A Mixed Methods Study of Class Size and Group Configuration in Online Graduate Course Discussions

By

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A Dissertation submitted in conformity with the requirements for the Degree of Doctor of Philosophy
Department of Curriculum, Teaching, and Learning
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ABSTRACT

Class size has long been recognized as a factor affecting achievement in face-to-face contexts. However, few studies have examined the effects of class size in online courses, or the effects of dividing an online class into smaller discussion groups. The current study examined the relationship between class size and the use of grouping strategies on note reading, note writing, and collaborative discussions in online graduate-level courses.

This mixed-methods study analyzed tracking logs from 25 graduate-level online courses using Web Knowledge Forum (25 instructors and 341 students) and interviews from 10 instructors and 12 graduate students with diverse backgrounds. The quantitative and qualitative data analyses were designed to complement each other. Findings suggested 13 to 15 as an optimal class size and four to five as an ideal subgroup size. Not surprisingly, the results revealed that, as class size increased, the total notes that participants read increased significantly. However, as class size increased, the percentage of course notes that students read decreased significantly (i.e., students were reading a smaller proportion of the course notes). In larger
classes, participants were more likely to experience information overload and students were more selective in the notes that they read. A significant positive correlation was found between class size and total notes written. Students’ note size and grade-level score were negatively correlated with class size. The data also suggest that the overload effects of large classes can be minimized by dividing students into small groups for discussion purposes. Interviewees felt that the use of small groups in large classes benefited their collaborative discussions. The preceding results underscore the importance of using small discussion groups when class sizes are large. The research concludes with a list of pedagogical recommendations and suggests new software features that may help enhance learning in online courses.
ACKNOWLEDGEMENTS

I would like to express my wholehearted gratefulness to many people whose encouragement and help made this dissertation possible.

I would like to start by expressing my gratitude and thanks to my supervisor Professor Jim Hewitt for his continuous patience and guidance throughout the past six years and half, from the framework of this dissertation, to the proposal defense, and to the final product of this dissertation. Without his help, it would be impossible for me to finish this dissertation and my doctoral study. My thanks to him are beyond words. I would also like to express my appreciation to other members of my dissertation committee: Professor Clare Brett and Professor Douglas McDougall for their directions of this dissertation and their support at my final oral defense. Professor Rina Cohen also provided some key inputs in my dissertation proposal defense. Professor Richard Wolfe helped me solve some problems in the framework of this dissertation, technical issues using quantitative software, and problems in quantitative data analyses. Professor Wayne Seller supported in my final oral defense and offered many insights in the interview. Professor Qing Li served as an external member of my dissertation committee and honored a perceptive appraisal. Professor Lynn Davie provided many helpful suggestions during the framing process of my dissertation and many insights in the interviews. My appreciation goes to them too.

My gratitude must be expressed to all who have participated and facilitated in the interviews. I am very much grateful for their kind support. It is their online teaching and learning experiences that enriched the dissertation. Their insights emerged out some important findings for my recommendations for benefiting future online graduate course.
My deepest appreciation goes to my beloved parents. So, I would also like to thank my father (in the Heaven now) and my mom in China for their patience, encouragement and support not only throughout this challenge, but also throughout my whole life.
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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study and Rationale

Online class size almost certainly has important effects on information overload (Hewitt & Brett, 2007; Lipponen, 2001) in computer conferencing courses. One method to reduce information overload is to divide a large class into discussion subgroups. This strategy is intended to decrease the amount of information that needs to be processed and in large classes with the goal of fostering greater participation in subgroup discussions, to promote deeper inquiry, to increase opportunities for online collaboration, to maintain proper participation, and to help discussion thread development. Nevertheless, it is not known if this method really reduces information overload, nor do we know how subgroup discussions impact online participation and discourse more generally. The purpose of this dissertation study is to explore these issues. Specifically, this dissertation will answer the following questions: “How did different class sizes and group configurations affect students’ and instructors’ participation in note reading and note writing?”, “What are students’ and instructors’ opinions about instructional design and strategies relating to class sizes and group configurations?”, and “How did students and instructors make sense of online cooperation and collaboration across different class sizes and group configurations?” The study involves a mixed method analysis of class sizes and group configurations in online conferencing utilizing quantitative measures to analyze course participants’ note reading and note writing as well as a qualitative analysis of their personal experiences in online discussions.
1.2 Motivation for the Study

There are many reasons accounting for the growing popularity of online classes. Faculty and students appreciate the convenience and flexibility of online education, and enjoy not having to spend the time or money traveling to class (Bender, 2003). Other advantages of online learning include the potential to learn collaboratively, the potential to learn in an online learning community, the support of different learning styles, and learning with different methods (Bender, 2003). Online courses also provide graduate level students with opportunities to participate in deep discussions on certain topics and examine ideas from many different perspectives.

In face-to-face courses, students learn by attending class, listening to the instructors’ lectures and by participating in discussions with classmates. They contribute by sharing ideas and opinions. In online virtual classes, students read instructors’ and classmates’ notes, and contribute by writing their own notes. Since note reading and writing are fundamental activities, we can analyze these operations to investigate how well instructors design and teach their online courses, how well students “listen” (read notes), and how well students contribute (write notes) in their online discussions. More importantly, we can investigate how well students, together with the instructors, learn and build their knowledge in online learning communities through discussions.

There is often a trade off between participation and information overload. Asking each student to contribute a certain number of notes per week (Masters, & Oberprieler, 2004; Linn & Slotta, 2006) is the usual way that some instructors adapted to encourage online participation. However, in large classes, this can produce information overload. Information overload can distract learners from course objectives (Clark & Mayer, 2002). For example, students might not have the time to respond to certain notes, respond less accurately than they would otherwise, respond incorrectly, or systematically ignore (i.e., filter) some kinds of notes (Hiltz & Turoff,
1985). These problems are mainly due to large class size and participation expectations, which are major issues in online conferencing. One method suggested to solve these problems is to divide large whole class discussions into subgroup discussions (Reeve & Shumway, 2003; Cohen, 1994). This strategy reduces information overload with the goal of fostering greater participation in discussions, promoting deeper inquiry, and producing better knowledge building. In face-to-face contexts, there have been many studies of small group discussions (e.g., Bales & Strodtbeck, 1951; Davis, 1969; Hoffman, 1965; Maier, 1971). However, researchers have not yet analyzed online course databases to determine optimal group sizes in computer conferencing courses. This dissertation study will conduct such an analysis using both quantitative and qualitative methods in an effort to deepen our understanding of how to effectively group students in online classes.

1.3 Statement of the Problem

Although a great deal of research has been conducted in related areas, such as information overload and investigations of online participation, few studies have answered the questions stated at the beginning of this chapter. The following mixed method analysis will explore the relationship between group configuration and online discussions.

This research examines note reading and note writing in online discussion groups of different sizes and group configurations. This research also explores students’ and instructors’ experiences in online discussions and their opinions about cooperation and collaboration relating to different group configurations. I look at differences when students are discussing issues in small whole classes, in large whole classes, and in large classes with subgroup discussions. Data for this study were drawn from courses at my institute because of its diversity of graduate online courses,
its history of online education, its experienced faculty members, and the software, WebKF used for threaded discussions at the Institute.

Methodologically, this research (1) analyzed quantitative data extracted from the institute WebKF online course databases to identify different practices across different class sizes and group configurations; (2) conducted interviews to capture students’ and instructors’ different experiences and opinions; (3) sought elaboration and enhancement of the results from quantitative method with the results from qualitative method; and (4) generated conclusions and recommendations.

Theoretically, the purpose of this research is to, as Creswell (2005) stated: (1) add to existing knowledge by examining the differences in note reading and note writing in different class sizes and across group configurations; (2) address gaps in literature by investigating an area of research that fills a void in existing knowledge; (3) expand knowledge by examining new ideas or practices; and (4) inform practice by presenting differentiation and diversity mainly due to different class sizes and group configurations in online discussions in graduate courses.

1.4 Significance of the Study

A great deal of research has been done on online discussions. Previous research has mainly focused on two topics: participation and online collaboration. A few researchers have studied information overload, class size and online activity patterns (Hewitt & Brett, 2007), student practices in asynchronous computer conferencing environments (Peters & Hewitt, 2005), habitual online practices (Hewitt, 2003), discussion thread development (Hewitt, 2005, 2001; Hewitt & Teplovs, 1999), and note scanning and skimming rates (Hewitt, Brett, & Peters, 2007). However, few have explored the relationship between class size and group configurations and online course participants’ note reading, note writing, and their personal experiences. It is also important to
better understand the conceptions and misconceptions that online instructors may hold about online participation and group configurations. The information provided by this study should benefit interested researchers, online course instructors, and online learners. The findings will hopefully add to our knowledge of online conferencing and collaborative learning.

1.5 Definitions of Terms

CMC (Computer-Mediated-Communication): learning environment with communication supported by computer technology.

Convergent Notes: notes with links to other cited or referenced notes.

Group Configurations: number of groups divided within an online course for effective discussions.

Note: A note is a message that students or instructors contributed to the discussion forum.

Note Reading: In this dissertation study, note reading includes both note opening and note reading due to the reason that it is impossible to distinguish which note is opened and read, and which note is opened but not read from the datasets.

Note Reading Ease Score: In this dissertation study, Flesch-Kincaid Reading Ease Scores are used as Note Reading Ease Scores.

Note Grade Level Score: In this dissertation study, Flesch-Kincaid Grade Level Scores are used as Note Grade Level Scores.

Note Writing: In this dissertation study, note writing includes both note writing and note editing due to the editing function the learning software WebKF provides.

NUD*IST (N6) (Non-Numerical Unstructured Data Indexing, Searching, and Theorizing) (NUD*IST version 6): qualitative software, a theory-generation program, was mainly designed for qualitative research data analysis.
**NVivo**: A new generation of qualitative data analysis software, designed for researchers who need to combine subtle coding with qualitative linking, shaping and modeling. It is a fine-detailed analyzer, integrating the processes of interpretation and theory emergence, and coding and linking with multimedia data.

**S-Plus**: Statistical software with special strengths in extremely modern and flexible language and high quality graphics generation.

**SPSS**: Statistical software for quantitative data analysis, once “Statistical Package for the Social Sciences”, and now “Statistical Product and Service Solutions”, or simply SPSS.

**WebKF**: Web Knowledge Forum – the second generation of CSILE (Computer-Supported Intentional Learning Environment). It provides a group work environment with the features of threaded discussions to support knowledge building and online learning community building. It is online teaching and learning facilitation software.

**WebKF Databases**: the databases that store the content produced in Web Knowledge Forum.

### 1.6 Limitations

Not all aspects and factors that affect online participation and online learning can be taken into account in this dissertation study. Thus, this study focuses on two principal objectives only. It is no wonder that there has been little in depth study of the relationship between class size or group configurations and online discussions, because this relationship depends on so many factors such as learning objectives (tasks), level and experience of students, and teaching approach of instructors. This dissertation research only explores this relationship by analyzing 25 online graduate-level course datasets from the institute WebKF databases and data from interviews of 10 online graduate course instructors and 12 online graduate students at the institute. The research findings are limited due to the data sources, interview questions, and interviewees’ experiences.
Other related variables are not captured in this dissertation study. Most of the interview questions were focused on online course participants’ experience. Their perceptions may not accurately reflect all online course participants’ actual experience and actual online course group configuration patterns. Consequently, their responses are not necessarily indicative of all online course group configuration patterns.

A purposive sampling procedure decreases the generalizability of findings (Creswell, 2003) from this dissertation study. This study may not be generalizable to all online courses around the world due to its purposive sampling procedure. The quantitative data are extracted from the institute WebKF online graduate level course databases and the qualitative data are collected from interviews of graduate students and graduate level online course instructors who have used WebKF. It is also due to the sizes of sampling from both quantitative and qualitative studies that the results of this research may not be generalizable to all online courses around the world. However, the quantitative samples are large (25 courses with 341 graduate students and 25 instructors) compared to other earlier studies.

1.7 Outline of the Dissertation

This dissertation consists of six chapters, with each focusing on one main component of this dissertation.

Chapter One states the background and rationale of the study by pointing out the motivation of this research, by discussing the existing problems that affect effective online learning, such as information overload and large class size, and by articulating the significance of this study. It then proceeds to the statement of the research question and the purposes of this study. It also contains outline of the dissertation and definitions of terms used in this study. It ends by pointing out the limitations of this study.
Chapter Two is a review of the literature relating to online class size and group configuration. It starts by an introduction of the literature review methods. Then it proceeds to reviewing three major theories supporting this study: constructivism, cooperative, and collaborative learning. After that, it studies research on existing problems relating to this study. This chapter also examines previous research done in related areas, including class sizes and online activity patterns, online practices and “survival strategies”, participation, and group configuration. In the summary of this chapter, I argue that there is a gap in the literature relating to class size and group configuration in online discussions. This gap has inspired the current research.

Chapter Three states the research methodology adopted for this study. Firstly this chapter presents the rationale for a mixed methods design. Then it describes the mixed methods design for this study, which includes: sampling strategies, data collection, data analysis procedures, and the integration of quantitative method and qualitative method. The internal and external verifications are described next. Lastly this chapter discusses issues relating to validity and limitations of this mixed methods study.

Chapter Four reports findings from both quantitative and qualitative data analyses. It starts with reporting findings from quantitative analyses of the relationships between class size and note reading and note writing. Then it explores students’ and instructors’ sense of class size and note reading and note writing. The second section presents the findings from statistical analyses of group configuration and note reading and note writing. Also included in it is the analysis of interviewees’ experiences and opinions about advantages and disadvantages of Small, Large and Group configurations. These two sections list a coherent set of investigations and hypotheses based on the first and second research questions. Then, the third section comprises
the analyses of interviewees’ opinions about collaboration and cooperation versus class size and group configuration to answer the third research question of this study.

Chapter Five first summarizes to conclude that class size does matter in note reading and note writing. Then it gives a brief summary of advantages and disadvantages of the three group configurations. It concludes that class size and group configuration affect student learning experiences and collaborative discussions. Particular emphasis is put on the discussions of the research findings from both methods and how they complement each other. It then points out implications and limitations of this research. In line with the findings, this chapter closes with the conclusion based on the research findings and with an avenue for future research in the areas discussed in this dissertation study.
CHAPTER TWO: REVIEW OF THE LITERATURE

2.1 Overview

2.1.1 General Introduction of the Literature Review

As early as in mid 1980’s, distance education became an important educational phenomenon in higher education in Canada as well as in a number of other countries (Davie, 1988). With the rapid development of graduate level online courses, more and more researchers are exploring online conferencing. For example, Bernard, Abrami, Lou, and Borokhovski (2004) have identified more than 5,000 research abstracts (including 862 full-text articles) concerning distance education and traditional classroom-based instruction. These studies were located through a comprehensive search of publicly available literature from 1985 to December 2002. A great deal of previous research has been devoted to comparing discourse from computer-mediated-communication to that of face-to-face communication or comparing hybrid courses that offer both face-to-face and CMC (Murphy-Boyer, 2001) to pure face-to-face courses. There is also movement towards research relating deep learning to the quality of online discussions. However, there has been little research examining group discussions and discussion thread development.

Although online discussion has been used largely with high expectations for learning benefits, the actual effects are unclear. In cases where simple question-answer cycles are employed, students do not appear to be as actively involved in critical thinking processes. These kinds of interactions are not sufficient to promote active knowledge construction (Choi, Land, & Turgeon, 2001). Consequently, a major challenge that instructors are facing in online learning settings is how to structure asynchronous online discussions in order to engage students in meaningful discourse (Gilbert & Dabbagh, 2005). The purpose of the literature review in this
study is to provide the reader with an overall framework of where small group discussions fit in the “big picture” of what is known about online conferencing and at the same time build a rationale for the problem that is stated in Chapter One of this dissertation.

2.1.2 General Introduction of the Literature Review Methods

There are two types of literature review: thematic review and study-by-study review (Creswell, 2005). In thematic literature reviews, the researcher identifies a theme and briefly cites literature to document this theme. The researcher discusses only the major ideas or results from studies rather than the details of any single study. Study-by-study reviews provide a detailed summary of each study grouped under a broad theme, which includes the elements of an abstract. The researcher links and organizes the summaries (abstracts) through transitional sentences and subheadings that reflect themes and major divisions. In this chapter, to conduct a thorough search of the previous research and existing literature related to this study, I employed a thematic approach with a study-by-study review nested within.

2.1.3 Locating the Research Literature

The present study involves a comprehensive search of the literature, published mainly from 1994 to 2008. To locate appropriate research with a focus on group configurations and online conferencing, formal literature searches were conducted. The literature review of this dissertation was based on a great deal of information obtained from many possible sources. Searches were conducted through University of Toronto library catalogue, a variety of hard copies of books, journals and theses. Electronic searches were performed on the following databases: U/T e-resources, Dissertation Abstracts, Education Full Text, Education Abstracts, ERIC, Pro Quest, PsycInfo, many online e-journals, as well as the web in general (via the Google search engine). Manual searches were also performed on Educational Technology Abstracts.
Major terms adopted in locating the literature include “Class Size”, “group”, “group work”, “group configuration”, “information overload”, “participation”, “note reading”, “note writing”, “social constructivism”, “cooperation”, “cooperative learning”, “collaboration”, “collaborative learning”, “online course design”, “instructional design”, “mixed methods”, “quantitative research”, and “qualitative research”, etc.

2.2 Theories Supporting This Study

I have reviewed several theories relating to this study. Social constructivism, cooperative learning, and collaborative learning are theories that explain how learners learn in social settings and how effective online learning takes place.

2.2.1 Social Constructivism

How people learn is strongly influenced by social context, which in turn is the product of the interaction of individual differences (Bransford, Brown, and Cocking, 1999). When learners are effectively motivated and engage actively to achieve their learning goals, deeper levels of thinking and learning are promoted (Scardamalia & Bereiter, 1994). This notion is consistent with Bruner’s (1986) observation that learning is an active social process. Studies on teaching from a Vygotskian perspective (1978) emphasize creating more advanced social learning opportunities for students. More recently Lave and Wenger (1991) have stressed the importance of the environment, both physical and social, to the learning process. Knowledge, Boettcher (1999) states, has the most chance of flourishing in an environment that is rich, supportive, encouraging, and enthusiastic. As Bereiter (2002) argues, deep understanding is most clearly demonstrated by the insightful solution of problems. Engagement in a group discussion with peers will facilitate individual learning and lead to deep learning and knowledge building.
The process of building knowledge using cognitive tools, a process that Jonassen (2002) referred to as constructionism, engages the learners more deeply and results in more meaningful and transferable knowledge in the learners. Technology is deployed to support and enhance human learning (O’Dennell, 2006; Mortera-Gutierrez, 2002), the acquisition of knowledge, and intellectual analysis and skills (Cameson, Delpierre, & Masters, 2002), rather than being merely added to classrooms as media for information transmission (Chen & Zhang, 2006). Technology also plays the role of an enabler for transferring content and feedback (Neo, 2003). All six levels of individual learning in Bloom’s (1956) taxonomy can be achieved through group discussions, whether in an online or a face-to-face class. Online instructional strategies are to guide meaningful online discussion between or amongst peers (Abowd, da Graca Pimentel, Ishiguro, Kerinbaev, & Guzdial, 1999) and co-construct knowledge, where learners share and refine meaning with peers in a social context (Tao & Gunstone, 1999).

2.2.2 Cooperative Learning

Theories of cooperative learning and collaborative learning are often adopted to guide online instruction. Research on cooperative learning (Johnson & Johnson, 1989; 2004; Slavin, 1989) and several theories such as constructivism (Jonassen, 1994), socially constructed cognition (Resnick, Levine, & Teasley, 1991), and distributed cognition (Solomon, 1993) support the concept that students benefit from their mutual interactions. Cooperative or group learning refers to instructional methods in which students are encouraged or required to work together on learning tasks (Lehtinen, 2003; Alexander & Boud, 2001; Bennett & Smilanich, 1994). Cohen (1994) stresses that “Cooperative learning can stimulate the development of higher order thinking skills” (p. 46). Cooperative groups and teams are particularly beneficial “in developing harmonious interracial relations in desegregated classrooms” (Cohen, 1994, p. 17).
Cooperative learning is a complex process which not only increases academic learning, but also creates conflicts and provides the process to resolve those conflicts according to Bennett and Rolheiser (2001). They also maintain that, according to the social cohesion perspective, the effects of cooperative learning on achievement are mediated by the cohesiveness of the group.

According to Kagan (1994), “there are four basic principles to cooperative learning: positive interdependence, individual accountability, equal participation, and simultaneous interaction” (p. 4). The motivational perspective for cooperative learning focuses primarily on the reward or goal structures under which students operate (Slavin, 1995), such as course participation marks. According to the social cohesion perspective approach, effects of cooperative learning on achievement are mediated by the cohesiveness of the group as well as effective factors (Lehtinen, 2003), such as a positive online learning environment. Panitz (1997) lists 67 benefits of cooperative learning, including improved critical thinking skills, improved classroom results, engagement of students in the learning process, use of problem-solving techniques, personalization of large lecture courses, increased motivation, social support system for students, development of learning communities, improvement of students’ self-esteem and reduction of anxiety. Not all of these benefits will be achieved without well designed instruction, including effective group discussions.

Cooperative groups differ from collaborative groups in that they tend to have a “divide and conquer” mentality, where the cooperative group divides the work into chunks that can be done independently (Graham & Misanchuk, 2004), by contrary, collaboration involves the mutual engagement of participants in a coordinated effort to solve the problem together (Roschelle & Teasley, 1995). Dillenbourg and Schneider (1995) make a similar distinction between cooperative and collaborative learning. They suggest that cooperative learning is a
protocol in which the task is split into sub-tasks that the partners solve independently, while collaborative learning describes situations in which two or more subjects build synchronously and interactively a joint solution to some problem. Collaboration is a personal “philosophy of interaction”, whereas cooperation is a “set of processes” geared to the accomplishment of specific goals or to developing an end product (Panitz, 1996). This distinction places greater emphasis on the extent and quality of the exchanges that occur within groups of students in collaborative environments (Curtis & Lawson, 2001). Students who have developed interpersonal group skills are more likely to gain from their collaborative learning experience than others (Johnson & Johnson, 1987).

2.2.3 Collaborative Learning

Collaborative learning is discussed more often than cooperative learning in the online learning literature. Among studies of collaborative learning in educational contexts, advantages of the performance of a group over individuals have been reported (Webb, Troper, & Fall, 1995). The theoretical framework relating to collaborative learning is underpinned by the theory of Constructivism based on the works of Piaget (1952), Bruner (1985) and Vygotsky (1978). In this context, students must play an active part in their learning process and not remain as passive learners as in teacher-led instruction, whereby the teacher is the sole authority and distributor of knowledge (Neo, 2003). In classrooms that adopt a collaborative approach, the basic challenge shifts from learning in the conventional sense to the construction of collective knowledge (Scardamalia & Bereiter, 1999). With collaborative learning, the control of learning is turned over to the students and the learning environment is student-centric. Learning takes place in a meaningful, authentic context and is a social, collaborative activity, where peers play an important role in encouraging learning (Neo, 2003). Collaboration is more than the exchange of
information and ideas. It is the creation of new insights among group members during online discussions (Ingram & Hathorn, 2004). Indeed, collaboration ideally engages learners in a kind of interactive problem solving in which the product of groupwork is more than the sum of its parts (Brown, Collins, & Duguid, 1989). Collaborative learning approaches engage students in active learning and give them access to the shared knowledge, experience, and insights of other members of the learning team (Golas, 2000). It is particularly important for higher-order, critical thinking skills that must move beyond the passive memorization of facts to a more “constructivist” engagement in which students comprehend, assess, and apply information in ways that lead to new insights and understanding. Collaborative learning processes encourage knowledge construction by prompting learners to articulate their own understanding and trying to negotiate a shared understanding (McAlpine, 2000). Researchers have found that collaborative discussions (competitive or cooperative) do facilitate learning (Cohen, 1994). In his review of collaboration and task design in higher education, Rodriguez Illera (2001) focuses on exploring tasks that have genuinely interdependent components. He concludes that we should make use of the “many strategies of co-operative learning not mediated by computers” (p. 492) in rethinking ways of organizing online groups, the division of tasks and the role of the teacher.

Vygotsky (1978) argued that all learning begins from a social context, which is in alignment with Dewey’s (1901) vision. Collaborative learning practices are often a liberating and democratic influence, creating new freedoms in the classroom. They transform a classroom from the normal “one authority/many listeners” mode of learning to a “one facilitator / many active participants” mode of learning (Hubscher-Younger & Narayanan, 2003). A peer discussion is a useful way of encouraging the kind of social interaction that leads to learning. Through interaction with others (Knowles & Knowles, 1959), learners jointly construct and instantiate
knowledge structures for themselves (Wiley & Bailey, 2006), and their learning is prompted by conflict with others (Piaget, 1932) and being introduced to varying and discrepant points of view (Oliver, 2000). Collaboration is especially important in online learning (Klemm, 1998; Naidu, 1997; Pena, 2004; Puntambekar & Luckin, 2003) where distance learners tend to be isolated, without the usual social support systems found in on-campus or classroom-based instruction.

Classic instructional design (e.g., Dick & Carey, 2004) focuses on individual learning outcomes and tries to control instructional variables to create a learning environment that supports the acquisition of a specific skill or specific knowledge (Kirk & Orr, 2003). Hiltz (1986) has found that people who engaged in online collaboration with their peers became more actively engaged with the course content and thus developed deep personal understandings. Through interaction with their classmates and instructors, students advanced their understanding because multiple new perspectives and ideas emerged during collaborative learning (Harasim, 1990). Newman, Johnson, Webb, and Cochrane (1997) evaluated computer-mediated-communication in a group learning context as a means of promoting deep learning and critical thinking. They believed that critical thinking was a key skill required in deep learning. Depth or quality of learning may therefore depend on how online collaboration is managed (Kukulska-Hulme, 2004). In collaborative learning environments, students can critique, link, reformulate, and combine ideas (Linn, 1995; Harasim, 1997; Smith & Winking-Diaz, 2004) with the objective of developing understanding (Hewitt, 1996).

