanced levels (see Table 2.2).

Because constructing knowledge is an endeavor that requires students to reflect and engage in thinking, advocates of asynchronous online discussion suggest that its use can foster high- or advanced-level student knowledge construction discourse due to its allowance for time-independent interaction (Hew and Cheung 2010b).

However, past empirical research suggests that high levels of knowledge construction rarely occur during actual asynchronous online discussions (Garrison 2007; Garrison et al. 2001; Gunawardena et al. 1997; Jamaludin and Quek 2006; Kanuka and Anderson 1998; Liu et al. 2008; Maor 2010; McLoughlin and Luca 2000; Meyer 2003; Osman and Herring 2007; Quek 2010; Vaughan and Garrison 2004).

For example, Cheung and Hew (2006) found that students were more interested in merely voicing their opinions to their classmates' queries—what Gunawardena et al. (1997) referred to as predominantly phase I level of knowledge construction (sharing of information). Consequently, the discussion appeared to resemble a mere question and answer session where students simply answered their course mates' online queries, rather than moving on to higher level knowledge construction such as phases II–V (Cheung and Hew, 2006).

Apparently, this is not an isolated phenomenon. For example, Gunawardena et al.'s (1997) study obtained a result of 93, 2.4, 1.9, 1, and 1.9 % from phase I to V, respectively. Chai and Khine (2006) also used Gunawardena et al.'s model and reported a distribution of 60, 20, 13, 4, and 3 % from phase I to V, respectively. Quek (2010) found that high school students' posts mainly consisted of phase I constructions (82.7 %). Researchers using Garrison et al.'s (2001) model have also concluded that the majority of students' online discussion posts involved the exploration of ideas, while a maximum of 10 % of these posts attained the highest level of resolution (Garrison 2007; Garrison et al. 2001; Kanuka et al. 2007; Meyer 2003; Vaughan and Garrison 2004).

Overall, the results of previous studies suggested that higher levels of knowledge construction such as phases II–V or stages 2–4 are difficult to achieve. McLoughlin and Luca's (2000), p. 5 lament probably summarizes and articulates the problem very well:

Analysis shows that most messages are in the category of comparing and sharing information. There is little evidence of the construction of new knowledge, critical analysis of peer ideas, or instances of negotiations. The discussions do not appear to foster testing and revision of ideas and negotiation of meaning.

These somewhat discouraging results lead naturally to the following question: Why do students tend to exhibit low-level knowledge construction in online discussions? Our review of the literature suggested the following possibilities.

First, the nature of the discussion task or activity that students engage in may influence the levels of knowledge construction. Schellens et al. (2005) found that when the discussion tasks were too complex, the levels of knowledge construction were significantly lower. The researchers suggest that too much complexity (e.g., when the conceptual base of a particular topic or issue is not completely available or made clear to students, or using a foreign language such as English to present information to students who are unfamiliar with the language) could make students feel insecure. They will be at a loss of what to contribute, and lose track of the discussion objective.

Participants' reluctance or hesitance at questioning others' ideas is another barrier to higher level knowledge construction. This can be attributed to two

factors. First, participants are reluctant to disagree with their peers because they are not familiar with one another yet. So, they try to avoid posting messages that challenge other individuals' ideas because this may be perceived as being confrontational (Liu et al. 2008). Second, some individuals are rude in their online posts (Hew et al. 2005). Consequently, other participants tend to “play safe”, and hold back from critically analyzing viewpoints in order to avoid conflicts in the online discussion.

2.2.8 Technical Aspects

The technical aspects of the asynchronous online discussion software have also been identified as a factor that can limit student contribution (Hammond 1999; Hummel et al. 2005b; Murphy and Coleman 2004). For example, in a study of 20 graduate students, Murphy and Coleman (2004) found that certain limitations of the software design frustrate students who want to contribute their ideas. Examples of these would be the inability to read through discussion postings while composing a message, and the way the software system constantly returns users to the top of the listings when they click to expand a thread: students then have to search through the entire list of postings to find their bearings.

Another technical aspect that limits the contribution of students is the inability to edit and delete messages (Murphy and Coleman 2004). Students were unable to change a posting mistake throughout the entire course, which made them feel uncomfortable and silly. Furthermore, a lot of time and effort is needed on the part of the students to rectify an error in a message—for example, students had to explain their mistake, say what they actually meant to say, re-explain their arguments, and make the necessary correction before someone else responded and made matters even more confusing.

Besides the aforementioned design quirks, technical aspects related to registration and login can also limit student contribution. Hummel et al. (2005b), for example, found that most students in their study technically did not contribute because they failed to login to the online discussion system. Specifically, the two-layer architecture of the discussion system without the convenience of a single login used by Hummel et al. (2005b) was not transparent to most students. This resulted in students not being able to navigate and find their way to the actual discussion layer.

2.2.9 Lack of Time

Several studies reported that students did not contribute or contributed minimally because they had little time to do so (e.g., Fung 2004; Gerbic 2006; Hammond 1999; Jeong and Frazier 2008; Rollag 2010). Many students attributed their lack of

online contribution to other commitments they had such as work or travel schedules. For example, students in Gerbic's (2006) study said that they were under considerable pressure of time as they tried to balance their study with work, and family commitments. Similarly, many participants in Hammond's (1999) study felt that they had too many demands made on them at work and at home to find time to contribute in the online discussions.

2.2.10 Risk of Being Misunderstood

Finally, several researchers (e.g., Yeh and Lahman 2007; Murphy and Coleman 2004) reported that the lack of gestures, vocal, and facial expressions was the greatest barrier that prevented students from contributing to an online discussion forum. This often led to participants misinterpreting others, or being misinterpreted by others in a text-based online discussion forum. Consequently, misunderstandings among various participants are likely to occur and further contribution to the discussion will inevitably cease.

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