In order to establish and maintain an online learning community, a dynamic learning environment (Stathakos, 2003), the learning environment needs to be effectively designed to provide students with opportunities to practice collaboration, critical thinking, and teamwork skills that are increasingly valuable in the information age (Kerka, 1996). With the development
of new technologies, new instructional strategies capitalize on the social constructivist nature of learning. One of the most prominent features of a computer mediated conferencing classroom is “the provision of a collaborative and peer-supported learning environment” (Peters, 2005, p. 10). The introduction of more flexible approaches to learning and greater use of online tools offer new opportunities for student collaboration and new challenges for teachers supporting group work (Palloff & Pratt, 1999) to produce and manage shared knowledge (Hubscher-Younger & Narayanan, 2003). However, CMC, if not well designed, leads to depersonalization and deindividuation (Bordia, 1997). Those students that are quiet thinkers may benefit from sharing their ideas with classmates if they perceive an electronic format to be more conducive for them to “talk” (Larson & Keiper, 2002). Research suggests that even when individuals come to a discussion with similar kinds of understanding, they spark responses in each other that can increase the total number of ideas shared (Hoadley, 2004). Knowledge is constructed in these collaborated conversations and interactive communication (M. D. Gall & J. P. Gall, 1976) through the process of social negotiation among the discussions’ participants (Grady, 2003). Collaborative forums can support argumentation by motivating individuals to build coherent and cohesive explanations in the process of negotiating meanings with peers (Duschl & Osborne, 2002), by involving learners in a collective effort of understanding and shared values (Bielaczyc & Colins, 1999; Ng & Hung, 2003), by engaging students in knowledge-building processes (Peng, 2004), and by extracting useful resources on students’ demand (Dringus, 2002). However, the pedagogical approaches used are, in many cases, more important than the technical features of the applied technology (Lehtinen, 2003).

Today the benefits of collaborative learning are widely known but rarely practiced, particularly at the university level (Roberts, 2004). Students and teachers are not the same as
experts; they have special needs that require consideration in designing technology for collaborative learning (Lipponen & Lallimo, 2004). Most online group work focuses on group projects. More effective group discussions should be designed to facilitate online learning and knowledge building. Online collaboration is likely to increase in educational settings in the future, as the trend toward group learning and online course activities and materials continue to merge. Some writers (e.g., Weigel, 2002) argue that combining more traditional courses with online collaboration represents a significant step forward in college teaching. Certainly it appears that it can be very productive to marry instructional strategy with technology (Ingram & Hathorn, 2004).

2.3 Challenges in Online Learning

In the literature, the advantages of CMC have been extolled by many researchers. Bonk, Wisher, and Lee (2004) listed ten benefits of e-learning, for example, more opportunities for shy students to open up and increase their participation, more extensive collaboration, minimal student disruptions and fewer students dominating the discussion. Well designed online environments can provide students with opportunities to develop sophisticated cognitive knowledge and skills (e.g., self-reflection, elaboration, and in-depth analysis of course content). It also makes possible the purposeful construction of knowledge (Pena-Shaff & Nicholls, 2004). However, there are still a number of problems with online conferencing. Among them, the following are major concerns:

2.3.1. Low Course Participation

Student participation is a central issue in debates about online education. Kuboni and Martin (2004) suggest that two features are important in a definition of participation: exchanging messages and a quantitative dimension in which the number of notes are counted. Davie (1988) provides the following definition of participation: “In the computer conference courses we can
analyze participation either through an analysis of transcripts to determine the number and kinds of written notes, or we can look at the records to see when students log on and read the conference notes” (p. 1). However, Coomey and Stephenson (2002) point out that “Instructors and course designers cannot assume that learners will be able to jump into group discussions, argue in online debates, or answer questions posed online, just because they are told to participate” (p. 39). Crucial to the success of online learning is active student participation and interaction both with peers and instructors (Sutton, 2001). Bruyn (2004) has found that student accessibility was often limited, levels of social presence were unequal and varying quality, and the degree of convergence was often low in student threaded discussions.

Course co-ordinators employ various techniques for increasing and maintaining student participation in online courses. A common approach reported in the literature is some overt reward or punishment system (Masters & Oberprieler, 2004). To guarantee participation, some researchers suggest that instructors require that everyone make a certain number of comments in online discussions or require students to make contributions and comment on the contributions of others (Linn & Slotta, 2006). In so doing, the low participation problem is often solved. However, with regard to large graduate online courses, students will face another problem – information overload.

2.3.2 Information Overload

After the participation problem is solved and a large number of notes are contributed to the discussion forum, both students and instructors will be facing a new problem – information overload, especially in large classes. This can produce frustration and disappointment (Kimball, 1995). Bonk et al. (2004) pointed out that among the ten problems of e-learning, one was too much data and information to read and respond to. Hiltz (1990) believed that online courses
often involved greater time expenditure and effort than traditional face-to-face courses. In particular, online courses with an enrolment of over 20 students often generate a large number of notes for students to read and respond to, in addition to required reading materials and corresponding assignments. Information overload has been defined as information presented at a rate too fast for a person to effectively process (Hiltz & Turoff, 1985; Stathakos, 2003; Eisenberg & Small, 1993). Coomey and Stephenson (2002) have discovered that “In almost all cases students say that effective procedures for instructor / tutor / peer feedback are the most important features of a successful online course” (p. 39). However, information overload may limit effective peer feedback if students have to skip notes or scan notes too often.

Students and instructors often complain that there are too many links or too many threads leading in all directions. This can confuse learners and distract them from the learning objectives (Clark & Mayer, 2002). Klemm (2000) found that some participants lurked (just read but do not contribute), a few students dominated all the discussions in some courses, not all students read what were posted, and the huge number of notes was too overwhelming in large classes. The volume and pace of information can become overwhelming (Kirk & Orr, 2003), especially since messages are not necessarily sequential and multiple topic threads are common, resulting in information overload. Information overload presents itself first as a problem, then as a constant challenge to be overcome. Intensive interaction with a large number of communication partners results in the mushrooming of the absolute amount of information and the number of simultaneous discussions, conferences, and other activities. In her study, Peters (2005) echoes that “a common complaint among students was the amount of information there was to read, particularly in terms of the time required to read all of the notes in their online course” (p. 38). These demands exceed learners’ normal coping abilities (Kerr & Hiltz, 1982).
Some studies suggest that working with others adds information that needs to be processed, because “Humans have a limited capacity for the amount of information they can simultaneously process” (Strijbos, Martens, & Jochems, 2004, p. 315). The individual has less time to state his or her own thoughts out loud, and “others’ contributions may interrupt the individual’s own processing, knocking him off his train of thought” (Wiley & Bailey, 2006, p. 300). Hiltz and Turoff (1985) list some results caused by information overload: individuals might fail to respond to certain inputs, respond less accurately than they would otherwise, respond incorrectly, store inputs and then respond to them as time permitted, systematically ignore (i.e., filter) some features of the input, recode the inputs in a more compact or effective form, or quit (in extreme cases).

2.3.3 Large Online Class Size

As mentioned previously, class size and information overload are related. Information overload is a phenomenon that is commonly reported by students in computer conferencing courses. In online conferencing, larger class sizes increase the amount of material that students are expected to read. This amplifies information overload. One student in Peters’ (2005) study complains, “Too many students in one large group; making for a more superficial discussion of many issues, rather than a deeper discussion of a few issues” (p. 38). Bender (2003) states that one of the reported feelings in CMC was being overwhelmed brought on by a large class, lengthy lectures or online responses, or numerous responsibilities. Harasim (1990) pointed out that the larger the class size in the online environment, the greater the likelihood that students will become frustrated and anxious with the emerging pressures of keeping up with the readings and stored messages. Potentially, according to Hewitt and Brett (2007), the perception of information
overload could have a number of negative consequences, such as heightened student anxiety, which can interfere with the amount of attention that participants dedicate to online learning.

Lipponen (2001) has found that group work (especially larger groups) could actually increase the processing load on individuals. Wiley and Bailey (2006) point out that “In the end, individuals may be more burdened and enjoy less intact cognitive processing than when working alone” (p. 300). Often students will split up a task, work separately, and later pool their ideas together (Paulus, Larey, & Ortega, 1995). Mertens (1998) points out that the impact of group size on interaction is still not known and that group size is an aspect of Computer-Supported Group-Based Learning that needs additional research.

2.3.4 Confusion Caused by Threaded Discussions

Some researchers have suggested that there may be problems existing in the threaded structure of discussions. Bender (2003) claimed that “students are confused by the tangled threads of the threaded discussion format” (p. 69), thus “they can only see the immediate messages to which they are responding” (p. 69). Each time someone starts a new discussion thread or extends an existing line of thought, there is a shift in the “intellectual spotlight” – a shift that influences the note reading and writing patterns of the discussion followers (Hewitt & Teplovs, 1999). Whether in large class or small group discussions, instructors’ starting notes tend to fuel a boom in the discussion threads (Bender, 2003). This might lead to a teacher-centered discussion. Experienced online teachers have complained that the threaded-topic design does not effectively support group learning and problem solving (Klemm, 2002; Kear, 2001; Sain, 2003). Furthermore, threaded discussions can be perceived as busy work if they are not well integrated into a curriculum. They can also lead to information overload if group sizes are not controlled (Chong, 1998; Edelstein & Edwards, 2002; Gregory, 2002). The design of some online discussion forums also adds to the
information overload problem (Mason, 2002). In addition, Jeong (2003) observed that there was a lack of methods and tools capable of measuring group interactions and processes in threaded discussions. Therefore, uses of online technologies need to be well structured to avoid information overload and assist navigation (Strijbos, et al., 2004), threaded discussions, and subgroup discussions.

2.3.5 Authority Structure, Depersonalization, and Deindividuation

Although CMC is often described as an equalizing medium, some researchers argue that this is not necessarily the case. Information overload and large class discussions also create an authority structure which has a large impact on subsequent learning and collaborative learning activities (Hubscher-Younger & Narayanan, 2003). Some students dominate discussions, while other students only have the time to read the notes. High-status members (those with ability to monitor and select which ideas are to be accepted by the group and to what extent) receive greater attention from the class than those of low-status members. Furthermore, the fact that the power of leading discussions resides in certain individuals decreases the creative input of low-status members (Douglas 1993). This leaves the shy students, especially those who lack confidence or withdraw upon rejection of initial ideas (Hoffman, 1965), with little chance to participate in discussions.

Some researchers suggest that the use of CMC leads to depersonalization and deindividuation (Bordia, 1997). Deindividuation takes place when the individual experiences a diminished sense of self (Murphy-Boyer, 2001), especially in large classes. According to Hiltz (1986), deindividuation and depersonalization are often said to lead to flaming and general misbehaviour of the participants.
2.3.6 Problematic Online Practices

Although individuals are overloaded at different levels (Hiltz & Turoff, 1985), most students in large classes cannot perceive and deal with all information cognitively and effectively. To cope with information overload and large class discussions, students have to find ways to meet instructors’ expectations and to achieve satisfactory marks for participation. As early as 1962, Miller found that individuals tended to focus on filtering and omitting (ignoring) information as the most effective ways of coping with information overload in face-to-face classes. In their research, Hewitt, Brett, and Peters (2007) have found that CMC students habitually engaged in practices like scanning, skimming, and reading new notes. Atack’s (2003) findings are consistent with this research which suggested skimming was a common strategy for coping with workload demands. Hewitt, Brett, and Peters (2007) have also found that larger classes had higher scan rates due to increased information overload. Less scanning occurred in small group configuration. However, skimming and scanning may lead to shallow superficial learning (Hewitt & Brett, 2007). In reality, many of these strategies are adopted to fulfill course participation requirements (Peters, 2005).

2.4 Class Size and the Use of Subgroups

In the literature, there are other studies which did not focus only on existing problems. Some studies explored issues that have both advantages and disadvantages for online conferencing. Those issues related to this dissertation research are described in this section. They help me, as a researcher, frame the research.

2.4.1 Class Size and Online Activity Patterns

Class size has long been recognized as a factor affecting achievement in face-to-face contexts and has recently been identified as a factor in online conferencing as well (Hewitt & Brett, 2007). Hewitt and Brett pointed out that there appeared to be both advantages and
disadvantages to large classes. Larger computer conferencing courses offer educational advantages. They can expose individual students to a wider range of ideas and perspectives. There are also more opportunities for peer collaboration. However, large classes also increase the amount of information that students have to process, and may reduce the amount of time that an instructor can spend working with individual learners (Hewitt & Brett, 2007). In their quantitative analyses of note production, average note size, note opening and note reading percentages, they found a significant positive correlation between class size and notes generated in each course, a significant negative correlation between class size and average note size, and a significant negative correlation between class size and percent of notes opened. The findings of their research suggested that students tended to write more notes in larger classes than their peers in smaller classes. However, the notes in larger classes had smaller word counts. Hewitt and Brett (2007) also noticed that class size was associated with student note reading behaviors. The larger the class size, the less likely that the students would open all of their peers’ notes. Additionally, students tended to scan more frequently in large classes than in small classes. Students in large classes read notes the quickest, often reaching or exceeding reading speeds of 8 words per second, while, students in small classes read notes more slowly. Scan rates varied with class size and class configuration (Hewitt, Brett, & Peters, 2007). Their research results also suggested that larger classes were associated with an increase in the number of notes written, a decrease in average note size, a decrease in the percentage of notes opened and an increase in note scanning. Hewitt and Brett (2007) developed three hypotheses exploring why students in larger classes tended to write more notes. The first hypothesis was that larger classes increase the number of opportunities for participation, such as more discussion topics. The second hypothesis was that students in larger classes feel uncertain about their place in the class and compensate by
participating more often. The third hypothesis was that well designed, interesting courses taught by skilled instructors attracted a larger number of students and also inspired higher levels of participation.

To overcome information overload, Hron and Friedrich (2003) argued that appropriate group sizes should be set up to ensure for each group a critical mass of participation, to reach the goals associated with collaborative learning, and to make it easier to establish social presence to encourage greater interactivity (Aragon, 2003; Tu & McIsaac, 2002). As a basic precondition, online learners have to read the messages, ask questions, comment on messages, and answer questions (Hron & Friedrich, 2003). Aragon (2003) pointed out that it was easier to establish social presence in smaller classes. In Davie’s (1988) case study, he divided the students into small groups of four to five members. He found that during both of his courses, each of the small groups succeeded in producing a good-to-excellent analysis of a case study. Dennis and Williams (2003) stated that instructors needed to be keenly aware of group processes and dynamics that developed both in the threaded discussion as well as in class. They may need to reassign students to new groups or increase or decrease group size throughout the semester, to expose students to new interpersonal relationships and viewpoints. This limitation can also be overcome by changing groups during the semester or by opening a temporary idea exchange forum for the whole class (Dennis & Williams, 2003; Weasenforth, Lucas, & Meloni’s, 2002).

2.4.2 Online Practice and “Survival Strategies”

Peters and Hewitt (2005) conducted research to examine the online practices and “survival strategies” of 57 students enrolled in graduate-level distance education programs at OISE/UT using WebKF. They identified a number of common habits and strategies that online learners typically employed. Many of these strategies helped learners meet course requirements more
efficiently and cope with information overload. However, some of these strategies may undermine learning (Peters & Hewitt, 2005). Learners in this study often complained about information overload and the lack of time to read all notes. Peters and Hewitt (2005) also found “To compensate, they often took shortcuts such as skimming notes or ignoring some discussion threads” (p. 6). The findings from this study revealed that learners tended to respond to notes with questions, notes with familiar topics, and the beginning of long notes. They also tended to read notes once only and scanned notes to find the ones that they were interested in. They did not always participate in a manner that maximized their learning. By adopting such time-saving habits, important issues, ideas and discussion topics in the later sections of long notes and notes with unfamiliar titles may be missed. As a result, some important issues and topics may lose their potential for influencing the discussions.

Students’ efforts seemed focused on ways to most easily meet course participation requirements. Students often participated in a manner that emphasized course efficiency over advancing their own understanding about course topics. The findings from their research investigation suggested that “students are not always benefiting from the educative advantages afforded by computer conferencing” (p. 8). In their conclusion, Peters and Hewitt (2005) pointed out the need to restructure the design of computer-mediated conferencing courses and to rethink the nature of online participation to foster true online collaboration. Hewitt (2003) found a tendency for computer conference users to focus on recently introduced notes and a reduced tendency to re-visit older, more established notes. He argued that “Consequently, the most recent notes in each thread are the ones most likely to drive the next round of responses” (p.31). He also pointed out that “Educationally, this situation can be problematic if an excessive focus on new notes unintentionally shifts attention away from important issues” (p. 31). Findings from Hewitt,
Brett, and Peters (2007) research revealed that scan rates increased when the note size increased. Students were more likely to scan the notes of their peers than notes written by their teachers. Students scanned more frequently than teachers did. What they have found that is most relevant to this research is that scan rates varied with class sizes and class configurations.

2.4.3 Participation

Student participation in a CMC environment is usually measured quantitatively. In Murphy-Boyer’s (2001) research, she discovered that researchers often measure:

- rate of participation in terms of how often participants contribute;
- amount of participation in terms of the amount of words and/or ideas, and;
- depth of participation in terms of the number of contributions, the average number of speech acts per contribution and the average number of words per contribution.

Linn and Slotta (2006) observed that to determine whether an online forum had been productive, researchers and instructors typically examined the number of comments, the frequency of contributions, the attribution of comments, student reading practices, and the patterns of participation in the online space. However, Davie (1988) observed that CMC allowed shy and less vocal students to participate without risk of interruption. This is consistent with Tuckey’s (1993) statement that CMC reduced the possibility of a dynamic individual dominating the conversation. There are many factors that affect students’ participation in online courses. Linn and Slotta (2006) noticed that curriculum design patterns impact participation, as do teacher expectations. Mazzolini and Maddison (2003) discovered that the ways in which instructors post to forums could influence students’ discussions and perceptions, but not always in expected ways. Frequent posting by instructors did not always lead to more student postings. The more the instructors posted and led the discussion, the shorter were the lengths of the discussions overall.
2.4.4 Group Sizes and Group Configurations

2.4.4.1 Learning in a Group

Individuals learn through interaction with others (Scardamalia & Bereiter, 1999). As Bender (2003) observes, “group work, when carefully designed and carried out, can include high-level tasks and can encourage students to think at a very deep level” (p. 122). The group has the advantage of multiple frames with which students can select relevant or important information to attend to, multiple long-term memory depots from which students can retrieve relevant knowledge, and multiple temporary storage that may allow for more elaborate processing in a group (Wiley & Bailey, 2006). In a group, the learning objective is not solely to produce a good group work, but to ensure that every member in the group contributes effectively toward the group learning outcomes (Lea, Rogers, & Postmes, 2002). Wayne and Cohen (2001) believe “The contributions of any group to its members will vary in nature and intensity with group purpose and model” (p. 6). All approaches to group work in FTF classroom teaching and learning utilize small group theory and involve an understanding of individual development and strategies for working with others (Garvin, 1981).

2.4.4.2 Online Group Learning

Online learning environments offer new opportunities to observe group dynamics and instructional design in unobtrusive ways (Kukulska-Hulme, 2004), and support information exchange (Kadushin, 1992) and flexible group interactions (Bodzin & Park, 2000; Graham & Misanchuk, 2004). One of the important factors in understanding the potential effects of online collaborative learning is group size, especially in larger groups (Mullen, Johnson, & Salas, 1991), “because the balance of process gains and losses changes dramatically depending on the size of the group” (Dennis & Williams, 2003, p. 168). Online discussions offer more flexibility in group size and group composition. Individuals can participate in both small groups and larger groups (Linn &
Slotta, 2006). The reasons for dividing large whole classes into groups vary from class to class and from instructor to instructor. For some, the purpose is to vary the learning activities in online conferencing (Bender, 2003) so that different groups discuss different subtopics. For others, the purpose is to overcome information overload and to stimulate online discussion and effective learning. Many researchers have studied how groups develop into functional teams (e.g., working on projects) and organize group processes to accomplish their tasks (Johnson, et al, 2002). However, there has been little research aimed at exploring the efficacy of classes of different sizes and group configurations.

2.4.4.3 Group Cohesion

Online learners have diverse backgrounds and individualities (Stroebe & Diehl, 1994). “Diversity appears to be a double-edged sword, increasing the opportunity for creativity as well as the likelihood that group members will be dissatisfied and fail to identify with the group” (Milliken & Martins, 1996, p. 403). To function effectively, a group has to cohere, or “hang together”, which involves generating a “we feeling” among members, and having a positive emotional climate. Johnson et al. (1994) remarked that “Group cohesion is the extent to which the influences on members to remain in the group are greater than the influences on members to leave the group” (p. 99). Chiu, Huang, and Chang (2000) discovered that the group performance is related to the amount and the level of group interaction. The greater the interaction, particularly in terms of complex co-operation, the better a group performed. To what extent groups engage in inquiry discourse is assessed, as Woodruff and Meyer (1997) outlined, by mechanisms of mutual knowledge, convergence and coherence. The premise is that if inquiry discourse is utilized effectively, knowledge-building will be possible and therefore a greater level of conceptual understanding will be achieved (Yoon, 1999). Graham and Misanchuk (2004) point out that there are two key challenges associated with structuring learning activities for
computer-mediated groups: establishing an appropriate level of interdependence and creating learner accountability. A high level of interdependence might require students to join in all aspects of the discussion (a more collaborative model). Accountability should be addressed at both the group and individual level to determine a corresponding balance between the two. On one hand, over emphasizing group accountability can lead to problems such as social loafing or free-riding (Wagner, 1995). On the other hand, over emphasizing individual accountability can undermine the cohesiveness of the group (Graham & Misanchuk, 2004).

To achieve successful online learning, it has become increasingly critical that online instructors know how to employ strategies to support effective group discussions (Abdelraheem, 2003; Valverde, et al, 2002). However, Bailey and Wright (2000) observed that many online instructors did not think about group size or organization in their course planning.

**2.4.4.4 Inappropriate Group Size**

The effect of different group sizes in online conferences is not clear. Considerable research has been conducted on the effects of different group sizes in face-to-face settings. For example, an inappropriate group size may interfere with effective group discussions or with group work on projects. Johnson et al. (1994) listed a number of ways that group size can interfere with group effectiveness. First, the greater the disparity between effective group size (the most productive size) and actual group size, the more ineffective the group will be. As a group gets larger, not all its members are active and try to solve the problem (Johnson, et al., 1994). In groups with more than ten people, there is often considerable process loss occurring. In groups of more than eight or nine members, a few students are likely to dominate the discussion and others are likely to remain passive (Watson & Johnson, 1972). Second, the less group members see their contributions as essential for group success (e.g. in large classes), the less effective the group will be. As the group size gets larger and larger, group members are less likely to see their own personal contribution to
the group as being important to the group’s success (Kerr, 1989). As the size of the group increases, social loafing and free-riding also increases. Third, the greater the complexity of group structure and the more time it takes to organize its joint efforts (e.g. to be collaborative in large classes), the less effective the group will be. Additional time is needed to organize a group; such organization is unnecessary for individuals (Bales & Strodthbeck, 1951). The larger the group, the more time is needed to organize it. Fourth, the less effort invested by each member (e.g. lurking in large classes), the less effective the group will be. As group size increases, the average contribution per member decreases. Fifth, the less the members identify with the group, the less effective the group will be. Kramer and Brewer (1986) have shown that a strong sense of belonging or social identity leads to cooperative behavior. They suggest that the more a learner feels part of the group, the less strongly he distinguishes between his personal welfare and the group’s welfare. Small groups are easier to identify with than large groups. Sixth, the fewer members that follow the group’s norms (e.g. engaging in inappropriate behavior in large classes), the less effective the group will be. Reducing group size makes it easier to monitor members’ behavior and strengthen members’ adherence to the group.

In summary, group size is the most important determinant of online group effectiveness, according to Johnson, et al. (1994). This is in line with what Davis (1969) and Garvin (1981) claimed in their discussion of face-to-face groups.

2.4.4.5 Group Size and Instructor Facilitation

The instructor should also be a good online classroom manager and designer, or some combination of these (Salmon, 2000). In large whole class discussions, instructors lead the discussion most of the time. However, for large classes with subgroup discussions, “leading from behind and trusting the group is an important strategy” (J. S. Storck & L. E. Storck, 2004, p. 243).
Strijbos, et al. (2004) state that “Frequently, large groups are divided into smaller groups, and sometimes into dyads, in order to bring about some of the advantages of increased control over instructional events” (p. 308). They believe that “Electronic classroom technologies are making it possible for teachers and instructors to have increased control over instructional events in a large group” (p. 307). Strijbos, et al. (2004) also explain,

“Large-group instruction is characterized by weak control of the effects of instructional events by the teacher. The gaining of attention, the cuing of semantic encoding, the eliciting of student performance, and the provision of corrective feedback can all be instituted as events, but their effects on the learning process are only probable.” (p. 308)

2.4.4.6 Large and Small Groups

The larger the group the more inhibiting its size becomes for members who have strong introversive tendencies and a fear that dissent will be equated with deviance (Hoffman, 1965). In small groups there are opportunities to practice both communication skills and engage in problem-solving strategies (Maier, 1971). Strijbos, et al., (2004) find that “Small groups are frequently formed from larger groups” (p. 308). Research suggests that online discussion within small groups offers a powerful environment for adult learning as it enables members to reflect on each other’s experiences and to engage in collaborative tasks (McConnell, Hardy, & Hodgson, 1996). In such groups there is likely to be a higher sense of presence (Perolle, 1991) and a growing sense of community. When the group is small, there are usually opportunities for member-to-member communication and group discussion. Small groups support many instructional methods associated with active learning— involving learners as participants in the process of acquiring, analyzing, and organizing information, and turning it into knowledge (Gagne, Wager, Golas, & Keller, 2005). Dirkx and Smith (2004) found that their students expressed a desire to spend time working in small groups. Arguments that support small group learning with computers are both practical and theoretical (Lou, 2004). Strijbos, et al. (2004)
stressed that “The aim is to attain some of the advantages of small-group instruction and to provide some added variation to the instruction possible with large groups” (p. 297). Most software programs allow for the entire online class to be divided into smaller groups; therefore each member in an individual group can communicate with any other online participant through a variety of ways (Bender, 2003).

2.4.4.7 Instructional Design in Group Learning

“Technology and a resurging interest in social construction have increased interest in group instruction and collaborative learning in large groups, and the establishment of learning communities has changed the way instructional designers think about group instruction” (Gagne, et al., 2005, p. 290). Graham and Misanchuk (2004) stated that the literature shows three general areas that are important for successfully facilitating and using groups in a computer-mediated environment: creating groups, structuring the learning activities, and facilitating group interaction. They also pointed out that there were two challenges related to creating successful computer-mediated learning groups: choosing appropriate group size and determining group composition. Group size not only determines some of the necessary characteristics of instructional events but also sets limits upon their effectiveness in supporting learning (Gagne, et al., 2005). Gagne, et al. (2005) described how instruction can be planned for different group sizes – the dyad (two-person group which will not be discussed in this study), the small group (under seven), and the large group (seven or more). The instructional event of gaining attention can be precisely managed in the dyad, but only loosely controlled for individual learners in a large group. Large group instruction will be effective on average but cannot by itself be ensured as effective for each individual learner (Gagne, et al., 2005). In large groups, individual students are less likely to affect all other members (Forsyth, 1990). A large group requires more effort from group members to achieve common ground or negotiate a problem solving approach (Strijbos, et
al., 2004). Group performance effectiveness depends on the handling of increased coordination and group management processes (Saavedra, Earley, & VanDyne, 1993).

Frequently, large groups are divided into smaller groups, and sometimes into dyads, in order to increase the individual learner’s control over instructional events (Strijbos, et al., 2004). The characteristics of instruction applicable to these three different group sizes depend on the degree of precision with which the instructional events can be managed by the teacher. Strijbos et al. (2004) recommended that if the interaction focused on feedback, dyads were preferred. If the interaction focused on idea generation, large groups were preferred. If the interaction focused on consensus generation and negotiation, small groups were preferred.

Researchers have proposed a number of different optimal sizes for online classes. Based on their own online teaching experience, Rovai (2002) and Aragon (2003) proposed 30 as an upper limit on class size. This matches Bi’s (2000) suggestion that to optimize and allow for effective feedback, fewer than 30 students should be enrolled in each class. Roberts and Hopewell (2003) suggested that faculty keep the size of the class to 20 students, to allow for more “workable” loads. This size is manageable without overwhelming the instructor or minimizing his effectiveness. Hiltz (1990) recommended that a class conference be divided into subgroups when the number of students reach or exceed 30. Even with 20 students in graduate level discussions, the reading and writing load is still very heavy. However, a class with less than 5 or 6 students is less overwhelming but not encouraging in participation. Rovai (2002) argued that to guarantee effective online engagement and interactions, 8-10 students were required. However, in general, students in smaller classes tended to learn more (Glass & Smith, 1979). As Garvin (1981) explains:

“Small groups, such as those of about four to eight members, demand and produce more intimacy than larger groups. Such small groups are likely to bring pressure on members to participate. Larger groups, on the other hand, allow members to withdraw from active
The tendency in such groups is for a polarization to occur with some members talking a great deal while others seldom speak.” (p. 79)

Some researchers argued that a group larger than five presented problems for participation in interaction. Cohen (1994) pointed out that “for group discussion, I have always found that four or five is an optimal size. Cohen stated that as the group gets larger, there is more of a chance that one or more members will be left out of the interaction almost entirely” (p.73). A group of three has some special problems (Cohen, 1994). There is a strong tendency for two persons to form a coalition, leaving the third feeling isolated and left out. Groups should be mixed as to academic achievement, sex and any other status characteristic such as race or ethnicity (Cohen, 1994). In summary, successful online learning depends on which group size is best suited to the learning objective, the expected level of interaction, task type and level of pre-structuring (Strijbos, et al., 2004).

2.5 Summary

Given the relative newness of online learning as a teaching and learning medium, it is not surprising that there are a host of unanswered questions and unexplored issues for further research. The major results and findings from the relevant literature that I briefly surveyed suggest that the current literature is deficient in the study of online group discussions and group configurations. The literature I reviewed pictured the variety of studies that researchers had conducted on issues relevant to this dissertation topic, for example, information overload, shifts on important course topics, habitual online practices (e.g., scanning and skimming) to cope with the course expectations. Researchers have provided some insightful suggestions for further research in these areas and some solutions to deal with these problems.

In this sense, the literature review yields some useful findings. First, it shows that many of the studies underscore the importance of previous research done in relevant areas of class sizes and
group configurations and it also informs online instructors of problems existing. Secondly, it brings to the fore the usefulness of presenting different practices and experiences under different class sizes and group organizations. Thirdly, combining the strengths of online learning practices, online participants’ experiences, and theories guiding online teaching and learning might offer opportunities to gain insights into one of the factors—group configurations—affecting online education.

A general conclusion of my literature review is that previous research has analyzed online groups in terms of function and general factors. However, there has been little in depth study of the relationship between group configurations and online discussions. This is an obvious gap in the research literature. There also exists a gap in how instructors and students experience differences in different class sizes and group configurations in online discussions in graduate-level courses.

In the present chapter, Chapter Two, I constructed an initial conceptual framework. This framework has established a foundation for asking researchable questions about the applications and organizations of online groups. It also provides information about applications in future instructional design of online course group discussions.
CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

In Chapter Two, the theoretical framework underpinning the research was discussed, along with problems and previous studies in related areas. In general, there have been theories supporting for the viability of effective online teaching and learning. However, there has been little research that has examined how different class sizes and group configurations might affect discussions in online graduate-level courses. In order to address this gap, Chapter Three outlines a research design of a mixed methods study for the purpose of elaborating and enhancing results from quantitative data analyses and results generated from qualitative interviews. This chapter focuses on the design, methods, and measures used to determine the relationships between different group configurations and note reading and writing practices, and discussion thread development, as well as students’ and instructors’ opinions about the relationships between group configurations, instructional design, cooperative, and collaborative learning. This chapter is organized into the following sections: (1) research questions; (2) rational for a mixed methods study; (3) mixed methods design; (4) sampling strategies; (5) data collection; (6) data analyses; (7) integration of quantitative method and qualitative method; (8) internal and external verifications; (9) reliability and validity; and (10) summary.

3.1 Research Questions

The primary goal of this mixed methods dissertation research is to examine the effects of different class sizes and group configurations in online conferencing. The central research questions are as follows: “1. How did different class sizes and group configurations affect students’ and instructors’ participation in note reading and note writing?” “2. What were
instructors’ and students’ opinions about instructional design and strategies relating to class sizes and group configurations?”, and “3. How did students and instructors make sense of online cooperation and collaboration across different class sizes and group configurations?”

3.2 Rational for a Mixed Methods Study

Qualitative researchers stress the socially constructed nature of reality and how social experience is created and given meaning, while quantitative studies emphasize the measurement and analysis of causal relationships between variables (Silverman, 2005; J. P. Gall, M. D. Gall, & Borg, 2005; A. Aron, & E. N. Aron, 1999). However, pure quantitative data analyses have been criticized for over generalizing the research results. The researcher is likely to have very limited or no contact with the people being studied (Blaikie, 2000). More than a few commentators have addressed the quality of the quantitative studies in distance education and the general consensus is that it is poor (Bernard, et al., 2004). Two major shortcomings in much of the published research on online conferencing are small sample sizes (Schoech, 2000) and a need for mixed methods studies. Erzberger and Kelle (2003) articulate that “Qualitative or quantitative data alone did not yield sufficient information to allow us to fully understand the social processes under scrutiny. Qualitative and quantitative methods have to be combined to allow adequate explanations of the phenomena under study” (p. 474).

Mixed methods research has been increasingly adopted in educational research as an alternative to traditional mono-method approaches of conducting educational research (Greene, Caracelli, & Graham, 1989; Creswell, 1994; Tashakkori & Teddlie, 2003; Howe, 1992; Bryman, 1988). Four main paradigmatic assumptions are under debate. The Purist stance argues that philosophical differences exist among different paradigms of inquiry that are incompatible and cannot be mixed in the same study (Smith, 1983). The A-paradigmatic stance (Reichardt & Cook,
1979) acknowledges these differences but stresses the logical independence of each method. The Dialectic stance (Greene & Caracelli, 1997) accepts differences and stresses envision as a way of intellectually engaging with multiple sets of assumptions toward better understanding. The Pragmatic stance (House & Howe, 1999; Tashakkori & Teddlie, 2003) prefers action over philosophizing and suggests that one should choose the method or combination of methods that is most likely to provide useful answers to important research questions.

Creswell (2005) points out that all research methods have limitations. Biases inherent in any single method could neutralize or cancel the biases of other methods. He also states that “Mixed methods designs are procedures for collecting, analyzing, and linking both quantitative and qualitative data in a single study or in a multiphase series of studies” (p. 53). Morse (2003) argues that the major strength of mixed methods research is that they allow for research to develop as “comprehensively and completely as possible” (p. 189). The fundamental principle of mixed method research is to collect multiple sets of data using different research methods in such a way that the resulting mixture or combination has complementary strengths and nonoverlapping weaknesses (Johnson & Christensen, 2004). Results from one method can help develop or inform the other method (Greene, Caracelli, & Graham, 1989) and provide insight into different levels or units of analysis (Tashakkori & Teddlie, 1998; 2003). Mixed methods help researchers develop a fuller understanding of the issues under investigation.

Quantitative and qualitative methods are used in this study to address overlapping phenomena, explore different facets of class sizes and group configurations, and to enhance the interpretability of this study. The purposes of using a mixed methods design in this study is (1) to develop stronger claims to test my hypothesis that different class sizes and group configurations do affect online teaching and learning; (2) to examine the research questions from multiple
perspectives, thus providing greater diversity of positions and values; (3) to understand online graduate course teaching and learning more insightfully; and (4) to develop more comprehensive, more complete, and more enriched portraits of online graduate course teaching and learning.

### 3.3 Mixed Methods Design

Using Greene, Caracelli, and Graham’s (1989) framework and Maxwell and Loomis’s (2003) model for mixed method research, this study takes advantage of complementarities and triangulation (Denzin & Lincoln, 2005). By bringing together the findings from quantitative and qualitative methods, the results of both can be elaborated and enhanced (Neuman, 2003; Morse, 1991; Clark-Carter, 2004). Mixed methods can be especially useful when unexpected results arise from a quantitative study (Morse, 1991). Interpretability is enhanced when the methods are implemented simultaneously within a single study. I, as a researcher, also seek convergence, corroboration, and correspondence of results from both quantitative and qualitative methods to increase validity and to find inconsistency and convergence. In this mixed method study, quantitative methods are used to make standardized analyses, to quantify relationships between variables, and to account for variance. Qualitative methods are adopted to study phenomena and situations in detail, holistically and in context, focusing on interpretations and processes (Punch, 2000). Figure 1 summarizes the design.
Figure 1. The design of the mixed methods study.

- **Methodology**
  - **Rational for MM**
    - To develop stronger claims to defend my claims;
    - To engage multiple perspectives with greater diversity of positions and values to examine the research questions;
    - To understand online graduate course teaching and learning more insightfully
    - To develop more comprehensive, more complete, and more enriched portraits of online graduate course teaching and learning.
  - **MM Design**
    - A Complementary mixed method design with triangulation embedded seeks enhancement, convergence, elaboration, clarification, and illustration.
  - **Sampling Strategies**
    - Multiple sampling strategies;
    - 25 online graduate-level courses from Jan. 2003 to Fall 2004;
    - 22 volunteer interviewees (10 instructors & 12 graduate students) from the institute with online teaching and learning experiences.
  - **Data Collection**
    - Quantitative Data
      - 25 courses: 10 small, 10 large, 5 large with subgroups classes;
      - 341 students & 25 instructors after data sorting
      - 29 variables
    - Qualitative Data
      - 10 instructors: most with experiences in all kinds of class sizes, one with small experience, one new online instructor;
      - 12 graduate students: most with experiences in all kinds of classes, one new online student, one with large class only.
  - **Data Analysis**
    - Parallel track Analysis
      - Data reduction and typology development
      - Quantitative data analyses: data cleaning, Descriptive statistics, Chi Square, $t$-tests, one-way ANOVA, ANCOVA, Simple Regression, and Multiple Regression.
      - Qualitative data analyses: open, axial, and selective coding.
    - Cross-over Track Analysis
      - Data comparison and data consolidation
  - **Integration of Quan & Qual**
    - Purpose of integration: to achieve the two goals of mixing the two methods, complementarity and triangulation;
    - Integration at data analysis stage with parallel track and cross-track analytic approaches;
    - Integration at data presentation stage;
    - Integration at interpretation stage;
    - Integration at discussion stage.
3.4 Sampling Strategies

This study adopted purposeful criterion sampling strategy for both quantitative and qualitative samples with maximum variation in the sampling of interview participants. Samples for both quantitative and qualitative data analyses were from the institute population.

3.4.1 Sampling for Quantitative Method

In quantitative studies, there is usually a desire for research results to be applicable beyond the population that is studied. The focus is on the representativeness of the sample (McMillan & Schumacher, 1997; Johnson, 1995). Many studies suffer from high attrition and use statistical analyses with small sample sizes, which violate the underlying assumptions of the statistical methods. The sample for quantitative method in this study is larger than most quantitative CMC studies described in the literature. The standard used in choosing participants and sites is whether they are ‘information rich’ (Patton, 1990; Kemper, Stringfield, & Teddlie, 2003). Ethical review approval of the quantitative data analysis (with numerical anonymous data only) was granted by the University in October, 2005 (see Appendix A).

3.4.2 Sampling for Qualitative Method and Recruitment of Participants

One of the primary advantages of qualitative data inquiry is its strength or focus in collecting naturally occurring data in ordinary settings (Miles & Huberman, 1994). Another positive feature of qualitative data inquiry is that it provides rich, thick, descriptions that are vivid, with a strong potential for revealing complexity. The sample for qualitative method in this method followed Creswell’s (1994, 1998, 2005) design. One-on-one semi-structured interviews were conducted as the basic data collection method (Creswell, 2005) to shape responses to my perceptions of how things were (Fraenkel & Wallen, 2000). I continued the interviews until I
collected enough data for my study, so the number of participants in the interviews depended on the data I needed for this study.

A purposive criterion sampling procedure was used to recruit participants, taking into account the notion that participants must have knowledge (Morgan, Krueger & King, 1998) of online group discussions under different group configurations. I assumed that I could use my knowledge of the population (online instructors and graduate students in the institute) to judge whether or not a particular sample (participant) was representative (Fraenkel & Wallen, 2000). Participants in this research were thoughtfully and deliberately selected (Grams, 2001). In this study, interview participants were graduate students with online learning experiences and instructors with online teaching experiences using WebKF software. Purposeful sampling (Strauss & Corbin, 1998b) enabled me to recruit participants who were at the institute. I put the Recruitment Notice in the FirstClass online conference at the institute to get volunteers from the whole institute. I also contacted some instructors and graduate students in person or by e-mails to get the names of some experienced online course instructors and graduate students who took online courses before or who were taking online courses. I interviewed individuals to get each individual participant’s online learning or teaching experiences in depth by providing enough time (being flexible and depending on the interviewees’ experiences) and privacy. I continued interview data collection until the data were saturated.

3.4.3 Qualitative Study Ethical Considerations

Ethical review approval of the qualitative data collection was granted by the University in February, 2006 and was renewed in March, 2007 (see Appendix B). Participants were volunteers (see Appendix C) and they were made anonymous in the data. Participants read the Information Letter (see Appendix D) and Consent Form (see Appendix E) before they
participated in this research. Before they signed the Consent Form, the participants had opportunities to ask questions or request clarification through e-mails or phone calls. All data generated during this study were stored on my personal computer and remain confidential. Student names and course names were replaced with codes or pseudonyms. Neither the participant names nor the names of their workplace were used in the published study. Only my supervisor and I had access to the primary data. All data, including audiocassettes, were destroyed once the study was concluded. Participants were free to raise questions or concerns throughout the study, and might withdraw at any time if they chose.

3.5 Data Collection

3.5.1 Instruments

Data from WebKF Databases
Each dataset included the following main variables: User ID, Note ID, Note author, Time, Read/Save event Indicator, Note Reading Ease Score, Note Grade Level Score, Build-on Note, and User Type, which were employed in the quantitative data analyses. These variables were used as indicators of note reading, note writing, and discussion thread development. They were developed to assist in determining the ways in which the three kinds of group discussions varied in online discussions.

Interviews
The instrument for the qualitative method was semi-structured interview questions. The time for each interview depended on the participant’s personal experience and their willingness to talk. Appendix F and Appendix G are interview questions for students and instructors. These interviews provided individual experiences of different group configurations in online teaching
or learning and personal opinions about different group configurations that elaborated and enhanced the quantitative data gathered (Gilgun, 1994).

Semi-structured interviews were conducted with a subsample of graduate students at the institute with online learning experiences. The sample was non-random (purposeful) and was selected to maximize variation. In addition, semi-structured interviews of online course instructors at the institute were carried out in order to understand their experiences of instructional design in group discussions and their teaching experiences in online conferencing. The interviews continued until saturation of the data was achieved.

3.5.2 Selection of Quantitative Data

According to Blaikie (2000), there are three types of data sources: primary (generated by the researcher), secondary (generated by another researcher), and tertiary (analyzed by another researcher). Data for the quantitative method in this study were the second type, secondary data. The quantitative datasets used in this study were based on the datasets extracted from the institute WebKF databases by a professor for one of his research project, which was approved by the University in July 2004 with reference number #12127. There are two forms of data: numbers or words (Blaikie, 2000). The form of the data produced from the quantitative method in this study was numerical, with numbers generated from quantitative data analyses.

Web Knowledge Forum (the software created to support Knowledge-Building theory) is developed by Professors Marlene Scardamalia and Carl Bereiter. It was originated as Computer-Supported Intentional Learning Environments (CSILE), an excellent example of CMC. It provides a platform under the control of learners (Shambaugh & Magliaro, 1997; Scardamalia & Bereiter, 2003; Yoon, 1999) within which knowledge building activities can occur and develop (Brett, 2001). The raw datasets were from courses delivered online using WebKF between 2003
winter and 2004 fall. I chose 25 graduate-level courses from the datasets, containing 341 students and 25 instructors. The 25 courses were divided into three groups:

- **Small Whole Class Group Configuration (10 courses):** In these courses, the class engaged in whole class discussions only. All of these classes contained between 5 and 14 students, plus an instructor.

- **Large Whole Class Group Configuration (10 courses):** These courses also engaged in whole class discussions only, but contained more than 16 students in each class, plus an instructor.

- **Large Whole Class with Subgroups Group Configuration (5 courses):** In these courses, students were divided into subgroups for discussions during certain weeks of the term. These classes contained more than 16 students in each class.

Table 1 presents class ID and class size information for each of the twenty five classes across the three group configurations. There were 29 variables in the raw data for each dataset. The datasets contained both numerical and classificatory variables. However, for a study of online discussions, it is important to identify the factors that are relevant to the analysis of differences and relationships. Quantitative data analyses in this study were based on a set of 14 variables (see Appendixes H) which were derived from the original 29 variables in the original 25 datasets with the help of software S-Plus. These 14 variables were designed to be useful in determining students’ and instructors’ practices in note reading and note writing.
Table 1

*Class Sizes (Number of students in each class plus one instructor) and Types of Classes*

<table>
<thead>
<tr>
<th>Small Configuration</th>
<th>Large Configuration</th>
<th>Group Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class ID</td>
<td>Class Size</td>
<td>Class ID</td>
</tr>
<tr>
<td>01</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>02</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>03</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>04</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>05</td>
<td>8</td>
<td>15</td>
</tr>
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<td>10</td>
<td>19</td>
</tr>
<tr>
<td>09</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>21</td>
</tr>
</tbody>
</table>

3.5.3 Qualitative Data Collecting and Processing Procedures

Table 2 presents background information about each of the 22 interviewees in the qualitative data. Figure 2 displays the qualitative data collecting and processing procedures. The procedures adopted the most popular data-collection method in qualitative studies: open-ended interviews (Johnson & Christensen, 2004). I used constant comparative method for the purpose of developing a theory based on the data to seek verification for hypotheses that emerge throughout the study (Mertens, 1998). I used grounded theory as a systematic procedure, because it was more likely to resemble the “reality” than was theory derived by putting together a series of concepts based on experience or solely through speculation (Strauss & Corbin, 1998a).
Table 2

Interviewees’ Online Experiences till the year 2006

<table>
<thead>
<tr>
<th>Instructors</th>
<th>Years Taught</th>
<th>Configuration</th>
<th>Students</th>
<th># Courses taken</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>7</td>
<td>Large</td>
<td>S1</td>
<td>7</td>
<td>All</td>
</tr>
<tr>
<td>I2</td>
<td>12</td>
<td>Large</td>
<td>S2</td>
<td>6</td>
<td>All</td>
</tr>
<tr>
<td>I3</td>
<td>16</td>
<td>All</td>
<td>S3</td>
<td>1</td>
<td>Large</td>
</tr>
<tr>
<td>I4</td>
<td>14</td>
<td>All</td>
<td>S4</td>
<td>2</td>
<td>Small/Group</td>
</tr>
<tr>
<td>I5</td>
<td>9</td>
<td>Group</td>
<td>S5</td>
<td>1</td>
<td>Group</td>
</tr>
<tr>
<td>I6</td>
<td>5</td>
<td>Small</td>
<td>S6</td>
<td>3</td>
<td>Large/Group</td>
</tr>
<tr>
<td>I7</td>
<td>1</td>
<td>Large</td>
<td>S7</td>
<td>8</td>
<td>All</td>
</tr>
<tr>
<td>I8</td>
<td>12</td>
<td>All</td>
<td>S8</td>
<td>5</td>
<td>Small</td>
</tr>
<tr>
<td>I9</td>
<td>12</td>
<td>Large/Small</td>
<td>S9</td>
<td>5</td>
<td>All</td>
</tr>
<tr>
<td>I10</td>
<td>15</td>
<td>All</td>
<td>S10</td>
<td>13</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S11</td>
<td>10</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S12</td>
<td>5</td>
<td>All</td>
</tr>
</tbody>
</table>

*Note.* I1 = Instructor 1. S1 = Student 1.

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Figure 2. Data collecting and processing procedures for qualitative data analysis.
The data collection process involves using multiple stages of data collection (e.g., a pilot study) and the refinement and interrelationship of categories of information (Strauss & Corbin, 1990). Data collection and analysis were performed simultaneously (Denzin & Lincoln, 1994). The Strauss and Corbin (1998b) method was chosen in that it explicitly outlined a series of steps to follow.

**3.6 Data Analyses**

The purpose of my mixed methods data analysis is (1) to reduce, transform, and organize the raw data to a form that permits inferences; (2) to assess relationships and patterns within the data sets; (3) to generate and validate interpretations, inferences, and conclusions of the research. Data analysis of this mixed methods study proceeded using Greene and Caracelli’s (1997) two approaches: parallel track analysis and cross track analysis. The parallel track analysis was adopted for data reduction, typology development (qualitizing or quantifying), and data transformation. The cross track analysis was adopted to compare, verify, and enhance results from parallel track analysis, given the initial complementary purpose of the study.

**3.6.1 Parallel Track Analysis: Data Reduction and Typology Development**

The first step in the parallel analysis of the mixed methods data was data reduction of a large volume of quantitative dataset from 25 online graduate courses and of a large dataset of 22 interviews (ranging from 20 to 80 minutes in length). Inductive analysis was applied to the qualitative data to derive categories and themes. Deductive analysis was employed to analyze quantitative variables. The parallel track analyses kept the deductive quantitative data analysis and inductive qualitative data analysis separate, but explained subtopics complementarily to each other. Accordingly, they are described separately below.
3.6.1.1 Quantitative Data Analysis

3.6.1.1.1 Data Sorting Procedures

Twenty-five online graduate-level courses delivered from winter 2003 to fall 2004 at the institute were chosen according to their class sizes and group configurations. The original datasets consisted of 463 participants (with 438 graduate students and 25 instructors) and 29 variables, such as Database ID, User ID, User Type, Gender, Date, Read/Save Indicator, Note ID, Note Owner, # of words in a note, Note Reading Ease Score, Note Grade Level Score, Buildon, and Author ID. Software S-Plus was used to sort the data, and a new dataset with 14 variables was created. All the guests, outsiders and those participants who did not finish the courses were excluded. The 366 participants (with 341 students and 25 instructors) in the new dataset were those who finished the courses and contributed to the course discussions regularly. The notes written before and after the course periods were also deleted. WebKF has an editing function which allows participants to edit a note more than once. In the new dataset a note written was a note written under one title, regardless of how many times it was edited. A note read was a note opened, regardless of whether it was read or not due to the impossibility to check whether a note was read or not after it was opened. The 14 variables in the new dataset were Class Type, Class ID, Participant ID, Participant Type, Gender, Total Number of Notes Written, Average Note Size, Notes Read, Average Size of Notes Read, Threads Initiated, Maximum Thread Length, Total Notes in Threads, Grade Level Score, and Reading Ease Score.

3.6.1.1.2 Statistical Power

Grinnell and Unrau (2005) have stated that the positivistic way of thinking in quantitative data analysis strives toward measurability, objectivity, the reducing of uncertainty, duplication, and the use of standardized procedures. In the quantitative data analysis, consideration was given to a number of issues central to ensuring maximum statistical power in the study. Consideration
was given to statistical power in order to minimize the risk of Type II errors (tests yielding non-significant results that are actually significant). With respect to effect size, it was expected that the greater the expected difference between the means of the 25 courses and the three group configurations, the greater the effect size. It was also expected that the smaller the variance within the population (the three kinds of groups), the greater the effect size, and the greater the effect size, the greater the statistical power. In the datasets, the three kinds of groups were expected to differ to at least a moderate extent. Another issue in maximizing the study’s statistical power related to sample size, where more subjects (courses and course participants) equal more power. A significance level of at least .05 was set. This is thought to sufficiently protect against Type I errors (incorrectly rejecting the null hypothesis). Two-tailed tests were used in the analysis, which means that more subjects were required in order to maximize the study’s power. The sample size of participants in 25 courses (341 students and 25 instructors) was thought to be large enough to produce effective statistical power. Data cleaning and checking were conducted first to ensure the quality of the dataset.

3.6.1.1.3 Statistical Design and Hypothesis Testing

A combination of descriptive and analytic statistical methods was used to help answer the first research question, “How did different class sizes and group configurations affect students’ and instructors’ participation in note reading and note writing?” The descriptive statistical analyses compared means, standard deviation, maximum, and minimum values of variables from the 25 course datasets concerning note reading and note writing practices. Pearson Correlation, one-way ANOVA, t-test, ANCOVA, and multiple regression analyses were employed to answer the following sub-questions:

Sub-question I: Is there a relationship between class size and participant note reading activity patterns?
Sub-question II: Is there a relationship between class size and participant note writing activity patterns?

Sub-question III: What is the impact of different group configurations and group structure (with subgroups / without subgroups) on participant note reading activity patterns?

Sub-question IV: What is the impact of different group configurations and group structure (with subgroups / without subgroups) on participant note writing activity patterns?

### 3.6.1.2 Qualitative Data Analysis

Denzin and Lincoln (1994) pointed out “Grounded theory is probably the most widely employed interpretive strategy in the social sciences today” (p. 204). Grounded theory, best defined as a research strategy, is to generate theory from data (Punch, 1998). When grounded theory is used, it is mainly because the researcher goes to the research literature and finds that little knowledge about this research topic exists (Grams, 2001; Corrine & Alan, 1992; Eisner, 1991). Grounded theory generates a theory when existing theories do not address the research problems. I aim to let theories emerge inductively from empirical data (Glaser & Strauss, 1967).

**Theoretical Guide for Qualitative Data Analysis**

The theoretical guide for qualitative data analysis follows the principles and practices that Tesch (1990) identified: (1) Analysis occurs throughout the data collection process. (2) The analysis process is systematic and comprehensive, but not rigid. (3) Data analysis includes reflective activities that result in a set of notes that record the analytic process, thus providing accountability. (4) The analysis process begins with reading all the data at once and then dividing the data into smaller, more meaningful units. (5) The data segments are organized into a system that is predominately derived from the data and the data analysis process is inductive. (6) The main analytic process is comparison of themes from data analyses. The researcher uses
comparison to build and refine categories, define conceptual similarities, find negative evidence, and discover patterns. (7) The categories are flexible and are modified as further data analysis occurs. (8) The data analysis is not mechanistic, so that the research findings can reflect participants’ perceptions on online learning under different group configurations. (9) The result of the analyses is a type of synthesis in the form of descriptive pictures, patterns, themes, emerging, categories, and eventually a substantive theory of group organization in online conferencing. The overall processes follow the constant comparative method from coding to memoing, to elaborating, to theoretical sorting, and to integrating.

The research data for the qualitative analyses were from open-ended semi-structured interviews. As Punch (1998) points out “Grounded theory analysis emphasizes the conceptualization of the data, and the generation of conceptually abstract categories grounded in the data” (p. 218). Grounded theory analysis of the qualitative data is a process of abstracting across two levels, first from data to first-order concepts (themes), and then from first-order concepts to higher-order concepts (theories) (Punch, 1998). Qualitative data analysis adopts a constant comparative method approach involving a constant interplay between the researcher, the data, and the developing theory (Johnson & Christensen, 2004).

**Coding** — Coding is the analytic process through which data are fractured, conceptualized, and integrated to form theories (Strauss & Corbin, 1998a). During the coding procedure, the researcher aims to build rather than test theory. The coding procedure provides the researcher with analytic tools for handling masses of raw data. It helps the researcher (as an analyst) consider alternative meanings of phenomena in data, be systematic, and creatively develop and relate the concepts that are the building blocks of theory (Strauss & Corbin, 1998b).
The researcher follows the three stages of grounded theory data analysis: open coding, axial coding, and selective coding (Strauss & Corbin, 1990).

Open Coding — In open coding, the researcher identifies concepts and discovers the properties and dimensions of the data through line-by-line analysis (Strauss & Corbin, 1998b). Open coding is the first stage in data analysis. This occurs after some initial data have been collected, and it involves examining the data and naming and categorizing discrete elements in the data. In other words, it is the process of labeling important words and phrases in the transcribed data. During this stage, the data are broken down into discrete parts, are closely examined, and are compared for similarities and differences. The researcher asks questions about the phenomena as reflected in the data. There are several ways of conducting open coding. One way is line-by-line analysis. Conducting line-by-line coding is especially important in the beginning of a study because it enables the researcher to generate categories quickly and to develop those categories through further sampling along dimensions of a category’s general properties (Strauss & Corbin, 1998b). Open coding constitutes a first level of conceptual analysis with the data. The researcher labels the data to generate conceptual categories for use in theory building and to expose theoretical possibilities in the data (Punch, 1998). The researcher is concerned with generating categories and their properties and then seeks to determine how categories vary dimensionally.

Axial Coding — The researcher moves to axial coding after open coding. “Axial” is intended to denote the idea of putting an axis through the data, where an axis (group configurations in this study) is the procedure which connects the categories identified in open coding. In axial coding, the researcher relates categories to their subcategories along the lines of their properties and dimensions to begin the process of reassembling data that are fractured
during open coding (Strauss & Corbin, 1998b). The researcher develops the concepts into categories (slightly more abstract concepts) and organizes the categories to see what kind of things (themes) the participants mentioned many times across the interviews. The researcher looks for possible relationships among the categories in the data to interrelate the substantive categories. The researcher also connects these categories and concept to form theoretical codes. By trusting the emergence of theoretical codes as the analysis proceeds, the researcher does not force the data. Instead, in axial coding the researcher allows the categories systematically to develop and link with subcategories (Strauss & Corbin, 1998a). It is the part of the analytic process in which the researcher puts the parts of the data identified and separated in open coding back together to make connections between categories (Mertens, 1998; Glaser, 1978).

**Selective Coding** — Selective coding is the third stage in grounded theory analysis. Punch (1998) states that “selective coding is aimed at developing the abstract, condensed, integrated and grounded picture of the data” (p. 217). It denotes the final step in analysis – the integration of concepts around a core category and the filling in of categories in need of further development and refinement. In selective coding, the researcher puts the finishing touches on the study to look for the story line (main idea) of the theory by reflecting on the data and the results that are produced during open coding and axial coding (Johnson & Christensen, 2004). It involves the process of selecting one, main core category (the story line) and relating the other categories to it. In this stage, the researcher seeks the core category and the story line (the descriptive narrative about this central phenomenon) (Punch, 1998). The researcher integrates and refines the theory by organizing categories around a central explanatory concept (Strauss & Corbin, 1998a).

**Qualitative Data Analysis Procedures**
One of the reasons for gathering qualitative data is to elaborate and enhance the research findings from the quantitative data analysis. Inductive analysis of qualitative data started with the sorting of transcripts and developing a coding scheme and a description using a sample transcript. This was followed by the coding and typology development of themes. I followed the theoretical guide and moved from a detailed, fine-grained analysis of the data (open coding) towards successively more general categories (axial coding), themes, and theories (selective coding). Memoing and diagramming began with initial analysis and continued throughout the research process (Strauss & Corbin, 1998b).

In the first stage, I initially read through text data from interviews, which is called open-coding. “The detailed line-by-line analysis is necessary at the beginning of a study to generate initial categories (with their properties and dimensions) and to suggest relationships among categories; a combination of open and axial coding” (Strauss & Corbin, 1998b, p. 57). I adopted Strauss and Corbin’s (1998b) ten major points about microanalysis strategies in the coding processes. I (1) allowed data to speak without adding researcher’s bias; (2) examined the specifics of data by looking at details; (3) “listened” closely to the interviewees’ interpretations line by line; (4) asked both general and specific questions; (5) understood that it is the data that are relevant to the research questions; (6) conceptualized and classified events, acts, and outcomes with software; (7) classified concepts according to their salient properties (similarities and differences); (8) developed concepts (categories) according to their various properties and dimensions drawn from the data; (9) made theoretical comparisons; and (10) identified variations in the patterns of note reading, note writing, and discussion thread development to be found in the data.
In the second stage (axial coding), I divided the text into segments of information (many segments of text), labeled the segments of information with codes (30 to 40 codes), and reduced the overlap and redundancy of codes (codes reduced to 20) into categories. I employed theoretical comparisons, an analytic tool, to stimulate thinking about properties and dimensions of categories (Strauss & Corbin, 1998b). The comparative technique used in this study was the flip-flop technique (Strauss & Corbin, 1998b). This indicated that a concept was turned “inside out” or “upside down” to obtain a different perspective on the event, object, or action / interaction. In other words, I looked at opposites or extremes to bring out significant properties (Strauss & Corbin, 1998b). This research also adopted Miles and Huberman’s (1994) 13 tactics for generating meaning. This involved noting patterns and themes of group organizations, seeking plausibility, clustering concepts and themes, making metaphors, counting similar events, making contrasts and comparisons of the three kinds of group configurations, partitioning variables, subsuming particulars into the general, factoring, noting relations between variables, finding intervening variables, building a logical chain of evidence, and making conceptual and theoretical coherence.

In the third stage, called “selective coding”, I collapsed codes from the data analyses into themes (codes reduced to 5 to 7 themes), layered the themes (using interconnected levels of themes), and interrelated themes (connected themes to display a chronology and sequence of events revealed from the data). This was an inductive process of narrowing data into a few themes around a central category. In this process, I selected specific data and disregarded other data that did not specifically provide evidence for the themes.
3.6.2 Cross Track Analysis: Data Comparison, Consolidation, and Substantiation

More integrative analyses were conducted using the outputs of the previous stage of parallel track analysis. Triangulation of results from the parallel track analysis was embedded in the complementary design. The goal of the cross track analysis was to synthesize results to provide a more holistic view of the research. The process was non-linear and iterative to allow comparison of qualitative data to quantitative data or vice versa. Comparisons of results from both methods were carried out throughout the cross track analysis procedure. I also combined quantitative and qualitative data sets into one consolidated data set representing a new enhanced and expanded set of data.

3.6.3 Software for both Quantitative and Qualitative Data Analyses

Strauss and Corbin (1998b) pointed out:

Computer-aided theories show two advantages in comparison to ordinary paper-and-pencil sketches of theories. First, their formal properties may be checked, and they may be formally described, in a logical language. Second, by a few mouse clicks, even the most abstract concept of a theory can be easily connected with all its indicators within the data, thus testing its groundedness. (p. 278)

Software programs for statistical analysis and for qualitative data analysis were used side by side for parallel and cross track analyses of mixed form data. As a researcher, I made use of the great convenience and efficiency of data handling with computer software. Some recent software has the capacity to incorporate quantitative data into a qualitative analysis and to transform qualitative coding and matrices into a format that allows statistical analysis (Bazeley, 2003). Software SPSS, S-Plus, Excel, N6, and Nvivo were used for both quantitative and qualitative data analyses, to take the advantage of modern technology tools for research data
analysis due to their robust ability to handle a variety of types of data for a mixed methods study in multiple ways.

3.7 Integration of Quantitative Method and Qualitative Method

The design of this dissertation research is complementary with triangulation embedded. So, the integration of the two methods happened at (1) the research question formation stage with each research question targeting to either quantitative or qualitative or both methods; (2) sampling stage with purposeful criterion sampling strategies for both methods; (3) data collection stage with the institute population as the target data collection draw pool; (4) data analysis stage with parallel track and cross-track analytic approaches; (5) data presentation stage with sessions to present research findings from both methods separately from different issues and topics and sessions of research findings from both methods under the overlapping issues and topics; (6) interpretation stage with interpretations of research findings from both methods integrated under several subtopics; and (7) mainly at discussion stage with discussions of research findings from both methods.

3.8 Internal and External Verifications

Creswell (1998) pointed out that researchers made use of multiple and different sources, methods, investigators, and theories to provide corroborating evidence and “typically, this process involves corroborating evidence from different sources to shed light on a theme or perspective” (p. 202). The role and purpose of the verification procedures in this dissertation study were to help readers understand why the research results of this study were believable, accurate, and ‘right’ (Creswell, 1998). Verifications for this mixed method study were planned and conducted with all possible methods to guarantee its reliability and validity. Methods used
for verification of this mixed method study were: triangulation, negative case analysis, peer review, member checks, and external audits.

3.9 Reliability and Validity

3.9.1 Reliability and Validity

Reliability and validity are vital elements of judging whether the findings from this study are true and have generalizability to other similar situations. According to Neuman (2003) and Clark-Carter (1997), reliability means dependability or consistency. It suggests that the same research finding from this study can be repeated or recurs under the identical or very similar conditions. Validity refers to how well an idea about reality from the research findings of this study “fits” with actual reality.

Webb, Campbell, Schwartz, and Sechrest (1966) pointed out the purpose of complementarity, “When a hypothesis can survive the confrontation of a series of complementary methods of testing, it contains a degree of validity unattainable by one tested within the more constricted framework of a single method” (p. 174). Triangulating data sources is a means for seeking convergence across qualitative and quantitative methods (Jick, 1979). In this study, complementarity and triangulation were adopted to guarantee and enhance the reliability and validity of research findings of this study (Erzberger & Kelle, 2003; Punch, 1998). The quantitative data of this study were from all terms (winter, summer and fall terms) during the years 2003 and 2004. This was to guarantee the stability reliability (across time) of the data collected. These 25 courses were chosen because they contained different kinds of online course group configurations: small whole class, large whole class, and large class with subgroups. The students and instructors in these 25 graduate level courses were from several disciplines\(^1\). These

\(^1\) Due to Ethical review principles, in the quantitative data, there is no way to find out the participants’ disciplines.
guaranteed representative reliability (across subpopulations and groups of people). To guarantee the reliability in qualitative phase of this research, all participants (both graduate students and instructors) were WebKF users. They were representatives of different disciplines and with different cultural backgrounds. Some of them were experts in online education. Data extracted from WebKF databases were thought to be similar to those that would be extracted from other online conferencing software.

3.9.2 Threats to Internal Validity of the Quantitative Analyses

Although every attempt was made to minimize threats to internal validity, there were a number of possible issues to consider. First, although the courses in each of the three kinds of groups were very similar, there were differences in the timing of the courses delivered. Winter and fall courses lasted 13 weeks. However, courses in the two summer terms lasted only six to eight weeks. It was possible that the number of weeks in different terms might affect the students’ participation. Secondly, different instructors had different instructional strategies and teaching styles. This might affect participation and generation of notes and threads in online courses. Thirdly, it was impossible to extract data within the large classes with subgroup discussions to find out during which weeks students were participating in subgroup discussions. As a result, it was impossible to compare the weeks with, and the weeks without, subgroup discussions to obtain more accurate research results. This might affect the accuracy of the data analyses. Finally, the potential problem for selection bias in the interviewees was considerable, given the lack of random selection.

These threats to internal validity were addressed in a number of ways. The issue of different lengths of weeks in different terms could not be avoided, but the total hours spent was the same for all courses. However, it was recognized that completing a course in 6 weeks versus
13 weeks might impact on the research results. If I wanted to examine all courses using these three group configurations delivered during those two years, this could not be avoided. On the contrary, this added to the diversity of courses in this study. The second potential problem, different teaching styles, was the result of the diversity of teaching strategies, but it produced results that were more generizable. The third problem, the weeks with subgroup discussions, could not be avoided because of ethics review restrictions and the techniques to extract data from WebKF databases. Lastly, the potential problem of selection bias in the interviewees was reduced by triangulation of methods in the study which provided useful validity checks. Participants with different backgrounds could add to the richness of diverse opinions to the study.

External validity was also a major consideration in the research design, because it was important that the results from the research be applicable beyond the dissertation itself. Ideally, the external validity would have been maximized through random sampling of all individuals in the population. In practice, however, this is not feasible due to ethical and logistical considerations. The courses chosen for statistical analysis were from one institute during two years, and the interviewees were volunteers from the institute. Although caution must be exercised in generalizing to other groups, the research findings did provide some indication of the broad utility of online group discussions.

### 3.10 Summary

This chapter has outlined the research questions, the rational for a mixed methods study, and the design of this mixed methods study. The sample and recruitment strategies are presented, along with an overview of statistical power and effect size. Data collection and data analysis procedures are discussed with details. Then, the integration of quantitative and qualitative methods is described according to where it happens. Also discussed in it are ethical
considerations, internal and external verifications, and threats to the study’s validity and reliability, along with the steps to minimize those threats. In general, this chapter has stated the research methodology which lays the groundwork for the presentation of the research findings in the following chapter, Chapter Four: Research Findings.
CHAPTER FOUR: RESEARCH FINDINGS

This chapter presents the research results in two sections. The first examines the relationship between class size and note-reading and note-writing. The second examines the experiences of participants in courses characterized by group configuration discussion: small whole-class groups, large whole-class groups, and large-class subgroups. Both sections contain findings from both quantitative and qualitative data analyses. I analyzed student and instructor data both separately and in combination. Students were labeled as S1-12 and Instructors as I1-10. The qualitative findings complemented the results from quantitative data analyses.

4.1 Class Size

4.1.1 Actual and Optimal Class Size

The actual class sizes range from six to 22 students (Table 1) from quantitative data and six to 25 from qualitative data. One dominant theme that emerged from the qualitative analyses was that classes having 15 to 20 students, or in that neighborhood, were considered “large” and somewhat less manageable. As one instructor remarked, “20 is very difficult if you don’t have any research assistant” (I4). Another instructor echoed, “18 to 20 is far too large a group for a single conversation. Some students might loaf…not participate or contribute. I thought that’s been well demonstrated that loafing and class size are directly related” (I8). A doctoral student agreed, “Once you get up to around 20 students, you can get into an information overload situation pretty easily. Certainly, the larger the class, the more the tendency to information overload” (S8). He pointed out the reason: “For graduate level, if the number of students reaches or is over 20, that’s a little bit frustrating because graduate students tend to write a little bit more” (S8). Information overload was experienced not only by students, but also by instructors.
One instructor said, “If a course is generating 2,000 or 3,000 notes, that’s a lot of reading, and then you have a lot of marking on top of that” (I10).

When asked to specify an ideal class size, instructors typically suggested about 12 to 15 students. “Based on the experience I had, 12 to 15, at the most 15 in my case, is defined as an ideal number in a class. You cannot provide students with efficient…, if you have 25,” said Instructor 4. He continued, “I feel there’s more synergy with classes around 12 or 15. I had classes of eight and six, and it’s pretty hard for the instructor to keep the momentum, to be sure that the students are online almost every day” (I4). Other instructors agreed. For instance, “I think a good class size is about 13. For the same reason, you need to have enough stimuli to make the thing go” (I3). “Fifteen is nice. I don’t want more than 15 because I am afraid if I have more than 15, it’s just too much work” (I9). A new online instructor also agreed, after her first online course, “My experience from this first time around is that 14 or 15 is manageable. It’s just between a small and a large class, on the cusped area, because then every student has a chance, not necessarily to respond to, to read all other students’ contributions” (I7).

Reflections from the students were similar to those of the instructors. Student 4 remarked:

About 15 is the maximum for me to really have a good sense of everyone, especially if I haven’t met any of these people before. It’s just easier to do if you are in a smaller class because as a graduate class you do not want to get any class bigger than 15. (S4)

Student 2, who was also teaching online undergraduate courses, detailed her experience:

Fourteen I think is an ideal number online. I would prefer to be in a class larger than five, but up to 12 to 14, an ideal number. People can get a sense of who other people are. They become friendly and start to challenge each other, not in a negative way, and discussion moves to a higher level. Smaller than that, you know, is just too cozy and the larger is too cold. So that’s my preference both as a student and as a teacher. (S2)
Some instructors wanted to set a limit at a size that they could manage. Instructor 9 insisted on taking 15 students as the maximum, saying “I don’t like more than 15 students and there is a waiting list to get in my courses.” Instructor 10 remarked:

I always kept my courses at 20. I will generally take up to 25. But that’s as far as I’ll go, and then I will work with subgroups. But I would prefer, even though with the work load, a class where I have 20 to 22. (I10)

4.1.2 Class Size and Note Reading

To answer Sub-question I — Is there a relationship between class size and participant reading activity patterns? — I first statistically examined participants’ note-reading practices in different sizes of classes; second, I analyzed the interviews about the participants’ reading practices.

4.1.2.1 Findings from Statistical Analyses

For the purposes of this study, I considered participants who “opened” a note on their computer screen to have “read” the note. Obviously, this is not an ideal metric, since students could open a note for viewing without fully reading it. However, this was a necessary limitation, since it was impossible to determine whether a student had actually “read” a particular note or not. The statistical analyses clearly revealed contours of differences in note reading in relation to class size. The total number of notes students read increased as class sizes increased (Table I 1 in Appendix I). However, the percentage of notes students read decreased from smaller classes to larger classes. Nevertheless, class size had less impact on the percentage of notes instructors read (82.29 percent on average, with 86.25 percent in large classes) than on the percentage of notes students read. As class size increased, instructors’ total reading load increased greatly, from a low of 217 to a high of 1955 notes in a class.
Pearson correlation analyses revealed significant positive correlations between class size and the total number of notes a student \((r = 0.777, p<0.001)\) or an instructor \((r = 0.902, p<0.001)\) read. This is not particularly surprising; one would expect participants in larger classes to read more messages. There was a significant negative correlation between class size and the percentage of notes a student read, \(r = – 0.801, p < .01\). However, the percentage of notes an instructor read was not significantly correlated with class size (Table I2, Appendix I; Figures 3-6 below).

**Figure 3.** Correlation between class size and total notes each student read.

**Figure 4** Correlation between class size and total notes each instructor read.

**Figure 5.** Correlation between class size and percentage of notes students read.

**Figure 6.** Correlation between class size and percentage of notes instructors read.

Based on class size, Pearson correlation analyses revealed a significant positive correlation between the total number of notes a student read and the total number of notes an
instructor read, $r = 0.929$, $p<0.01$. When an instructor read more notes as class size increased, a student in the class also tended to read more, or vice versa. However as class size increased, the percentage of notes a student read was not significantly correlated with the percentage of notes an instructor read (Table I3, Appendix I; Figures 7-8 below).

![Figure 7. Regress total notes a student read on total notes an instructor read.](image1)

![Figure 8. Regress percentage of notes a student read on percentage of notes an instructor read.](image2)

### 4.1.2.2 Findings from Qualitative Interviews

As one instructor stated, “Online reading is like listening in face-to-face classes. So, if you are not doing that, you are not participating” (I1). Graduate students understand that “In a graduate-level course, students are expected to do a lot of reading” (S1), “to post messages, read messages” (S7), and to “have deeper consensus discussions” (S3). Instructor 2 believed that “the people taking the courses want to learn about the topics and do benefit from reading each other’s.” Student 8 agreed, “Obviously the more students you get, assuming they all participate, the more information you are expected to read in the same amount of time.” As Student 3 put it, “You couldn’t just jump in the conversation. You have to read everything first before you could write.” As most instructors did, Instructor 9 was very strict with reading and set criteria to
“punish” those who did not read others’ notes, saying, “If I notice some don’t read, they get penalized for that. I have a set of criteria I use for evaluating online participation.”

However, the reading load in online courses exceeded the course reading materials in face-to-face classes, believed Instructor 7, “The reading load is the articles plus the notes.” All participants confirmed that information overload came from reading notes, especially in larger classes; as one instructor put it, “I think the workload issue is about reading notes. My sense is that students are reading, but they are reading very selectively by topic and by person” (I8). He went on, “A course that runs, let’s say, in a January term, will generate probably around 1,800 messages. One that is in the summer may be 1,400. The overload is reading notes. It’s not writing notes” (I8). These comments matched the decrease of percentage of notes read when class size increased (Table I1, Appendix I). Most students experienced the feeling that there was “a lot to read”. WebKF uses little red flags to mark unread notes. These red flags made some students feel nervous. Student 2 complained, “That used to make me crazy, seeing them. I had to look at them all.”

Student 12 only selected notes to read: “In the large class, I just focus on the topics I am interested in and ignore the others.” Instructor 8 noticed the same phenomenon: “My sense is that students are reading, but they are reading very selectively by topic and by person.” Student 3 noted, “There is a limit to how much students can do in terms of discussion without adequate time to do their own writing first.” Student 1 confirmed this: “People don’t want to read everything unless there is something that they are interested in or unless they are forced by the instructor — that it’s mandatory that they have to read every note.” Like most, Student 9 experienced reading overload in large classes, “It’s just too much to read, and it ended up with some just opening the notes without reading them.” In a large class, especially when students
logged on late in the week, they needed to read more to write their notes “because it gets longer to get to prove that something could contribute” (S3). So Student 3 felt frustrated and complained:

The stress of online course work for me was that I need to keep up all the time, because there is a lot to read, lots of synthesizes to think about, and to figure out if I have anything more to contribute. To avoid that, I needed to always be reading, constantly engaged. (S3)

Some instructors had reasons for putting all their students in one large discussion group. Instructor 1 mentioned that her reason for doing so was that she wanted her students to read every note that might contain important information. So, she did not want students limited to examining notes in their subgroup and ignoring those in other subgroups. She wanted them to learn more, as did the other instructors who ran large whole-class discussions. However, the quantitative data analyses suggested that their students did not read all or most of the notes (Table 11, Appendix I; Figures 3-5). One pioneer online instructor confirmed these findings, commenting on Instructor 1’s strategy:

Well, she is wrong. She might be right in that’s what she wants, but students find all kinds of strategies to deal with the setting in which they find themselves. So, if you have a thousand notes, probably most people are reading the titles and then just choosing the ones they want. (I3)

By doing that, students still missed some important notes. So, “when the number of notes that students have to read gets over a certain level, the reading goes down” (S8). This notion was supported by the findings from the statistical analyses (Figure 5). Student 4 identified class size as a factor that affected students’ reading as well, commenting:

I think what happens in large classes is that people tend not to read all the notes, even though they might show up as having read them. But I don’t think so. I think it’s harder for them maybe to hold that much information in their head without taking notes. (S4)

This unexpected situation might lead to a “disaster,” as Student 8 pointed out:
We know if you are going to work cooperatively or collaboratively, you need to know what the other people are talking about. So when you get a lot of postings, which has to happen in classes with a large number of students, reading level goes down and therefore the potential for cooperation and collaboration also decreases. (S8)

WebKF has a “Who has read this note?” function. Ideally, as one new online instructor thought “most of my students check WebKF everyday. That way they can keep up with it and they will save time when they respond” (I7). However, in a large class it was difficult for both students and instructors to open and check all notes and see who had read their notes; as student 2 confessed: “Who would check 2,000 notes if you get a large class?” Instructor 10 explained one main reason why students in large classes could not read all the notes:

For a large class, it depends too on who most of my students are. Most of my students are working full time. So they are doing this in the evenings and on weekends. If they go into the website and find 40 or 50 new notes from the last time, it becomes very, very difficult for them to sort of keep up with everything. If they do and if that caught their consciences and they are trying to keep up with everything, it becomes superficial. They just do a quick read and they don’t really get a chance to think about it. (I10)

Student 1 agreed:

Because I work full time, reading everything is time-consuming. Realistically, I don’t think anyone can read all the messages and remember the content in those messages within a period of time. I remember there are a number of students who work during the day and they do not have the time to do extensive reading. (S1)

Instructor 2 said, “I certainly have had students say there’s too much to read in this,” and tried to solve this problem: “I probably cut down the amount of the work in the course and the expectations for the discussions.” Instructor 7 said her requirement for reading ranged from 60 to 70 percent of the total notes written in her class. When I asked why she did not ask students to read all of the notes, she answered “because I thought it’s quite a huge number of notes, especially when we stayed with the 21 students at the beginning of the course. That would be my life’s total notes.” (I7) Some instructors let students choose the number of notes they could manage to read. Instructor 2 gave an example:
I can see it in the records that not everybody reads everybody’s notes. But they may be more selective in which ones they might read and respond to some. I guess I just permit them to make that decision on their own. (I2)

Instructor 8 suggested, “I think the optimal solution for that is to get students to make wise choices about what they read, rather than kind of yelling at them because they’re not reading.”

Some students had similar feelings; Student 3 recalled, “The easiest way to manage that is to always read every day, so that I cannot get behind. But over the course of the semester, that is pretty stressing.” Student 10, who took 13 online courses for his Masters and Doctoral programs, developed strategies to cope with this problem: “As time goes on, I log on more frequently and read a few notes every day, instead of trying to log on once a week and read everything. So, I’ve taken that approach.”

Information overload did not fall on students’ shoulders only; most instructors also agreed that reading notes was a lot of work. “That’s a lot of work. I spend a lot of time reading, but you see I am not spending class time,” complained Instructor 7, the new online instructor. In the statistic analysis, instructors read on average more than 82 percent of the total notes written (Table II, Appendix I); not all performed like the new instructor, who “read everybody’s contributions” (I7). However, it is impossible for students to check “Who has read this note?” all the time. As a result, some students felt that instructors were not reading their notes and complained about instructors’ neglect, even though the findings from the statistical analyses suggested the contrary.

4.1.3 Class Size and Note Writing

Note reading depends on note writing. To answer Sub-question II — Is there a relationship between class size and participant note-writing activity patterns? — I again first
statistically examined note-writing practices in different sizes of classes, and second interviewed instructors and students about their note-writing practices.

4.1.3.1 Findings from Statistical Analyses

For the purpose of this study, I counted a note “saved” as one note no matter how many times it was edited. The descriptive statistical analyses clearly demonstrated differences in note writing due to the impact of class size (Tables I4, I5, Appendix I). As class size increased, the total number of notes written increased, from 247 to 2194 (an exceptional high). The total number of notes written by students increased from 203 (fewest) to 2015 (most), and by instructors from 33 (fewest) to 461 (most). The average number of notes per student also increased from 25.60 to 125.94. Both students and instructors tended to write shorter, dialogic notes in larger classes. Notes by students in large classes had higher Reading Ease Scores (and conversely lower Grade Level Scores) and were thus easier to read. The percentage of notes instructors wrote on average decreased as class size increased, which indicated less voice from instructors in larger classes. However, notes by instructors showed no significant differences in note Reading Ease Score and Grade Level Score.

Pearson Correlation analyses revealed that class size was significantly correlated with the total number of notes by a student ($r = .498, p < .01$; Figure 9), the total number of notes by an instructor ($r = .554, p < .01$; Figure 10), and students’ average note size ($r = -0.613, p < .001$; Figure 11). However, there was no significant correlation between class size and instructors’ average note size. It is understandable that, when class size increased, students tended to write much shorter notes. Instructors also had to respond more (Table I6, Appendix I).

Pearson Correlation analyses also revealed that class size was significantly correlated with the students’ average note Reading Ease Score, $r = 0.517, p < .01$ (Figure 12), and Grade
Level Score, $r = -0.555, p < .01$ (Figure 13). However, there were no significant correlations between class size and instructors’ note Reading Ease Score and Grade Level Score. In other words, when class size increased, due to the amount of information, students tended to write simpler notes with fewer academic words, which were easier to both read and write. Instructors tended to write higher quality notes, even when class size increased (Table I6, Appendix I).

Figure 9. Correlation between class size and total notes by a student.

Figure 10. Correlation between class size and total notes by an instructor.

Figure 11. Correlation between class size and average note size by students.

Figure 12. Correlation between class size and note Reading Ease Score by students.
Based on class size, Pearson correlation analyses revealed a significant correlation between the total number of notes by students and the total number of notes by instructors \((r = .518, p<0.01; \text{Figure 14})\). This indicated a strong relationship between the number of notes students and instructors wrote. The analyses revealed that due to the increase of class size the average total number of notes by per student and their note size \((r = -.598, p<0.01; \text{Figure 15})\) were negatively correlated. The total number of notes by per instructor and their note size \((r = .407, p<0.05)\) were also negatively correlated.

**Figure 13.** Correlation between class size and note Grade Level Score by students.

**Figure 14.** Correlation between total notes by students and total notes by instructors.

**Figure 15.** Correlation between average total notes by per student and average note size by students.
When writing more in larger classes, both students and instructors tended to write shorter notes. As class size increased, the average total number of notes by per student and their note Reading Ease score \((r = .640, p<0.001)\) were positively correlated, while the average total number of notes by per student and their note Grade Level Score \((r = -.584, p<0.01)\) were negatively correlated (Figures 16-17). This confirmed again that when students wrote more in larger classes, they tended to write notes that were easier to read with fewer academic words.

**Figure 16.** Correlation between average total notes and Reading Ease Score by students.

**Figure 17.** Correlation between average total notes and Grade Level Score by students.

**Figure 18.** Correlation between note size and note Reading Ease Score by students.

**Figure 19.** Correlation between note size and note Grade Level Score by students.

Students’ note size and note Reading Ease Score \((r = -.647, p<0.001)\) were negatively correlated as class size increased (Figure 18), while students’ note size and Grade Level Score \((r = .759, p<0.001)\) were positively correlated as class size increased (Figure 19).
were positively correlated (Figure 19). In other words, when they wrote longer notes in smaller classes, students tended to use more academic words and to write more thoughtfully. However, as class size increased neither the Reading Ease Score nor the Grade Level Score of instructors’ notes correlated significantly with the total number of those notes. Instructors’ note size was not significantly correlated with their Reading Ease Score and Grade level Score either (Table I7, Appendix I).

To elaborate on Sub-question II, I deployed a series of Multiple Regression analyses, which yielded the following results: total notes per student read accounted for a significant proportion of the variance in the average total notes per student wrote ($R^2 = .767, F(1, 23) = 75.535, p < .001$); total notes per instructor read accounted for a significant proportion of the variance in the average total notes per instructor wrote ($R^2 = .322, F(1, 23) = 10.913, p < .01$). Class size accounted for a significant proportion of the variance in average total notes written by per student ($R^2$ change = .083, $F$ change (1, 22) = 12.188, $p < .01$), but not by an instructor ($R^2$ change = .009, $F$ change (1, 22) = .312, n.s.) over and above total notes read. Class size and total notes per student read together accounted for 85 percent of the variance of the average total notes per student wrote (Table I8, Appendix I). When class size increased, students and instructors tended to read more and thus tended to write more.

### 4.1.3.2 Findings from Qualitative Interviews

Instructors perceived that writing was essential for students’ learning, even more so than reading. Instructor 3 stressed: “The main learning in fact comes not in reading other people’s notes, but in having to construct your own ideas in your own notes.” Instructors expected their students to articulate their understanding of the topics or issues under discussion through “talking”, namely note writing (I2). Instructor 8 elaborated:
The reason I want them to talk is because of a belief in constructivist teaching and learning — that students learn by trying to articulate their understanding of the academic material and how it relates to their specific practical teaching assignment. In the process of articulating that and hearing what other people interpret them to be saying, I think that they, first of all, create some kind of collective understanding of the course, but also individual level understanding. So, people see ideas that haven’t occurred previously, see perhaps fallacies in their reasoning or gaps in their arguments that they can fill in, and come away with a much deeper understanding of why it is they do what they do, and optimally acquire some strategies they want to try out in their own classrooms. (I8)

Instructor 3 gave the reason why class size does matter in note writing: “Since I want everyone to write, then I have to make the group small enough that you are not assigned to read 50 notes a day. You know that’s just unreasonable.”

4.1.3.2.1 Quantity and Quality of Notes

If students learn more through note writing, it would seem a common-sense notion that the more notes students write, the more productive the class discussion and the more the students learn (I4). However, in large classes, competition for higher marks for participation also led to more prolific but less thoughtful notes; as Instructor 10 mentioned, “There are always students who will write a lot of notes, but they don’t always say very much.” Instructor 2 provided an example:

I can think of one person that would be sending messages maybe seven or eight a day with only one line, and they were not very thoughtful. I would suggest and write her ‘Perhaps you can make a smaller number and have more thoughtful and edited ideas.’ (I2)

Student 5 also noticed that some students wrote notes just for participation marks:

Sometimes that’s what you attempted to do. That’s what I noticed that other people are doing as well. They put in all these resources just to make an impression on the professor, to show the professor they did this wonderful research and provided all these references. When you go in, you become very disheartened because you think ‘Oh my God, I haven’t worked that hard.’ You’re also put off because you are also given marks for your contributions, and that’s the other thing in the back of your mind as well. (S5)
New online learners might not know how to respond to others’ notes and would worry about how to respond to every note or get responses to all their own notes, especially when they were concerned about their participation mark in a large class. To reduce information overload, Instructor 9 set limits on the number of notes that students were allowed to write.

There is a limit for their initial response. If students go over, I have to let them know they have gone over, because it’s not fair. I make a general statement to tell everyone be sure that you stand by the limits. (I9)

However, sometimes “It’s not only the number of notes, it’s also the length of notes that causes information overload, because it has to do with the time it takes to read a note”, Student 8 pointed out. As a very active student in his first online course, he became aware that his frequent long contributions had the potential to frustrate his classmates, as he now admitted:

Certainly, inexperienced people making very long postings can be frustrating. I can’t complain too much about that, however, as I’ve been guilty of it myself when I was a newbie in online classes. Every posting gets to be like a mini-essay. (S8)

He described his feeling of reading good notes: “If the notes are shorter and come to the point, that’s Ok, even though you have 80 notes to read. But if the notes are longer and are off topic, you feel frustrated” (S8). From his experience, he felt that:

People inexperienced with online classes tend to write more, and cover many things in one posting where they should have made more than one posting and keep it shorter. It goes to information overload and a few other things if everyone is writing very lengthy notes. (S8)

As for the proper length of a note, he felt that one screen in length was efficient as he explained: “More experienced students tend to keep their postings to about one screen in length, because it’s easier to read and it’s not so disheartening when you may not have a lot of time.”

Due to the fewer number of notes in a small class, students might find it manageable to read all or most notes posted (I6). However, in a large class, it becomes more important to notice
the rules for writing good notes of proper length and keeping them on topic (e.g. I2, S8). This leads to better quality of notes.

Instructor 1 pointed out what most instructors were looking for in students’ notes:
I’d rather they didn’t write a note one week, and then when they did write, they would spend some time reading and the stuff they post is of some use and of some quality. I’d rather my students write less, but to the points than just finish the number of notes. (I1)

Student 8 felt that “Discussions are helped by short to-the-point notes”. Irrelevant notes added to information overload in large classes, as Instructor 8 noticed: “In every course, there are some folks who are hard to understand, and there are folks that tend not to make a whole lot of sense. You can tell because people don’t respond to their posts.” Students also “can write nonsense notes or notes that don’t mean anything,” Instructor 3 pointed out. Instructor 4 deleted notes that did not contain a substantial message to reduce information overload, saying “It has to be a substantial message. For example, if the students just say ‘Oh, I agree with Mr. A.’ or ‘It’s great what you just said’, I delete that message automatically.” Another instructor explained how he assessed students’ notes:
If you take a person who writes a lot of boastful notes and another person who only writes one or two, but has put a lot of thought into it and advances the discussion, there is difference to me in the value of what they have done. (I10)

So instructors had to set some rules to guarantee the quantity and quality of notes. One instructor said, “Just in my experience, if you didn’t have contribution rules, four or five students would contribute and everyone else will just read” (I3). Student 8 mentioned that one of his instructors had given his students four rules for posting notes (one screen in length, one point, focused, and polite). Some instructors created participation guides or rubrics for note writing. Instructor 8 said that “the rubric that I have for class participation has elements of frequency and quality of contribution. People take those rubrics seriously and are guided by them.” In his rubric, he made his requirements clear: “There are some things that I have done to ensure the quality of
the discussions. The most important has been to be very clear about how frequently one should come in, what one should talk about, and especially word limits” (I8). Student 8 suggested that instructors should provide examples of good and bad notes, saying:

Were I teaching an online course, I would provide a sample of good postings and bad postings regarding all of those things. So I wrote a long, rambling off-topic note and gave it as an example of bad postings and a short concise note as an example of good postings. (S8)

Some instructors felt that the highest quality notes were well-composed convergent or summary notes. Instructor 8 explained:

One of the aspects of quality is the notion of trying to integrate the comments of different messages into a coherent theme, as supposed to responding to individual posts. I think that’s something that students really struggle with. They find it difficult enough to relate it one person. But to pull out a common element from several different messages is what distinguishes the highest from the lowest performers. (I8)

4.1.3.2.2 Instructors’ Responses to Notes

The quantitative analysis also suggested that when class size increased, the total number of notes written by instructors increased greatly. When instructors wrote more notes, students in the class also tended to write more, or, when students wrote more, instructors responded more, especially in larger classes. So, “the instructor affects what’s going on by their participation” (I3). Several student interviewees complained that their instructors disappeared during certain weeks or did not participate enough, especially in small classes. Student 11 said, “The problem in the course is not the number of the students, but the absence of the instructor from the course. For a while the instructor just disappeared. He wasn’t there for a month.” Student 10 experienced the same problem: “It was definitely the instructor, because he only posted about four times in the entire course. It was a very absent prof.” Student 3 also felt that the instructor did not contribute
enough. She expressed her idea of what instructors should do, “I think that it would be good to have instructors teach, because they are instructors, not just facilitators.”

The complaints came not only from small classes but also from large classes with subgroup discussions. Student 2 tried to give some reasons for her complaints:

Sometimes, the instructors think, ‘In small groups there’s less work, because I do not have to participate.’ They split the whole class up to small groups one week, and that’s the week they’re going to Cuba. Or, that’s going to be a busy week; they are marking the assignment from the previous week. So, they can just blow off doing the leading or participating in the discussions. (S2)

Instructors, Student 2 argued, “need to be there and need to be seen being there.” Conversely, the quantitative analysis found only one instructor who did not read and respond enough. On average, instructors read more than 82 percent of notes and contributed more than students did in all sizes of classes. Instructor 10, who had taught online for more than 14 years, still found it difficult to figure out how often instructors needed to respond, arguing “It’s always difficult to know when they want to hear from you and when they don’t.” Another instructor explained, “I found that the instructor can talk too much, so there is a fine balance in modeling a kind of interaction that I want to have happening” (I8). Student 8’s sense of instructors’ participation was closer to these instructors’ view: “The instructors would generally take a hands-off approach to the discourse as long as it was going well. Sometimes they would post if the discussion was going off track, or if they felt that a student was not contributing appropriately.” In addition, most instructors did in fact participate in or supervise subgroup discussions, as Student 10 said:

They will make the occasional contribution, particularly if a topic came up where they felt they could. The professor contributed when he felt that there was something we might want to go and read, or if there was a particular aspect of research that we were touching on. (S10)
Most instructors participated regularly. Instructor 8 remarked, “I try to go on every day and I try to post a message every day. Sometimes I do more than that.” The new online instructor (I7) participated very actively in her large class:

I started the discussion with some questions I prepared. As soon as somebody responded, I responded to them and asked for questions. I gave more information. I found that got the students going. I found the more I participated, the more everybody else participated too. (I7)

However, this approach had its limits, she said:

The concern I do have is some students didn’t receive very many notes from other students. That’s one thing I would like to change. If they didn’t receive any response from me, they didn’t receive any response from anybody. That was one thing I wasn’t satisfied. (I7)

When asked “If you contribute more, will students follow you?” she answered:

They respond to me. I think they also felt more of obligation to respond to me than they did to respond to their peers. So if I wrote something back to them, they felt that they need to write something back to me. (I7)

Instructor 10 described a problem he experienced in responding students when he first started teaching online 15 years ago:

I made a basic mistake. I tried to respond to every note that students wrote, figuring that they need that kind of reinforcement. A whole bunch of things happened on one spoon that wore me out. I found that so much from me would stop them; they were waiting for me to tell them all the answers. (I10)

Even Student 2 thought instructors need not respond to every note: “That’s stifling. Just like the face-to-face class, if you respond to every thing students said, other people won’t have enough opportunity to connect.” Instructor 3 summed up the basic dilemma: “Students would prefer, in almost all research we had, instructors to write more. But if instructors write too many notes, then it stops the discussion.” Instructor 9 agreed: “If instructors write too much to individuals, it stymies the conversation. If I do that in the midst of the conversation, it puts an end to the conversation.” Instructor 6 waited to deal with students’ notes in her small class,
allowing students to respond to each other until one of them raised a point about which she had a comment or an issue to address. Instructor 10 participated in the discussion like a student to find out what was going on. Instructor 5 said: “At the beginning of the course, I write more. As the course goes on, then I tend to comment only when I feel that I can really make a difference.” Student 9 described how her instructor responded to notes in subgroup discussions, “Initially, he was responding to a lot of the questions, but then slowly, he started to fade away and the group just started to teach each other the ideas.” The nature of instructors’ response also matters, as Instructor 3 pointed out:

I think to some extent it probably has more to do with the nature of the instructor’s answer than how many. If I just answer back to you, that would stop the discussion. If I say, ‘What do some of the rest of us think about this?’ that more likely would encourage the discussion to go on. (I3)

Student 8 preferred what his instructor in one course did to provide a “weaving message”. The instructor “would take excerpts from various notes and weave them into a narrative summarizing the week’s discourse”. Student 10 discovered that instructors’ summary notes at the end of the week helped him a lot in understanding what had been discussed during the week, commenting:

In the course I have seen that the professor has posted the summary at the end of it. The most valuable experiences have been one that instructors have summarized all of the conversations at the end of the week from different groups, and have been able to say: ‘Here are the themes that have been emerged, and here is how it fits with the research’. (S10)

Instructor 8 tried to get the last word and bridge into the next week and “certainly encourage strands that are going in the right direction”. Some instructors would take abstracts from various notes, and let students recap the key points in the discourse (S10). Student 8 noticed that “If you have a large class divided into subgroups, instructors would have to do four or five summaries, not just one. So it may not always be possible to do that for reasons of time.” Instead of writing
summary notes himself, Instructor 9 assigned students to summarize. Student 10 worried that “the problem is if you have several groups, the students are only responsible for their subgroups. Instructors have got the overall picture.”

4.1.3.2.3 Instructors’ Assessment of Note Writing

Instructor 8 pointed out the important role assessment played in encouraging and guiding students’ note-writing: “In my sense, student assessment has a powerful steering effect. It has a great impact on how people interact.” The interview data showed that some instructors assessed students’ note writing by quantity, some argued that they did it by quality, and some tried to balance both. How students and instructors sensed these ways of note writing assessment were different based on class size and their experiences.

By Quantity

Some instructors required students to write a certain number of notes each week. They “counted the number of notes students wrote and gave a specific grade for that” (I8). Instructor 9 stated, “I say at least three secondary notes each week. If they do more than three secondary notes, I am not going to penalize them for that” (I9). Some instructors set “the basic requirement” (I4) for how many notes a student should have written each week. For example Instructor 4 required “two notes every week for each student…which will normally vary from 20 to 25 percent of the final mark” (I4). However, his requirement varied with schedule and class size:

I would normally vary that requirement depending on the class size sometimes. For example, this summer I had a summer course. There was six weeks instead of twelve weeks. So I adjusted from two messages to four a week. If I get 15 students, I will bring it down to three. So I try to play it by ear. (I4)

His 16 years’ online teaching experience had convinced Instructor 3 that “requiring a certain number of notes is the very basic strategy for participation.” He emphasized that “If I did
not assign a number of notes for participation, I might have students who contribute none.” He elaborated:

….the grade depended on how many they contributed, generally two or three. That’s because if you ask for more, you get less thoughtful ones... If you didn’t have contribution rules or you didn’t try to manage the situation like that, what you will have is what you see online in an e-mail list or some things, four or five students would contribute and everyone else will just read. (I3)

He admitted that asking students to write a certain number of notes each week for their participation grade was a necessary but not sufficient assessment:

They can write nonsense notes or notes that don’t do anything. But I do know that I saw such a requirement as an attempt on my part to let students know what would be expected of them, what would be a good citizen in the course. (I3)

Several other instructors set two to three notes per week as the required number. For instance, Instructor 2 suggested students “try to make two or three contributions per week.” Similarly, Instructor 7 said, “I set two to three times for a block is the minimum.” Instructor 10 told students that, “I expect them to log on a minimum of three times a week, and they will contribute to the discussion at least two of those times.” Instructor 9 only set a limit for the first note; because that was the only one he marked. He said, “There is a limit for their initial response. I don’t really set the limit for the second.” Instructor 8 allowed flexibility in the requirement: “I asked them to produce one or two. In fact, the norm is around six. It depends on when the courses are offered.” Instructor 6 set a response requirement: “I asked the students to react to at least four of their classmates. I don’t expect every student to react to every piece of work that’s posted.” Student 2 assumed that requiring a certain number of notes for participation marks probably happened more in larger classes.

I would suspect probably it would be more common in a large class, because when you think about it realistically both as a teacher and as a student, it’s really hard. You can’t keep in the back of your mind who is doing the quality postings. So, when you think back at the end of the course, it’s likely the quantity is sticking in your head. (S2)
However, when asked to post a certain number of notes each week, some students did feel uncomfortable. For instance, Student 12 reacted: “I think that’s not comfortable, because sometimes I really don’t know what to say.” However, he also admitted that requiring a certain number of notes for participation was necessary.

Although I feel uncomfortable when the instructor asks the students to post a minimum number of notes, I think it is necessary. I think that is the best way and the only effective way to get the students to really participate in the course, or at least read the course readings. If they don’t make that kind of requirement, I think maybe one week if I am busy I will not do anything, not even read the course reading materials. (S12)

However, Instructors 5 and 9 argued against the minimum-notes assessment: “I don’t really like that method very much,” (I5) “because if they work for the number of notes, they just write garbage” (I9). Likewise, Student 11 argued assessment should measure “the content of the notes, not the number.”

**By Quality**

Instructor 5 was more concerned with quality of notes than quantity: “I am aware of quantitative as well, but it is quality that’s important to me. I am influenced very much by how articulate someone is, whether they are able to capture their ideas and put them online.”

Instructor 10 felt the same: “I stress with my students that I look for the quality rather than quantity.” Although Instructor 9 required students to contribute a certain number of notes a week, he would only assess at the first response; his assessment was “more on quality”. He said: “I look at the quality of their responses.” Instructor 1’s participation mark was totally based on quality. She said “I don’t have a required number of notes, because I don’t want them to do that.” She’d rather her students not write a note a week, but when they write, write meaningfully. Student 11 agreed with this viewpoint: “You are not interested in my number of words, not in the number of my notes, but in my ideas, in what I really think.” Instructor 10 added:
There are always students who will write a lot of notes, but they don’t always say very much. If you take a person who writes a lot of boast notes and another person who only writes one or two, but has put a lot of thought into it and advances the discussion, there is difference for me in the value of what they have done. So I don’t assign a certain number of notes, and I tell them I watch for the quality. (I10)

Instructor 4 felt that “Online teaching was more objective with the pitfall of not knowing the students well enough to evaluate them.” He realized: “Students can copy, cut and paste and get a message for participation. You as an instructor have to make sure that doesn’t happen. If that happens, you have to take proper measures.”

**By both Quantity and Quality**

Most instructors assessed students’ notes by both quantity and quality. Instructor 8 gave a specific grade for note writing. He emphasized: “One of the considerations is quantity. Beyond two doesn’t help you in the slightest; really the rubric is heavily oriented toward the quality of the contribution.” Instructor 2 strongly supported using both quantitative and qualitative assessment:

I set up the minimum standard that people contribute. I try to encourage better quality contributions rather than just the sheer number of contributions. It’s more important to make thoughtful, interesting, unique statements that demonstrate learning and help people learn than to just keep firing off simple messages to other people. (I2)

Instructor 5 used a variety ways to assess students note writing. Her reason was:

I try to measure a student’s accomplishments in a variety of ways, not just how many notes, and not just the quality in some respects, at least when it comes to English, because I think that you can be a good communicator without being perfect in English. (I5)

Most students agreed that quality requirements for notes would reduce information overload, especially in larger classes. As to how assessment of note writing related to class size, Instructor 3 made a supportive conclusion:

I think I came from another way round … I figure that students and I have a responsibility as citizens in the class to help make it go as well as it can. If it was a smaller class, to be a good citizen you might have to contribute more to make it go.
Whereas if you were in a larger class, being a good citizen in that case would be trying to write summary notes or things that help people understand the discussion. So there might be different kinds and probably I would be explicit about what I would value each of those situations. (I3)

**4.2 Group Configuration**

Most instructors and students believed that dividing students into subgroups is “a very effective strategy in online teaching” (I10). Some instructors used subgroup discussions to reduce information overload due to large class size. In Instructor 8’s words: “I think group size is not related to anything important except workload. I think there’s huge importance for workload.” “If groups are threaded through a course, having a week with full group (whole class), having a week where it is small groups, you can actually use it to reduce the workload,” agreed Student 10. However, Instructor 10 pointed out another important purpose for subgroup discussions: “I think you can arrange it so that people get that opportunity to make individual and group interactions. My main purpose is to give people opportunities to exchange ideas, and people won’t do that in a large group unless you create smaller group opportunities.”

**4.2.1. Number of Groups and Group Size**

It was impossible to find out the number of subgroups and the weeks of subgroup discussions in the five large classes with subgroup discussions, due to the limited sample, ethics review issues, and software parameters. I used the qualitative interview data to find the number of groups and the group sizes. Instructor 3 felt that “Really small classes, with like six people, would just stay as a group of six.” Instructor 5 thought that more than eight or nine students were too many for one group. In her classes, “even of eight, there were two groups, four in each.” (I5). Instructor 8 echoed Instructor 5, “I think nine is too large a class. I divided them into subgroups.” The interview data revealed that the number of groups in the large classes ranged from two to
five depending on how many students a class had and what the tasks were (I4); group size also varied accordingly. One instructor adopted a two-group configuration for debate. Another instructor used the Chinese five elements “Earth, Wood, Water, Fire, and Gold” to form a five-group configuration with four students in each group. Some classes had four groups of five students. Others had three groups of seven or eight students in each. One instructor divided a 10-student class into two groups of five. Some instructors broke their classes into groups of three or four students.

Most instructors preferred a group of four or five students. Instructor 3 said, “Four or five is best.” As for the number of groups, “as the classes got bigger, then, there were generally more new groups” (I3). Instructor 5 insisted:

Four is the ideal number. Four is more balanced, more harmonious, possibly. If four are on a team, even if one person doesn’t come through, three can carry the weight. For more than four, it becomes incrementally more difficult for group cohesion and communication, and there is always a chance of someone feeling left out, or someone taking over because of the difficulty of keeping so many people in line. So, often the dominant players will come forward and can in fact bully their groups. (I5)

Another instructor preferred three to four in a group:

I think the optimal group size is probably three to four. I won’t have more than four. If you have too many people, they just loaf. They let other guys do all the work, and don’t have the opportunity to get in themselves. So, I decided that I no longer have groups of two and that groups will be three or four. (I8)

However, in some instructors’ experiences, a group of three did not work. Instructor 5 noticed that “Three always causes tension.” Instructor 3 added, “Some groups with three people won’t work really well, but the problem is, I think, just too few. I think three is pretty small, and actually the small group research indicates that three is a particularly nasty kind of group”.

Instructor 2 tried a group of three and his reflection on this experience was that “A group of three
I haven’t done recently, because it didn’t work out so well. Usually, one person is lazy and makes the other two feel bad. I find pairs tend to work better” (I2).

Some instructors and students preferred a group that was a little larger for diversity. In Student 5’s words, “Personally, I prefer larger groups, maybe a group of more than five, I would say at least, to have a fruitful diversity and build-on points.” Instructor 10 confirmed this:

I like six to eight. If you work with smaller groups, it’s far less critical, because for them every group is about six to eight people. So it does matter how many in a class. It’s just that I get chance to meet more people if there’s a bigger class… Their ideas of how big this class doesn’t seem as important because their immediate group is always the same size. (I10)

The most important point about group size arising from the interview data was that ideal group size depended on group stimuli. As Instructor 3 put it:

The problem with online teaching is if the students sign on and there is nothing to read, then pretty soon the discussion just stops. So, there’s got to be enough stimuli so that every time there is something for you to read, you want to participate. (I3)

Not the size of the group but “the stimuli” (I 2, I3) or “the energy” got the discussion ball rolling:

There is what I call energy. It’s what gets them going and starts them thinking. If you’ve got six to eight students, somebody will start. They all say something that will trigger something in somebody else, who will think about some stuff and come back. And pretty soon, you’ve got that energy going and they are kind of feeding of one another. If it’s too small, there’s not that much energy going into it. (I10)

**4.2.2 Instructors’ Strategies to Divide Subgroups**

Various ways of dividing classes into subgroups emerged as a theme. The most important consideration was “Does the course give a reason why you need the split, and how you are going to split?” as Student 10 pointed out. Instructor 3 stressed the importance of group configuration: “Probably the most predominant teaching method in adult education is dividing people into small groups; how to do it was more important at the beginning of my career, because at the beginning people really didn’t know what to do” (I3). He thought that ideally group configurations “are
designed to expand people’s thinking.” Student 8 felt that instructors’ online teaching experiences played a key role in the choice of strategies to divide subgroups, stating “I was very lucky in that the instructors I had were all very experienced online instructors. They knew what to do and they did it” (S8). Instructors had a repertoire of ways to divide classes into subgroups.

**Assigning Students to Subgroups**

Most instructors assigned students into subgroups. “They would post the names of the students in each group” (S7). Student 2 said, “In most cases, we were assigned, and I think that’s a good idea.” Instructor 10 stated, “I assign them. I make up all the groups. I definitely form the groups.” His reasoned that if students chose groups, “some people will be left till the very end, and they never get chosen. We used to call it ‘Baseball Central’. I don’t want that to happen in my class” (I10). Instructor 3 remarked, “Early on, I tried ‘We are going to have 5 groups, and you choose’ and it had several bad effects. I didn’t do it much.” Student 10 supported this argument by his experience:

The groups were always assigned. I haven’t seen the element of choice used, and I don’t know whether or not it would be beneficial, because there isn’t a whole lot of time for online students to get to know each other. Without knowing that, it’s not for me to decide whether or not there is an optimal strategy for picking subgroups. (S10)

Student 5 also preferred to be assigned to a group:

I would much prefer that the instructor chooses and puts us into groups rather than we choose which we want to be in, because if we choose who we want to be with, then we probably have chosen people who are in line to our thinking; and sometimes that’s not helpful, because it doesn’t push us to think further than what we already know. (S5)

Some Instructors only assigned students to groups after they got to know their students through their postings. Instructor 4 mentioned, “I wait till I get to know my students through their posts.” Student 8 had an instructor who “asked a question of educational theory and grouped the students who are most alike in their responses to the question on that continuum.”
Instructor 8 asked students for their three top preferences before he assigned them to groups. Other students confirmed this selectivity. Student 6 reflected, “Instructors assigned the groups and I don’t think it’s random. I think it was based on how many responses students did, who is dominating, the different ideas, maybe on biographies that we have done at the beginning.” Student 8 felt that his instructor “divided the class based on their pedagogical orientation.”

Student 2 pointed out the importance of knowing students before assigning them to subgroups: “Instructors have to work harder to know their students first to do better grouping, and I bet most of the online teachers don’t do that. They will just pull the names out of their hats.” She pointed out the pitfalls of “arbitrarily putting students into certain groups, because groupwork can be very painful” (S2).

Allowing Students Choose Their Groups

Instructor 1 had the same problem: “if you try to assign people to groups, their participation is determined by their own life circumstances. You have to know them intimately, which you don’t as an online instructor. Then, it’s not going to work.” Student 11 argued, “I don’t really like to have assigned partners and I had an awful experience.” Student 2 reasoned, “People always want to work with the people that they are comfortable working with.” Student 1 agreed, “There is a time you don’t like to be assigned to specific groups; because of the personalities, you don’t feel like contributing.” Instructor 5 let students choose their groups, remarking “I let them choose. I let them self select, but I suggest how many should be in a group.” Student 10 said, “We have self-picked groups.” Student 4 argued, “It’s nice if you can form a group. You can form a group with others based on interest. That’s more motivating for sure.” Student 9’s experience led her to agree, “We decided to form our own group to work with each other. We worked with the students we chose. We will be motivated and interested to work
with people we choose.” Some instructors allow students choose their groups by giving groups different names. Student 8 noticed “another unique touch was the naming of the groups” in his class. His instructor named groups after flowers “so that there would be no sense of preference for an orientation as might happen in numbers or letters used”. One instructor used colors. Instructor 5 used the Chinese schema of the Five Elements (Earth, Wood, Water, Fire, and Gold) to name the five groups in her courses.

However, Instructor 4 opposed letting students choose, “I tried it, and then they go madly off in all directions. The problem with online teaching is that it takes a while to correct the mistake or to get back on track.” Instructor 3 averred that “In the earlier days, because the adult education way was ‘let people choose’. I always let people choose. However, that didn’t work very well.” When asked whether assignment or students’ choosing worked better, Student 8 reasoned:

If all things are equal and you are living in a near-perfect world, allowing students to choose their own groups around topics of interest is preferable and assigning them to things they might not care about might be a disaster. However, I can see instances in a large class where you could get everybody clustered around one or two topics and no one covering others. In such a case, you might say I am going to have to assign you to work on this. Ideally, you let them choose based on their own interests. Sometimes that won’t work. (S8)

Instructor 3 made an important remark on the proper time to let students choose. “At the end of the course, in that case you could choose because you also know us already” (I3).

**Combining Both or Using Multiple Methods**

Many instructors combined assignment with students’ choices of groups. Instructor 8 said, “You’d better combine these two to have even number of students in each group.” Instructor 3 mixed the two methods:

What I did do in the last four or five years, that worked pretty well, is that I might have in fact a series of four different kinds of groups over the course. I will put people randomly
into one, and I will mix them together and randomly put them into another one, and mix them up randomly and then I might let them choose, because I know them each other more at this point and they also know each other. (I3)

Student 2 sensed that “For discussions, you can assign them, but for assignments, you’d better let them choose.” Student 12 liked the way his instructor divided groups with multiple methods, saying:

He used a lot of different methods to divide the groups. Sometimes, he gave you the topics and asked you to select one. Sometimes he assigned you to a group. Sometimes he just asked you to join in any group you liked. He changed the members of the group, switched them from group to group. As a student, I like to go to a group that I can talk or the topic interests me. (S12)

**Basing on Topics, Goals, or Course Contents**

Instructor 3 thought that “both the academic topics and the learning goals are important to consider” when dividing students into subgroups. He explained: “If the topic is one where everyone should be learning the same set of skills, then you will be creating groups that focus on that.” Otherwise, “if the importance of the topic is to expend and broaden people’s reading, then you would mix structures that would focus on that” (I3). “It’s up to what you want the students to do,” Student 2 added. In other words, “It just depends on what your goals are” (S4). Instructor 4 felt that “Some topics are more easily discussed in the small group than in the large class.”

“For group discussions, the groups could be divided according to topic interest,” Student 7 suggested. Instructor 4 said, “If the groups aren’t selected according to interests, then it poses of a little bit of challenge.” Some instructors divided groups or let students choose groups by discussion topics they liked. Like most students, Student 5 preferred this method, saying “that was really good.” Student 12 described the method his instructor used, “If he let the students choose the group, normally it depends on the topic, but not on the group members.” Instructor 3
said, “I might, as a week’s work, divide them up with topics, but the activities were likely going in parallel.”

**Mixing Different Characters, Skills, Professions, or Gender**

Instructor 3 pointed out a problem when using a single criterion to divide groups. “The times when we had real problems were when there were mixtures of students with different expectations” (I3). One method he utilized was to mix students with different expectations and skills:

One of the things I did in that course that worked out well was I gave out a questionnaire on the first day of the class about people’s skills. I made the groups up so they had the same number of resources. So that even though the small group was there, it still had at least ostensibly the same kinds of resources as the whole class. I attempted to make the groups homogeneous as much as possible. (I3)

Instructor 10 assigned students by the mixing their professions:

Sometimes I want them to explore a topic based on shared experience. I’ll say, ‘This group is elementary school teachers. That group is secondary school teachers. This group here teaches adults. So I’ll bring them together that way.’ Sometimes I want a real mix of those, so I’ll make sure there is elementary, secondary, and adult educators all in together…. also, I guess, the underlying idea is as much as possible to get to work with everybody in the class. So they get a chance to know everybody in the class. (I10)

Instructor 4 considered helping shy students, stating:

What I am trying to do is if I see there is a student who is shy, and that person has no technical difficulty and can write well and so on, I will appoint that person to a responsibility, a job in a debate or a subgroup. So subgroups are very useful for that, because you can force students to interact. They are appointed ‘volunteers’. (I4)

Instructor 8 utilized doctoral students’ expertise, saying “when I have doctoral students in the course, I’d like to distribute those people a little bit if I can.” Instructor 8 also paid attention to gender in grouping: “I think that it’s better to avoid situations where there is a lone woman amongst a group of men.” Student 2 also articulated that “we don’t see very many men in the kind of teaching that I did, so I would, if I had guys in the class, I would try to put one with a
“I try to vary, because as an instructor, if you use always the same method, I think it would be quite boring for the students.”

**Rotating Group Members or Allowing Moves**

Student 4 felt that “it would help if the instructor could rotate through the groups.” Several students mentioned that their instructors “move people around from group to group” (S2) every one or two weeks. They do not just stick students with just one group all the time. “So you knew that you were going to be with different people each week. By the end of the course you came away with more of a sense you knew everybody,” Student 10 said. Instructors 3 and 5 allowed students to move to other groups. “At the earlier stage of forming the group, sometimes students will notice that another group is doing something that might be much more relevant to their graduate studies or to their work, so they will request a move” (I5). Flexibility was Instructor 3’s policy in dividing groups: “I don’t have a set of rules for structuring. I try to make the structure fit the situation. The choice of what you want to do is based on the strategy for what you try to achieve” (I3).

**Setting Subgroup Discussions Private or Public to the Class**

Most instructors made subgroups public for all students to view or even to contribute to (S10). However, some instructors set up private subgroups for members only. Instructor 8 designed two kinds of subgroups: private developmental groups to prepare group presentations and public discussion groups for all students to read. Student 2 thought that all discussion subgroups “should be all open and public” for all students to view.
4.2.3 Findings of Note Reading and Writing from Statistical Analyses

4.2.3.1 Group Configurations and Note Reading

To answer Sub-question III — What is the impact of different group configurations and group structure (with subgroups / without subgroups) on participant note-reading activity patterns? — this section presents results from the statistical analyses.

As Table 3 shows, students read similar numbers of notes in Large ($M = 916.85$) and Group ($M = 909.58$) configurations, but much fewer notes in Small configuration ($M = 333.64$). However, students in Small configuration read the highest percentage of notes ($M = 79.64\%$), while students in Group configuration read the lowest percentage of notes ($M = 55.03\%$), with students in Large configuration ($M = 60.54\%$) ranking second. The note size students read in Small configuration ($M = 314.78$) was larger than the note sizes students read in either Large ($M = 208.96$) or Group ($M = 195.07$) configuration. The results suggested that Group configuration reduced students’ percentage of reading load in subgroups, thus reducing information overload. Small configuration produced much less information for students. Surprisingly, the results showed that Instructors in the Group configuration read more notes ($M = 1452.20$) than instructors in Large ($M = 1185.00$) or in Small ($M = 319.80$) configurations. Instructors read 82.29% of notes on average in all three group configurations. However, they read the highest percentage of notes in Group configuration ($M = 92.05\%$) and the lowest in Small configuration ($M = 79.25\%$), with Large configuration ($M = 80.44\%$) ranked the second. The average note size instructors read in Small configuration ($M = 314.74$) was larger than the note sizes in either Group ($M = 182.14$) or in Large ($M = 199.88$) configuration. The results suggested, when students were discussing in subgroups, instructors were not absent, but were reading notes and supervising “behind the scene”, contrary to students’ sense.
However, some instructors in Small configuration did not read actively, which matched students’ complaints about “absent” instructors in small classes.

Table 3

*Means, Standard Deviation, Maximum, and Minimum Values of Notes Read by Three Group Configurations*

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Max.</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Notes Read (by all students in a class)</td>
<td>S 10</td>
<td>333.64</td>
<td>97.92</td>
<td>516.88</td>
<td>191.25</td>
</tr>
<tr>
<td></td>
<td>L 10</td>
<td>916.85</td>
<td>247.16</td>
<td>1338.06</td>
<td>593.69</td>
</tr>
<tr>
<td></td>
<td>G 5</td>
<td>909.58</td>
<td>222.24</td>
<td>1301.30</td>
<td>601.24</td>
</tr>
<tr>
<td>Avg. Notes Read (by instructors in a class)</td>
<td>S 10</td>
<td>319.80</td>
<td>89.46</td>
<td>509.00</td>
<td>217.00</td>
</tr>
<tr>
<td></td>
<td>L 10</td>
<td>1185.00</td>
<td>278.73</td>
<td>1721.00</td>
<td>862.00</td>
</tr>
<tr>
<td></td>
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<td>1452.20</td>
<td>339.70</td>
<td>1955.00</td>
<td>1010.00</td>
</tr>
<tr>
<td>% of Notes Read (per student in a class)</td>
<td>S 10</td>
<td>79.64</td>
<td>14.76</td>
<td>100.00</td>
<td>40.99</td>
</tr>
<tr>
<td></td>
<td>L 10</td>
<td>60.54</td>
<td>26.76</td>
<td>100.00</td>
<td>9.93</td>
</tr>
<tr>
<td></td>
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<td>55.03</td>
<td>25.34</td>
<td>100.00</td>
<td>10.75</td>
</tr>
<tr>
<td>% of Notes Read (by the instructor in a class)</td>
<td>S 10</td>
<td>79.25</td>
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<td>98.20</td>
<td>42.78</td>
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<td></td>
<td>L 10</td>
<td>80.44</td>
<td>8.72</td>
<td>91.36</td>
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<td></td>
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<td>4.23</td>
<td>96.51</td>
<td>86.25</td>
</tr>
<tr>
<td>Avg. Note Sizes Read (by all students in a class)</td>
<td>S 10</td>
<td>314.78</td>
<td>103.60</td>
<td>591.58</td>
<td>160.77</td>
</tr>
<tr>
<td></td>
<td>L 10</td>
<td>208.96</td>
<td>40.61</td>
<td>333.71</td>
<td>110.77</td>
</tr>
<tr>
<td></td>
<td>G 5</td>
<td>195.07</td>
<td>34.55</td>
<td>278.32</td>
<td>118.15</td>
</tr>
<tr>
<td>Avg. Sizes Read (by the instructor in a class)</td>
<td>S 10</td>
<td>314.74</td>
<td>110.75</td>
<td>513.69</td>
<td>185.83</td>
</tr>
<tr>
<td></td>
<td>L 10</td>
<td>199.88</td>
<td>36.64</td>
<td>272.83</td>
<td>120.83</td>
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<tr>
<td></td>
<td>G 5</td>
<td>182.14</td>
<td>49.45</td>
<td>239.97</td>
<td>107.47</td>
</tr>
</tbody>
</table>

*Note:* N = Number of classes in S (Small), L (Large), or G (Group) configuration. M = Means of number of notes read in each group configuration. SD = Standard Deviation. Max. = Maximum number of notes read in each group configuration. Min. = Minimum number of notes read in each configuration.
One-way analysis of variance (ANOVA) revealed the following significant differences in the average total number of notes \( (F(2, 22) = 20.964, p < .001) \), the percentage of notes \( (F(2, 22) = 29.911, p < .001) \), and the average note sizes \( (F(2, 22) = 7.835, p < .01) \) students read. To identify exactly where significant differences existed, I performed follow-up Post Hoc (Tukey HSD) analyses and found that Small configuration differed significantly from Large and Group configurations in terms of average total number of notes, the percentage of notes, and the average note sizes students read in a class. However, there were no significant differences between Group and Large configurations in terms of these three variables (see Table I9 in Appendix I).

One-way analysis of variance (ANOVA) also revealed the following significant differences in the total number of notes \( (F(2, 22) = 50.874, p < .001) \) and the average note sizes \( (F(2, 22) = 7.367, p < .01) \) instructors read. However, the percentage of notes instructors read \( (F(2, 22) = 2.367, n.s.) \) showed no significant differences. To identify exactly where significant differences existed, I performed follow-up Post Hoc (Tukey HSD) analyses. These found that in terms of total notes and the average note sizes instructors read the significant difference existed between Small and Large and Small and Group configurations. There were no significant differences between Large and Group configurations (Table I10, Appendix I).

To test impact of group structure, I conducted independent-samples \( t \)-tests and found significant differences between classes with-subgroups and classes without subgroups in the percentage of notes a student read \( (t(23) = 4.913, p < .001) \), the total notes an instructor read \( (t(23) = -3.743, p < .01) \), and the percentage of notes an instructor read \( (t(23) = -3.717, p < .001) \). However, no significant differences appeared in the total notes a student read \( (t(23) = -1.863, n.s.; \) Table I11, Appendix I).
Then, a series of one-way analysis of covariance (ANCOVA) were conducted. After the
test of the homogeneity-of-slopes assumption, with a not significant interaction (group
structure*class size), the ANCOVA (Dependent variable: the average number of notes read in a
class and the percentage of notes read out of the total notes written in a class; Independent
variable: group structure 0 = classes without subgroups, 1 = classes with subgroups; Covariate:
class size) were not significant \((F(1, 22) = .863, \text{MSE} = 42443.929, \text{partial } \eta^2 = .038, \text{ n.s.} \) and
\((F(1, 22) = .358, \text{MSE} = 21.147, \text{partial } \eta^2 = .016, \text{ n.s.})\). The strength of relationship between
group structure and the average number of notes and the percentage of notes read in a class were
not strong, with group structure accounted for only 3.8% and 1.6% of the variances, holding
class size constant (Tables I12, I13, Appendix I).

**4.2.3.2 Group Configurations and Note Writing**

To answer Sub-question IV — What is the impact of different group configurations and
group structure (with subgroups / without subgroups) on participant note-writing activity patterns?
— this section presents results from the statistical analyses.
The results from a descriptive statistic analysis shown in Table 4 suggested that students in Group
configuration produced the most total number of notes \((M = 1453.76)\) in each class, compared with
those in Large \((M = 1296.18)\) or Small \((M = 366.81)\) configuration. However, students in Large
configuration produced the most average number of notes written \((M = 77.32)\), compared with
Group \((M = 76.14)\) and Small \((M = 46.33)\) configurations. In Group configuration, 91.75% of
notes were written by students, while students’ contribution accounted for 86.70% in Large and
84.38% in Small configurations. Students in Small configuration wrote longer notes \((M = 314.78
words)\) with higher Grade Level Score \((M = 11.52)\) and conversely lower Reading Ease Score \((M =
50.30)\), compared with their notes in Large \((M = 207.64 \text{ words}; \text{Grade Level Score } M = 10.24;\)
Reading Ease Score $M = 54.82$) and Group ($M = 188.22$) words; Grade Level Score $M = 9.52$; Reading Ease Score $M = 59.22$) configurations. Instructors in Large configuration wrote the most total number of notes ($M = 191.10$) in a class compared with instructors in Group ($M = 131.60$) and Small ($M = 61.90$) configurations. However, the percentage of notes by instructors in Small configuration ranked the highest ($M = 15.23$%) compared with $13.21$% in Large and $8.19$% in Group configurations. Their notes in Large configuration ($M = 166.73$ words) were much shorter than those in Small ($M = 351.26$ words) and Group ($M = 211.36$ words) configurations. There were no significant differences of notes by instructors in note Reading Ease Score and in Grade Level Score among the three group configurations.

### Table 4

**Means, Standard Deviation, Maximum, and Minimum Values of Notes Written by Three Group Configurations**

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>$M$</th>
<th>$SD$</th>
<th>Max.</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Notes Written (by all students in a class)</td>
<td>S 10</td>
<td>366.81</td>
<td>140.40</td>
<td>663.00</td>
<td>203.00</td>
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<td></td>
<td>L10</td>
<td>1296.18</td>
<td>368.45</td>
<td>2015.00</td>
<td>906.00</td>
</tr>
<tr>
<td></td>
<td>G 5</td>
<td>1453.76</td>
<td>299.74</td>
<td>2009.00</td>
<td>1101.00</td>
</tr>
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<td>Total Notes Written (by the instructor in a class)</td>
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<td>12.00</td>
</tr>
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<td></td>
<td>L10</td>
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<td>461.00</td>
<td>97.00</td>
</tr>
<tr>
<td></td>
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<td>46.21</td>
<td>185.00</td>
<td>70.00</td>
</tr>
<tr>
<td>Avg. Notes Written (by a student in a class)</td>
<td>S 10</td>
<td>46.33</td>
<td>18.80</td>
<td>94.71</td>
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</tr>
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<td>L10</td>
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<td>125.94</td>
<td>50.33</td>
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<td>G 5</td>
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<td>62.14</td>
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<td>% of Notes Written (by all students in a class)</td>
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<tr>
<td></td>
<td>S 10</td>
<td>L 10</td>
<td>G 5</td>
<td>S 10</td>
<td>L 10</td>
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<td>--------</td>
</tr>
<tr>
<td>% of Notes Written (by the instructor in a class)</td>
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<td>13.21</td>
<td>8.19</td>
<td>15.23</td>
<td>13.21</td>
</tr>
<tr>
<td>Avg. Note Size (by all students in a class)</td>
<td>314.78</td>
<td>207.64</td>
<td>188.22</td>
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<td>166.73</td>
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<td>Avg. Note Size (by the instructor in a class)</td>
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</tr>
<tr>
<td>Avg. Reading Ease Score (by all student in a class)</td>
<td>50.30</td>
<td>54.82</td>
<td>59.22</td>
<td>58.62</td>
<td>58.17</td>
</tr>
<tr>
<td>Avg. Reading Ease Score (by the instructor in a class)</td>
<td>50.30</td>
<td>54.82</td>
<td>59.22</td>
<td>58.62</td>
<td>58.17</td>
</tr>
<tr>
<td>Avg. Grade Level Score (by all student in a class)</td>
<td>11.52</td>
<td>10.24</td>
<td>9.52</td>
<td>11.52</td>
<td>10.24</td>
</tr>
<tr>
<td>Avg. Grade Level Score (by the instructor in a class)</td>
<td>9.12</td>
<td>9.49</td>
<td>10.38</td>
<td>9.12</td>
<td>9.49</td>
</tr>
</tbody>
</table>

Note. N = Number of classes in S (Small), L (Large), or G (Group) configuration. M = Means of notes written in each group configuration. SD = Standard Deviation. Max. = Maximum number of notes written in each group configuration. Min. = Minimum number of notes written in each group configuration.

One-way analysis of variance (ANOVA) revealed the following significant differences in the total number of notes by all students ($F(2, 22) = 32.189, p < .001$), the average number of notes by each student ($F(2, 22) = 5.937, p < .01$), the average note sizes by all students ($F(2, 22)$
= 6.795, \( p < .01 \)), the average Reading Ease Score \((F(2, 22) = 4.532, p < .05)\), and the average Grade Level Score \((F(2, 22) = 4.091, p < .05)\). However, the percentage of notes by all students brought out no significant differences \((F(2, 22) = 2.173, n.s.)\). To identify exactly where significant differences existed, I performed follow-up Post Hoc (Tukey HSD) analyses and found that in terms of total notes in a class and the average note sizes by students, significant differences existed between Small and Large and Small and Group configurations. In terms of the average number of notes written by students, significant difference existed between Small and Large configurations. In terms of note Reading Ease Score and Grade Level Score the differences existed between Small and Group configurations. However, there were no significant differences between Group and Large configurations in terms of total number of notes, the average number of notes, the average note sizes, note Reading Ease Score, and note Grade Level Score. There were no significant differences between Small and Group configurations in terms of average number of notes by a student. There were no significant differences between Small and Large configurations in terms of note Reading Ease Score and note Grade Level Score (Table I14, Appendix I).

One-way analysis of variance (ANOVA) also revealed significant differences in the total number of notes by the instructor in a class \((F(2, 22) = 8.193, p < .01)\). However, there were no significant differences in the percentage of notes \((F(2, 22) = 2.173, n.s.)\), the average note sizes \((F(2, 22) = 2.361, n.s.)\), the average note Reading Ease Score \((F(2, 22) = .021, n.s.)\), and the average note Grade Level Score \((F(2, 22) = .486, n.s.)\). To identify exactly where significant difference existed, follow-up Post Hoc (Tukey HSD) analyses were performed and found that in terms of total notes instructors wrote the significant difference only existed between Small and
Large configurations. There were no significant differences between Group and Small and Group and Large configurations (Table I15, Appendix I).

To test impact of group structure, independent-samples t-tests were conducted first and found significant differences in terms of total notes all students wrote ($t(23) = -3.132, p < .01$), the percentage of notes students wrote in a class ($t(23) = -3.607, p < .001$), the percentage of notes an instructor wrote in a class ($t(23) = 3.607, p < .001$), the average note sizes ($t(23) = 2.628, p < .05$), note Reading Ease Score ($t(23) = -2.720, p < .05$), and note Grade Level Score ($t(23) = 2.372, p < .05$) (Table I16, Appendix I).

Then, after the test of the homogeneity-of-slopes assumption (group structure*class size), one-way analysis of covariance (ANCOVA) uncovered that the total notes written by a student in a class and the average number of notes written per student were not significant. The strength of relationship between group structure and the total notes written by students and the average number of notes written per student in a class was not strong, holding class size constant (Table I17, Table I18, Appendix I).

4.2.4 Findings of Group Configuration from Qualitative Interviews

4.2.4.1 Large Whole-Class Discussions

The participants generally pointed out some advantages of large whole-class discussions; however, many findings showed the disadvantages of large whole-class discussions, especially information overload. Particular participants’ perceptions varied according to their experiences. Some instructors had weekly discussions at the whole-class level, because they “think the experience of the students is very positive” (I2). Some students liked large whole-class discussions for the diversity of opinions (e.g., S5), while some students had mixed satisfaction and frustration with large whole-class discussions (e.g. S10).
4.2.4.1.1 Advantages

Some instructors kept all students in whole-class discussions because they wanted everybody to contribute to the same view as Instructor 9 said, “I don’t divide them into groups. It’s just everybody contributes to the whole view.” He reasoned, “I like to give them opportunities to respond to anyone they want on the issues they are most interested in. I find it motivates” (I9). Instructor 2 said, “In a way I’ve seen all of the whole class as a group discussion, in a sense; it just involves more people” (I2). He added, “I have a sense that, for this kind of course, people benefit from reading each other’s ideas and sharing those ideas and my input too” (I2). Instructor 2 continued, “I think it would be more important for people to read the comments of the others to get the diversity.” These instructors liked the diversity of a large class, the rich information provided, and the freedom for students to choose whichever topics they want to read. Instructor 2 also argued that he did not see the benefits of subgroups.

I don’t know, for those courses and those topics, whether the benefit would be explicitly assigning people into particular groups. I don’t think I would see a strong reason to do that. I think it would be more important for the people to read the comments of the others to get the diversity and just ignore if they don’t like the persons’ comments. Usually they just don’t read it or read it very quickly. (I2)

Student 6 expressed her preference of large whole-class discussions because of the diversity of the participants, declaring, “I like the discussions of the large group class, because it is nice to read the diversity of the large class.” Student 5 likewise said, “I think in a larger class that’s much better just because you have that diversity of thought and because you don’t have that concentration of dominance.” Large whole-class discussions also helped students to find people with the same interests or in the same fields. Student 10 said, “The best ones I had have been the large whole-class I took. Large ones, more threads, more focused discussions. The math people could talk to the math people, and the secondary people could talk to the secondary people, whereas in a small group you don’t have as much choice.” He continued:
In large ones, I have picked and chosen, and I have got the topics that are interesting to me. There are particular people I know are going to post stuff that is very readable. I know who the more experienced ones are, who are going to relate posts to theories. (S10)

As for participation in a large class, there was usually competition among students to establish their status in the class (S2). So, “it’s not a matter of trying to get them to go and they are doing well” (I10). The large number of students also increased the opportunities of having some doctoral students or other experts in the class. They played an active role in helping the discussion, as Instructor 1 pointed out:

You have 20 people. You have the expertise, which is quite considerable often, with doctoral students, for example. They will come and say things that are often very good and quite appropriate. But if you’ve got a small group or a small class, there’s less of that. So, you as an instructor will have to do more of that. It’s the reason I don’t use small groups online often in the discussion part because I want them to have the range of exposure to different ideas in the class. (I1)

4.2.4.1.2 Disadvantages

Students were encouraged to participate in discussions actively and “especially in graduate courses, students are getting evaluated on their participation” (S2). However, more participants had complaints about the disadvantages of large whole-class discussions; many of them were common among participants’ descriptions. Most participants were frustrated by the large amount of information in large whole-class discussions. This first and foremost disadvantage was other phrased as “too many notes to read”; often defined as information overload, which is directly related to class size.

Information Overload

All students who experienced large whole class discussions sensed information overload. Student 12 felt that, “the large whole class gave me an impression of too many notes there,” adding that, “my first experience was very bad.” As a new online learner, the large class scared him because of the large number of notes and participants. Student 5 reported feeling the same
when a new online learner. Student 7 exclaimed, “Frustration in large classes is the volume of
notes to read,” and added, “because at the moment you get information overload, it can’t be
productive.” Student 4 sensed that “In a large class discussion, it’s just sort of all over the place.”
Student 3 complained, “As a student in a very large class, there are so many postings you have to
go through. It is very overwhelming and you have to read them all to start writing your notes.”
Student 8 felt that in a large class “it’s not only the number of notes, it’s also the length of notes
that created information overload because it has to do with the time it takes to read a note.”
Instructor 1 noticed that students in her large whole-class discussions were complaining about
information overload and she let students self limit their workload.

Information overload did not only frustrate students, it also frustrated online instructors,
especially new online instructors. Instructor 7, a new online instructor, described her first two
weeks’ experience of information overload in her large class:

In the first two weeks in the large class, it was too hard to respond to every single student
in every single block at least once. Most students are responded to more than once. I find
it frustrating to read everybody’s work, and respond to them, and extend it…. It was far
too much. (I7)

Instructor 10 described the information overload situation in his experience:

If you have an online class that is what I called very talkative, they write a lot of notes. If
you work within one large group, it becomes unmanageable. There’re way just too many
notes, and it gets overwhelming for a lot of the students. (I10)

Most instructors also sensed information overload because they had “to read everything
the students wrote” (I4). Instructor 4 admitted, “Sometimes I just can’t keep up any more.” Only
two instructors — I5 and I6 — reported that they were not overwhelmed by information
overload. Instructor 6 only taught small classes with fewer than 10 students, while Instructor 5
always divided her large classes into 5 subgroups.
When one instructor kept all students discussing in the same large whole class until week 6, the students became overwhelmed. For example, Student 10 complained, “There’ve been too many notes and you haven’t been able to follow them all up. By the time you follow down a thread, you are just overwhelmed. There’s been discussion about students being overwhelmed when we are on week 6” (S10). Students 6 and 11, in the same large class, confirmed this complaint. Although most students might not admit to being overwhelmed in the large class, some did complain when they really could not manage. Student 10 said, “There is one person particular, who is feeling overwhelmed, who posted a complaint on the Blog first, then posted in the Café, and then posted in the course.”

Information overload might lessen a little after some students either were scared and dropped the course or stopped posting. Instructor 7, the new online instructor, was unhappy about the dropouts in her class: “I have never had so many students dropped out of my class before. I never had 6 students drop out in my face-to-face class ever.” Student 3 dropped a course because:

In a larger class, the more people contribute, the more stress is put on the individual students to find something new to say. So, you need to get in there earlier. In this particular course [a large class], I dropped it, because it wasn’t well designed. It was too competitive. We really had to be the first one in there and have something to say. In law, it’s one competition. I wasn’t comfortable at that time. So, I dropped it. (S3)

Student 9 said, “In the larger class, we feel that only five people constantly contributed and the rest just read notes, and some of them did not participate. So, that’s my personal experience” (S9). Then, as Student 12 said, “At the end, it seems to be becoming better, because everyone was tired and stopped posting. So till the end, there were not many notes to read” (S12).

Repetition of Ideas
The second disadvantage that emerged from the interviews was repetition of ideas. Student 4 remarked, “What I find in large classes is that there are a lot of notes and many people don’t read all the notes, and so sometimes there is repetition of the same ideas.” This frustrated those students who did read all or most notes and tried to make sense of the discussion. It also added to the information overload in large classes (S2).

**Branch-out Discussions**

The large number and diversity of students’ backgrounds became a double-edged sword; it provided more experiences and ideas, but it also led discussions to branch out off topics. “When there’s a large class, people tend to branch out, keep talking about what they are interested in” (S2). Thus, “it’s hard to get that many people to work on the same problem or same idea in order to advance that idea” (S4). Student 10 has a class where “a group of females who would always look at the feminist side of the issue” scared away male students and made themselves “almost exclusionary in their conversation” (S10). Instructor 3 suggested how to deal with similar situations:

If there are four or five people who are really enthusiastic about a particular topic and they kept chatting about it in this large class discussion, I think you would set up attempts to get them to just stop doing that…. That’s just simply one of the problems with a large class. (I3)

Instructor 4 also tried to discourage branch-outs in his large whole class discussions:

The problem is to keep focused, because if you are not focused you can end up in all kinds of directions. If you are a practitioner in the field, a school principal or a teacher, you have the tendency to go to talk about your own problems or your own experience, and that’s what I am trying to avoid. So I try to discourage that type of intervention. (I4)

**Less in-depth Discussions**

Students felt that their notes received less response in large whole-class discussions (S6). It’s hard to make progress on anything,” said Student 4, who reasoned:
What happened was, there were people whose research I could not really relate to; their research is so different from mine. It’s really hard for me to understand the subtleties of their research. I mean, I could understand generally what it was about, but not enough for me to make any kind of productive commentary or to respond. (S4)

She continued, “I found frustrating just keeping track of different interests and goals these people had. It’s also because I didn’t really know them very well. I found it very difficult to make any kind of critical comments” (S4). Discussion in large whole classes was less focused, as Student 7 stated:

In large classes, the discussion can be random. It’s harder to maintain a focused discussion in the spread threads. There are always tons of threads. A large class can be frustrating because there is so much volume to sort through. The discussions are less focused, and threads tend to morph into entirely different topics. (S7)

Lost in Discussions

“In a large group, students can get lost,” Instructor 10 termed the fifth disadvantage. One of the reasons might be as Student 7 explained:

Many people don’t provide context in their notes, and they’re a direct response to the preceding note. But, since students don’t usually open notes in the same order, the reader may or may not have read the earlier note that a particular note is referring to. Of course you could move back in the thread to get the gist of the discussion, but that can be time-consuming. (S7)

Lack of Social Presence

Large class made it difficult to get a sense of other students’ identities. In Student 2’s words:

The larger the classes, the more problematic I think it is in getting a sense of who people are. When that happens for me, for other people as well, discussions tend to be very cold. People don’t in a friendly way challenge each other. They never move to critical thinking. (S2)

“In a large class, one or two people could be left out and not be doing anything,” Student 1 pointed out. “In a large class, if one person is missing, it does not make a big difference,” reflected Instructor 10 from his experience. “It’s easier for someone to hide themselves, or loaf,
or just lurk in large whole-class discussions” (I4). Instructor 8 felt certain, “I thought that’s been well demonstrated, that loafing and class size are directly related.” Instructor 10 sometimes found this when checking participation.

You can get caught up, especially if you’ve got a good discussion going; and I get involved in that, and I forget that there is a student or two who’s not contributing at all. By the time I catch on to that, it’s really too late. It’s not fair to the students, and it’s not fair to me. (I10)

Student 1 also experienced this phenomenon: “Someone could be left out and there is no equal participation among others. It’s hard to delegate duties.” This might make students “sit back a little bit” (S2) or loaf in a large class (I5). Student 9 felt that, “Sometimes in a large class, there is the possibility that people will feel that they don’t have to contribute because others are doing it for them.” Instructor 5 found that, “Typically, students find in the first few weeks it is very difficult to become orientated to all ways of working.” Especially at the beginning of the course, students “are just more afraid of what the other people are thinking about them. If this is their first online course, a lot of them are uncertain unless the first couple of topics let them feel comfortable in a large class” (I10).

**Leadership Problems**

Sometimes large whole-class discussion suffered from ambiguous or non-existing directions. Instructor 3 remarked:

There’re just too many people for everyone to have leadership, and therefore it’s more likely to have either conflict or this kind of silent conflict, where people drop out or just stop participating. That, in fact, in online situation is more likely problematic than a continuing fight. (I3)

All these disadvantages might discourage students from staying in the course or from taking any online courses afterwards (e.g., S3 & S8). Large classes often experience these
difficulties. However, this does not necessarily mean that smaller class sizes always provide more productive experiences as the next section discusses.

4.2.4.2 Small Whole-Class Discussions

Participants’ perception of small whole-class discussions varied based on their experiences. Instructor 6 only taught small classes. Unable to compare her small classes with larger ones, she felt that her small class discussion was productive; she also received positive feedback from her students (I6). Student 4 preferred a small-class environment for collaborative learning. However, most instructors and students reflected that small classes did not necessarily benefit discussion effectively.

4.2.4.2.1 Advantages

The quantitative data analysis showed that instructors wrote a higher percentage of notes and initiated more threads on average in small classes than they did in larger classes. This perhaps because, as Instructor 3 said, “If it were a small class, I would be a part of it. I am a permanent member under those circumstances.” Instructor 5 found that her small class “is productive and we get to know each other on a deeper level, perhaps.” Instructor 6’s small-class teaching experiences were so positive because of the subject and the nature of her students; as she said, “it works very well and the course evaluation has always been positive” (I6). “I haven’t done the other” as she stated, so, “I could not really compare.” She thought, “It’s probably better for me because it’s easier. I have less marking, fewer people to check on, and fewer to get to know” (I6). She also mentioned, “I make sure for every topic that a student has posted at least one very substantive message, but it’s easier to do when you have relatively few students.” Student 4 preferred the experience of small whole-class discussions because “in the smaller
whole-class discussion, I would say it’s more collaborative. It’s easier to get in-depth in smaller
classes.” She explained further:

I like to have a sense of who everyone is in the discussion and who ever is participating. It is more
difficult to keep track of the other participants in the discussion when it gets beyond a certain
number. The other reason, if I can keep track of who everybody is, is that it’s much easier to have a
coherent kind of discussion or productive kind of online discussion when there is a smaller group of
people. (S4)

4.2.4.2 Disadvantages

However, most instructors’ and students’ small-class experiences were not very positive. The
first disadvantage to surface was the lack of class stimuli in small classes. Instructor 5 found
a class of eight made it “much more difficult to keep students’ interest and input going,” than a
large class. Instructor 9 said, “I had one small class in the summer. I think it was nine or ten.
What happened were that students’ attempts to respond decreased more than they would in a
large class, but I don’t know why” (I9). Instructor 4 reported similar experiences, saying “The
group dynamics is a bit slower. It is because of the number and dimension. In a smaller class, to
me the problem is to try to keep the movement going and keep people’s interest.” Student 12 said,
“The smallest class I was in was only six or seven students. There were almost no discussions at
all. As I remember, every student only posted one note to talk about the course stuff.” He
answered the questions more often, because he knew the course content (computer programming
language) better. Due to the other students’ limited knowledge, he did not learn much from that
course, he said. Instructor 3 emphasized, “If it was a smaller class, to be a good citizen you might
have to contribute more to make it go.” Otherwise, there might be insufficient information for
students to discuss (S9 & S12). Student 4 contended that “Sometimes in a small class, there will
become a culture norm where you build on to a question and you keep building on to a thread
regardless of whether it’s productive or not, so they’re going somewhere at a superficial level.”
Student 8 experienced a similar small class and pointed out the “danger” of the lack of stimuli in small classes, “I have only once been in a really small class. I have had occasions when I logged on and nothing much has happened, and the danger there is that you stop logging on.”

The second disadvantage was the limitation of participants’ experience in small classes. Instructor 5 sensed that in small classes “the dynamics are not the same and there is not the same variety of experience for the students as in large classes.” Instructor 3 said, “As it gets smaller than thirteen, it’s more difficult to get students to talk. I mean, the participation went slower. That’s just not the resources in the class to do anything about it.” He continued, “I think that’s understandable, in the sense that many notes are written in response to someone else’s notes. So…. there are fewer of them to respond to, and it’s uncomfortable to respond to every note” (I3). With a small class of six, Instructor 10 felt that “I missed the interaction that I get when I got 20. You are limited in the six’s experiences.” Student 7 agreed, “In an online class of five people you pretty much have your group set. Those will be the people you interact with for the whole course.” Student 9 added, “With a small class, information can be limited.” In Student 8’s small class, “the class had problems that made it very difficult to continue and it almost felt apart.” The reasons were:

What I was told it had to do with was the students came in with such different skill levels for the course. The instructor was having difficulty finding a middle ground, and students were getting frustrated and not posting and leaving. (S8)

The third disadvantage that emerged was instructors’ powerful role in small classes. Instructor 3 claimed that “If it were a small class, you would be too powerful as an instructor and affect it too much, because you need to.” “The smaller the class, the more I do. I jump in more, because often there isn’t somebody else to”, said Instructor 1, continuing, “If you have 20 people, you have the expertise. They will come and say things that are often very good and quite
appropriate.” However, the powerful role also meant that an “absent instructor” could ruin the discussions. Student 10 said, “In the small class, the difficulty was communication with the professor. The fact the professor wasn’t totally involved was a challenge.” In this class, “there was the discussion among the students as what we ought to be doing, at a certain degree of frustration, because it wasn’t obvious” (S10). Student 10 was not the only one who complained about “an absent instructor’s powerful role”, especially in small-class discussions. Students 8, 11, and 12 had similar experiences. Student 8 provided a strong example:

There was a case in which the instructor, for reasons still unclear, absented himself from the course for a prolonged period, and the course essentially withered. Another student and I were able to keep it going for a few of us, but it was a pretty grim experience. (S8)

These problems might also discourage students from taking any more online courses afterwards.

### 4.2.4.3 Large Classes with Subgroup Discussions

The participants stated a multitude of different comments and diverse opinions on subgroup discussions. Some participants experienced teaching or learning in all three kinds of group configurations and their experiences enabled them to make comparisons. Participants who had experienced large classes with subgroup discussions held positive attitudes toward their learning experiences. Most large classes had subgroup discussions during certain weeks, as Student 1 reflected: “The majority of the courses are always with small groups. People are grouped into small discussion groups.” Instructor 10 employed the subgroup strategy in his classes, declared, “Basically, in all my classes I use small groups unless for some reason I have a very small class. But if I have 10 or more students, for my discussions, I break them into smaller groups.” Some students had never experienced large whole-class discussions even in large classes. Student 7 said, “I have never had that experience. I believe I had the experience where a large class was divided into groups of three or four during certain weeks. The students worked in
smaller groups during those weeks.” Instructor 3 had his pedagogical background to support subgroup discussions: “I came to this from adult education. Probably the most predominant teaching method in adult education is dividing people into small groups. It was something I was very used to doing.”

An exceptional example of less-productive small-group discussions occurred in Instructor 10’s class: “I had classes where I was using small groups. For the life of me, I couldn’t get them talking.” In addition, an exceptional information overload developed in one very active small discussion group. Student 9 said, “We had like five students with more than 200 notes. I think the participants were totally overwhelmed. They did not know where to start and they just gave up.” However, all students and instructors who had subgroup discussion experiences expressed their general preference for subgroup discussions. Student 9 remarked, “In my personal experience, that large class with subgroups works the best. It is the most productive and the most effective. That’s my personal experience.” Instructor 4 said, “Subgroup is very efficient. I find it very efficient as a teaching tool or approach.” Student 12 added:

Comparing the three different kinds of classes, I like the large class divided into small groups. When students were divided into smaller groups, normally the instructor only asks you to focus on your own group and discuss the topic of your group. So there will not be a lot of postings. We have enough time to read the postings, think about others’ ideas, and write our own notes. In small groups, I never feel any frustration. (S12)

4.2.4.3.1 Advantages

Interview data analysis brought forth some advantages of subgroup discussions, which overweight the disadvantages. Even instructors who did not use subgroups admitted some of the advantages. Furthermore, the interview data provided evidence that using subgroups in general combats three of the main disadvantages of large whole-class discussions; it reduces information overload, encourages participation, and achieves more focused discussions. In addition to these
three major advantages, the participants also suggested some other advantages of subgroup discussions.

**Reduced Information Overload**

The interviewees agreed the most important advantage of subgroup discussions was the reduction of information overload. Clearly, overload mainly came from reading (I8). Student 6 observed, “It was easier to read everybody’s response in the smaller group” Student 8 understood the purpose of dividing students into subgroups as “the idea was to trying to keep the discourse within your group avoiding overload for you and for others.” Student 1’s experience in subgroup discussions was similar:

> Usually, the instructor makes sure that we are not overwhelmed with having to read so many messages. In that way, the focus is to be assigned to a small group for interaction and participation. The amount of reading is smaller than the amount for a large class. I think the purpose is to avoid having to read too many notes and to avoid a lot of threads within the discussion. (S1)

When asked whether small group discussions reduced information overload, Instructor 3’s reflection was: “I think they make it possible. You have to get your idea and work at it a little bit.” Instructor 5 usually had large classes, with about 25 students. However, she did not feel information overload: “I do not because I break down them into small groups. In Web Knowledge Forum, I have different views. Students are in the whole class, but they are also in different views [opinion groups].” She explicitly stated her purpose was to reduce information overload. Student 12 also supported subgroup discussions:

> I like that kind of course very much. You know, when students are divided into smaller groups, normally the instructor only asks you to focus on your own group and discuss the topic in your group. So there will not be a lot of posts and we have enough time to read postings and think about others’ ideas and write our own notes. (S12)

Student 7 added, “And plus, you can attend to the notes you read more carefully because you’re not in undated with tons of unread notes. You can follow entire discussions more easily,
and you have more time to think about them.” She continued: “I would say that students can have more focused discussion and not feel so overwhelmed with the volume of notes. It changes the dynamics, too.” Student 9 concluded, “If the responsibility is just to read in your own group and work in your own group and then read whatever you want in other groups, then, it does not cause information overload.”

**Encouraged Participation**

The quantitative data analysis showed students tended to write more and initiate threads more in subgroup discussions. Likewise, the participants felt that subgroup discussions encouraged participation. Student 2 said, “If you have 17 students and they are in small groups, you have even more postings, because they are more likely to post in that small group.” Student 3 also acknowledged this advantage: “I will be forced to talk. There will be more participation.” Student 2 described her participation in small-group discussions:

In smaller groups, I tend to be a little bit more active. Being aware that I teach online undergraduate courses, I don’t want to be seen as jumping in and taking control in a large class. But in a smaller group, you know, because it’s just a little easier, so I’ll be a little more active. (S2)

Instructor 10 said that subgroup discussions encouraged participation in his class: “In a small group, most times, they all participate and they will generate a good discussion.” He corroborated: “That’s easier in a small group because if you get four or five articles, you can say ‘Every person takes one article and reports back to the group on that’. Now you were forcing them to work themselves.” Instructor 7, the new online instructor, kept all her students in one large whole class for the whole term, but later during the interview realized: “But I think they would be contributing more in a smaller group.”
Subgroup discussions also provided student moderators more opportunities to lead discussions, as Student 10 pointed out: “I like the group thing done with the moderators as well. It’s putting the student candidates into the teaching role, and I think that’s got benefits.”

Subgroup discussions had advantages over large whole-class discussions in encouraging participation, in that it was easier for instructors to check participation in the small group discussions than in large whole-class discussions. As Instructor 10 described it:

In small groups, it’s easier because there are only six people in the group. I can tell very quickly just by looking at the view who’s been in and who’s not. It becomes very obvious if somebody is not contributing. There is more peer pressure. (I10)

Properly organized, subgroup discussions also had advantages over small whole-class discussions in encouraging participation, as Student 7 pointed out:

In an online class of five people you pretty much have your group set. Those will be the people you interact with for the whole course. In a large class divided into small groups, the group members will be switched around, so you’re interacting with more people. You have the advantage of having many perspectives that comes with a large class, but without having to have a whole-class discussion of 20 or so people. (S7)

**Facilitated More Focused and In-depth Discussions**

Student 7 felt that small groups focused students’ attention on discussion topics, saying “It might be easier to work in smaller groups. It’s easier to maintain a shared focus.” She sensed that “In small groups the discussions are more focused, which is better. In a large group, there are always tons of threads.” Instructor 10 had become aware of this advantage: “It’s easier to keep track in a small group than it is in a large class. In a large class, they can get lost.” Student 4 said, “It’s easier to keep track of who has said what and not just to repeat what has already been said somewhere else in a view or in a folder.” Similarly, Student 10 reported, “I found that the small groups were beneficial because I could keep track of my group.” Student 6 imparted that “In a small group you had more of a focus for the task. The discussion tends to promote itself to
that end or goes a little deeper.” Student 4 also supported this idea: “In my experience, it’s a sort of delicate balance where you want people to be working on the same idea, in the same thread, and it may be easier to do it in a smaller group.” She continued, “I think that to go in-depth it is easier to have smaller groups.” In subgroup discussions, students “will draw the different threads of what is going on together. Instructors expect students to focus on certain topics, so they can dig deeper rather than covering more ground,” Student 10 agreed. Subgroups also facilitated more focused discussions on “sub-ideas,” as Instructor 3 pointed out:

If a small clique was really enthusiastic about a particular topic and they kept chatting about it in a large class discussion, I think you would set up attempts to get them just stop doing that. There were people you would start to read in the writing ‘I think we should get back to the main point here.’ There is no tolerance for doing a sub-idea, and that’s just simply one of the problems with a large class. That’s why either small groups or some kind of threading or structuring would allow that. (I3)

Several students mentioned that subgroup discussions benefited them a lot when they were allowed to choose their subgroups according to their interests. Amongst them Student 1 remarked:

There are a lot of things to read, and not everyone seems interested in one particular topic. You have people with different background, who may be interested in talking about something else. That’s why small groups are better than a large class, because you can divide a group based on the topic that you want to talk about. (S1)

Gained Ideas from Reading Notes in Other Groups

Some interviewees said an advantage of subgroup discussions was that they got ideas from reading notes in other groups. Students “would work primarily in their groups, but they were in no way prohibited from participating in the discourse of other groups,” Student 8 reported. “It is expected that one subgroup can be talking about something entirely different than another subgroup. They would benefit if they go to each other’s postings,” Student 8 continued. So some students might occasionally “write a note to the students saying ‘someone seems have
made a very good point in their group’” (S8). Most instructors “gave every student the freedom to read any other group’s notes,” said Student 12, and in some classes, “If you want to jump in, you can also jump in and post your notes in other groups.” Instructor 3 felt that it might motivate students who found out that “There are people in this class in other groups that are doing more than we are doing. Shouldn’t we be doing some more?” Instructor 3 elaborated.

If you were a student who for which that was just too much, you could just pay attention to your group. But if you were a student who wanted to see what else was going on, you could do that. One of the nicest things about that design is that not all groups know what they are supposed to be doing. So, if they can wonder and look into another group that’s going very well, it often encourages this one to go well too. (I3)

Student 7 liked the ability to overhear other groups:

I might want to get a sense of what’s going on in other groups. You know, it is curiosity. In a face-to-face group, you might overhear parts of another groups’ discussion and it may be interesting. So reading other groups’ notes online is sort of the same thing. (S7)

Student 10 confirmed this advantage:

I found that the small groups were very beneficial, because I would keep track of my group, and if I had extra time, put my head in other groups to see what they were doing. You are always welcome to look at other groups, contribute to other groups, but you have to deal with your home group first. If you have extra time and the other person you are interested in talking to has time, then you can find that engagement. (S10)

Instructor 10 also declared that online subgroups had the advantage, over face-to-face small group discussions, that students could visit other groups.

You know that the other groups are there and they are busy. If you can, go and sit in and read what they are doing. If you feel that you want to contribute, do that. So they get a chance to hear what they can’t do in face-to-face, which is no one goes to the other groups. They get a chance to visit the other groups in online. Most of them in fact will do some visiting. Some of them will visit a lot. Others will just visit a little bit. (I10)

Instructor 10 also suggested that instructors direct students to visit other groups in order to get more divergence on the topic.

….you as an instructor say, “Why don’t you go and take a look at this because this is interesting stuff?” If that is the strategy, you get more divergence on the topic, because
different groups will come at a topic differently even if you’ve given them the same readings and the same questions. When you follow their discussions, every group is different, and that’s why I think a lot of them will do the visiting. They realize there’s difference. There are different topics and different points of view. If you have them all in one group, I don’t think you will get that difference. At least it would not become as clear. So you wouldn’t get as rich a discussion like that. (I10)

**Allowed Instructors Supervise All Groups or Supervise “Behind the Scene”**

Online subgroup discussions allowed instructors to supervise all their groups, which was difficult in face-to-face subgroup discussions because “you can only be in one. When you look at this group, when you join in this group, you do not know what others are doing,” as Instructor 5 said, “but online, any time, you can log on and see what they are doing.” Instructor 10 found it easier to keep track of discussions in small groups. Some instructors, for instance Instructor 3, supervised from behind the scene by providing resources to students in the subgroup discussions. Instructor 4 also guided students in their subgroup discussions and pointed out directions. He found that it was more productive to let students take over the lead:

I found that extremely productive, because teaching online you cannot participate like the way we usually used to do as professors in face-to-face courses. Knowledge building is to give students the responsibility to find out by themselves within the group interaction, built on the knowledge that each and every one of them bring to the class, and the instructors are there as facilitator. (I4)

Online subgroups also made less obvious the interruptions from “instructors’ participating” or “walking around” (I3) in their subgroup discussions, as some instructors did in face-to-face classes (S2). Instructor 4 further explained:

It’s because I can turn on and look at other groups and deal with other groups at the same time. You can read whatever is being done there. But in small group discussion, I tend not to intervene during the discussion process within the group. (I4)

Instructor 5 also mostly left the discussion to the students, “When it comes to subgroup discussions, I leave it to my students with some minimum guidance. It’s very rare for me to give much guidance.”
Aided Flexible Schedule

Subgroup discussions allowed flexibility in students’ work schedules. Instructor 10 mentioned this advantage: “The rules for online are if you are really pushed for time, and I know you have busy work and it is report card time, whatever, pay attention to your small group. That’s your first responsibility.” Having received supporting notion from his students, he claimed: “I’ve also had feedback from students who say that they appreciated the fact that if they had a very busy week and worked, they just didn’t have much time. They only had to go to their own group and that was ok.” Student 10 said subgroups allowed weekend participation as well.

Strengthened Group Cohesion

Subgroup discussions also strengthened group cohesion. Student 2 said, “I did enjoy being broken into subgroups sometimes. I think that gives you opportunities to really connect with people.” She added, “I think what instructors expect us to do is to interact more or be more comfortable interacting.” Student 6 confirmed, “I like the closer relationships in the small group.” Student 1 thought that subgroups enhanced relationships: “I prefer having a small group discussion, because it is easier to interact with others.” Even Instructor 2, who never adopted the subgroup strategy, admitted that subgroups benefited “more interactions and relationships.”

Instructor 5 recalled this advantage from previous online learning when she was a student:

As a student taking online courses, I never felt it to be a very effective way of working, to be relating to the whole class. I found it much better to be in a small group. That’s just easier to do with fewer people and their ideas than it is in a whole class and all the various persons. (15)

Instructor 10 gave an example:

When you get those kinds of experiences, a couple is from British Columbia and one from Georgia in the States, they like to get into groups when they have a chance to interact with somebody who is in a very different situation than they are. That works better in the small group, to get to know them better. So they prefer that too. (110)
“Sometimes if you have a happy group, you will be more productive,” said Student 2.

Instructor 4 agreed:

If you have subgroups, you kind of provide an opportunity for students to intervene more and to provide more substantial input. You provide or you ‘force’ them to go with the subgroup. It’s ‘a double whammy’, if you can use the term. You either force them or provide them more opportunity to intervene more often and provide some productive input. (I4)

**Assisted Shy Students**

Instructor 4 thought that subgroup discussions helped shy students. He would appoint shy students as group monitors in leading discussions. He said, “I feel in my case, I was satisfied with that. So it is particularly to provide shy students or students at low productivity to come up to the level of the group. So it’s an indirect approach to the group” (I4). Student 4 confirmed this: “Some people, in a smaller group, might have confidence to speak out or lead the discussion.” Student 12 added, “I agree with that shy students talk more in small groups.”

**Benefited Large Class Discussions**

Many participants thought that subgroup discussions benefited large class discussions. Student 11 had a key insight: “People will be discussing with a purpose of bringing their ideas into a larger class discussion. It was not just small group discussion per se, but rather a small group activity intended for some larger social activity.” Student 9 remarked, “You collaborate within the small group. You can learn what your peers are thinking about in the group. And then you share with other people in the large class. So you learn more.” Student 2 added, “That sharing to the big class from the small groups is valuable.” Student 4 supported this point:

If everybody has the same discussion question and everybody is working on the same thing in the subgroups, most people come up with very similar things, especially at the graduate level. If that is brought back into a whole class discussion, then the similarities and differences are sort of brought together. (S4)

Instructor 10 described how he brought subgroups back to benefit the whole class:
Through groups, you are talking about very different stuff. I say, ‘As we finish our topic, let’s bring it back to a large group, and each group tells us what the main thing that came out was.’ So, they get a chance to hear what everybody else did. (I10)

Instructor 3 believed that subgroups’ topics and tasks should aim at reporting back to the whole class and contributing to it (I3). He explained:

The purpose of your original questions was almost always having some way where the small groups are supposed to come back and inform the large class. Sometimes, when I am not being very creative, they just come back and give a report. But I had cases where people were in small groups and then came back and we had a debate. I almost always tried to have the small groups have something to contribute to the large class. (I3)

Subgroup and whole class discussions can benefit each other, as Instructor 5 alleged:

“Subgroups can also post their ideas and invite anyone in the whole class to get feedback.”

Instructor 3 explained further:

Part of the design is there might be a place for the whole class to be in small groups, in which case I might pick out something that was particularly good and put it where everyone can read it to get some cross-fertilization between the small groups. (I3)

**Enhanced Social Presence**

“Small group discussions enhanced social presence,” said Student 7. Instructor 10 opined, “If you have a large group, the number that didn’t participate actually tends to get lost, and it’s very easy for them to sit back and not participate. It’s not that easy in the smaller groups.”

Student 9 said, “When we were in a small group, there are more people taking the responsibility, because they knew that there were only five of us.” Student 6 also reflected, “In smaller groups, there is less risk. There’s more opportunity to elaborate on your ideas. What happens is everybody has a crucial role. They have to participate because it’s such a small group.” Student 4 affirmed this: “If it is a good small subgroup, you are accountable to your group. So, in a way if there is a lot more pressure on you, the contributor is not just loafing or becoming a lurker” (S4).

Student 7 had an important reason for preferring small groups in a large class:
In a small group, a group of four people, there is a bit more of a sense of accountability. For example, in a group of four, you represent 25 percent of that discussion, so your absence or your visions are very important to the group. In small groups, you have more of a sense of responsibility. You are responsible to your group, and it’s noticeable if you don’t participate. (S7)

Instructor, 10 recalling his 14 years’ online teaching, said:

If they are in small groups, there is more peer pressure, because they know if they’re not contributing, they are letting their group down, because it’s a small group. One person missing makes a difference. In a small group, it’s very difficult to not contribute. (I10)

He also compared this advantage with large whole-class discussions, reasoning:

Plus, a lot of the students are self conscious if they don’t have anything to contribute, or are uncertain. They don’t mind as much in a small group as they do in a large group. In a small group, they feel that they’re a member and they got support. It just makes it more comfortable for them. In a large class, they’re just more afraid of what the other people are thinking about them. If this is their first online course, a lot of them are uncertain unless the first couple of topics let them feel comfortable in a large class. Small group doesn’t really make them feel that way, but helps to get them going. A small group makes them more feel comfortable. (I10)

**Supported Collaborative Learning**

Finally, the participants disclosed that subgroup discussion supported collaborative learning. Most participants agreed that “Smaller groups tend to be more collaborative” (S2). Some were more certain: “Absolutely, smaller groups helped collaboration more,” Instructor 5 said. “I think it is easier to get good collaborative learning in a smaller subgroup,” agreed Student 4. When instructors divided students into subgroups, “what they expect us to do is to interact more”, said Student 2. Instructor 10 used subgroups because “in a smaller group, there are fewer notes, and they will spend more time thinking about it. They’re willing to interact with each other. As a result, in the smaller groups, they interact more.” Student 2 also believed subgroups supported collaborative learning, “I think the smaller groups will become a little bit more collaborative.” She continued: “If you have a huge class that has never been split into the small groups, people rarely get into that collaborative nature” (S2). Instructor 8 said, “My main
purpose is to give people opportunities to exchange ideas, and people won’t do that in a large group unless you create smaller group opportunities.” Student 4 became aware of instructors’ intentions in using subgroups:

I think instructors may expect students to play a larger part and interact with each other a bit better in a smaller group. I think the intention when instructors break students into subgroups is that they will work more collaboratively. I think this is the intention and ideal. (S4)

4.2.4.3.2 Disadvantages

Although they generally had positive attitudes, the participants also pointed out some disadvantages and problems of subgroup discussions.

May Miss Information in Other Subgroups

The quantitative results suggested that students in Group configuration read the lowest percentage of total notes produced. This worried Instructor 1: “It’s the reason I don’t often use small groups online in the discussion part, because I want the students to have the range of exposure to different ideas in the class.” Instructors 9 and 2, who also did not divide their large classes into subgroups, expressed the same concern, as did some students. For example, Student 4 told her thought:

When I participated in a smaller group discussion in a larger class, I tend to stay within my group. That’s usually six or seven people, at the most, or maybe five people. It’s not always encouraged to read all other discussions, and somehow, I feel like I am missing out on something if I am not reading everything. It’s partly because it’s easier just to stay within your own group, and partly the way the discussion is structured in the smaller groups that I was placed in by the particular instructor. (S4)

“In some cases, students are encouraged to read what is going on in the other spaces and contribute if they wish,” (S8) when instructors make subgroup discussions accessible to the whole class (S2). However, Student 4 said, “I wonder how many students will actually do that. In fact, I sometimes won’t do that just because of the way these online courses are structured.” She
added that, even if one read notes in other groups, “it is at superficial level, because it’s hard to
get in-depth doing a jigsaw given another time issue.” Student 5 also said time was a problem in
that situation: “you can, but sometimes have just no time to do that.” She elaborated:

What I tend to do is I read my own group and I might go to other groups maybe a couple
of times in the week, no more than that usually, because I just barely have the time to
follow the thread of discussions. Sometimes there’s just too much going on to be able to
do that. (S5)

Some instructors made subgroup discussions private for subgroup members only, or open
to the whole class for reading but restricted to subgroup members for posting. The latter
discouraged some students from even reading notes in other groups; as Student 6 wondered:
“What good is the information if you cannot dialog with it?” She also felt that “going and
looking at somebody else’s dialog ended up like it didn’t fit any purpose” (S6).

May Limit Diverse Interests

Student 4 pointed out the lack of diversity in subgroups. Student 10 agreed: “In large
whole classes you can join in to a variety of discussions. So you can focus on something that is
more interesting to yourself.” In small subgroups, Student 10 continued:

If the groups aren’t selected according to interests, then it poses of a little bit of challenge.
When you have two people interested in math in different groups, you don’t have the
chance to talk about that angle. You don’t have as much choice. If they’re mixed together,
eventually you get to talk to that other person anyway. (S10)

May Weaken Group Agreement

The small number of students in subgroups sometimes made it difficult to get group
agreement. Student 6 felt that “There’s much more of a stress on the individuals for small group
than a large group to actually respond.” Her reason was “If you have people in your small group
who don’t have that expertise in what you write about, then no one can comment on other people
because there’s nothing to comment about.” Student 4 said that another “possibly frustrating
situation was in the class broken down into smaller subgroups. I couldn’t get my group members to agree to constrain their notes to manageable length.” Her story ended: “I just want to negotiate the group down to a manageable level…. But one disagreed with me, saying that not everybody was articulate enough to compose notes that short. I found that kind of frustrating” (S4).

May Make Domination Permanent

Student 2 commented on the dominant students in her subgroups: “Just look at those conquerors; the one voice all the time”. Student 5 found that, “Domination is more permanent in a small group than in a large class. In that case, it’s very difficult to participate meaningfully in the discussion.” As a new online learner, she had the impression that, “In a large class situation, like if there are 10 or 15, you can pick out three or four people to have discussions with. The dominance is not that permanent.” But in small groups, “if you just have this one person who has very discouraging ideas, then it is pretty difficult to break that mood, because that one person then takes over.” She also sensed the phenomenon of “early-bird” domination in subgroups: “Some people who just dominate the discussions are first into the discussions and first people online” (S5). These dominants made her feel that:

Sometimes it becomes a battle to actually post your points or your thoughts. Especially, there are times when I’ve been really busy during the week, so I can only go online near the end of the week. What I find is that one person or two people are just having a discussion, the two of them, and nobody else has input any ideas. So you have to….put in radical ideas to just engage other people and other discussions. That might make you think a little harder than you normally would, I guess, in the small group environment. (S5)

May Fail to Notice Teacher Presence

The quantitative analysis showed that in large classes with subgroup discussions, instructors read the highest percentage of notes written (more than 90 percent on average) in each class. However, most instructors read the notes but did not comment on them very often.
For example, “I did not intervene in subgroups,” confessed Instructor 4. Many instructors left students with the impression that their instructors usually did not participate actively in their subgroup discussions. Student 6 felt that “it’s hard to get any immediate response” from instructors. Student 12 recalled, “I remember most of the time they just supervise. But I do remember once in a small group, there were very few notes, so the instructor jumped in.” Student 4 described the disadvantages of having “absent instructors”:

I think it would help if the instructor, just like in face-to-face, offer commentary, sometimes modeling things, and another time sort of move and pattern the discussion. I think it would help if they are more involved, obviously. But I find with a lot of online courses the instructors do not participate in the discussions. So my experiences have mostly been with students. More students moderated discussions where the instructor first started off, organizing the discussion in different subgroups, and then the students take over a bit more. (S4)

Instructor 1, who kept all students in whole-class discussions, felt that “If you have a big class divided into three groups, I can say that you wouldn’t be doing more. You will be doing something different, because you just pop into each group” (I1). Student 2 voiced serious complaints about instructors not helping subgroup discussions: “Nothing. It’s just like ‘Here is the group’, ‘Here is the topic’, ‘Go and discuss it.’ They do not join in, not in my experience.”

Some students complained about instructors’ absence from subgroup discussions because their instructors had not made their expectations clear about what students should do in subgroups when they organized the groups. Student 2 emphasized that instructors should, “know when they need to tell students and when they don’t.” She went on to say:

I think we need to, in the small groups, be very clear about what we expect people to do and give them a clear understanding of the task of why they are in that small group and what you want them to do, because sometimes it is just like ‘break into small groups and talk’. ‘What?’, ‘About what?’ So, you need clear guidelines and clear expectations. (S2)
4.3 Collaboration and Cooperation vs. Class Size and Group Configuration

The interviewees described two types of interactions that took place in their classes, collaboration and cooperation. Both categories appeared to play a key role in online discussion and their prevalence was related to class size and group structure. Instructors often appeared aware that cooperation and collaboration differed. The two differ “in terms of their goals and how they operate,” as Instructor 4 said. However, the interviews revealed no clear understanding of the definitions of online collaboration and cooperation. The new online instructor and the new online student could not provide clear definitions. Instructors, who had taught online for several years and / or in the educational technology field, provided better definitions, as did graduate students who had taken several online courses and / or studied in educational technology field.

4.3.1 Confusion of Collaboration and Cooperation

The interviews revealed a common definitional confusion between online collaboration and online cooperation. Ninety percent of the instructors and graduate students asked for a definitional distinction between collaboration and cooperation. For example, “I am confusing the two things,” said Instructor 5, “What’s the difference?” asked Instructor 7. “You need to tell me what you mean by cooperative versus collaborative,” requested Instructor 6. Two instructors wondered whether we need to distinguish cooperation from collaboration or not. Instructor 9 said, “I don’t know what it is. I mean whether you’re presuming that they work in a group and they have a task to do or not. I don’t know whether this applies to what I am doing or not.” Other instructors and students attempted to distinguish online cooperation from collaboration. Instructor 8 said, “Cooperation to me means structured tasks and procedures for directing how groups operate.” Instructor 10 asserted that “cooperation means they are working together to
achieve one end.” Instructor 10 observed that, when they worked on projects, students worked cooperatively more often than not. Student 7 explained her understanding of cooperation: “I am going to understand cooperative as people working individually on a common task. That would happen when working on projects. The work is divided at the beginning and then put together at the end.” Student 8 agreed, “Cooperative work might involve working separately on different aspects of a course project.” Instructor 3 elaborated on the same idea that cooperation focuses on students working on their own parts of a project and then later assembling them together for a final product. He gave an example: “So the most likely example is the project in an online course, in which somebody takes leadership and says “All right, A is going to do literature review. B will…. Instructor 8 also used the illustration of a developmental group: “Some of the activities are cooperative, in the sense that people take responsibility for different pieces individually and then assemble it as a group. So, that would be the developmental groups who are working toward a presentation or a project.”

4.3.2 Definition of Online Collaboration

The interviews yielded no clear definition of online collaboration. When asked to define it, more than 90 percent of the interviewees in fact asked for a definition themselves. Typical responses included: “How do you define it?” (e.g., I7) or “I don’t know. You have to ask the students that” (e.g., I6). Some instructors attempted to provide definitions. Having taught online for more than 12 years, Instructor 8 said: “Collaboration to me means a more naturalistic approach, in which the instructor tends not to be very directive about the task or the way in which the task is accomplished.” Instructor 10, who had taught online for more than 15 years, suggested “Collaboration means they are working together and building something. Then they each are going to take something different from this.” Student 2 put it simply, “Collaboration, I
think, is what I would call critical thinking. You do the reading, you still have the question post, and here is the answer, and somebody knows and says ‘Ok, have you thought about this?’ or they take it to another level.” After taking eight online courses, Student 7 thought, “When collaborating, students are supposed to work on the same thing, not breaking the work up into parts and then putting them back together again.” After 5 online courses, Student 8 offered his definition of collaboration:

Collaboration is one of two kinds of things. One is when you work together to produce something that hasn’t been produced before. That can be something as simple as a presentation at the class, or can be something more complex, like generating a theory. I suspect that collaboration involves more work together. (S8)

Instructor 3 proposed that collaboration related to knowledge building: Students discussed together and built on each other’s ideas; not that they had to reach agreement, but they were contributing and constructing knowledge, and later on could take from it whatever they understood and needed, he suggested. He concluded, “Probably another stream would be in knowledge building, in which it’s to try to build an idea.”

4.3.3 Online Collaboration vs. Cooperation

“Cooperative and collaborative learning are not outcomes. They are strategies,” Instructor 8 believed. He argued that “what matters is the outcome, which is the quality of the discourse and the construction of knowledge.” He thought that knowledge construction occurs under both collaborative and cooperative conditions. But, he argued, “I think what we are always trying to do is to maximize the opportunities for individuals to construct their meaning as well as situations in which they can benefit from group discourse.”

Instructor 3 found that online instructors adopted cooperation more frequently, “Over the long number of years, cooperation as we discussed here is a more frequent design.” Student 8
also said, “A lot of the online discussions are cooperative.” He understood, “Cooperative learning is just where people post notes or respond to other people’s notes. But they may not be as relevant as one hopes. That does happen and I think it’s probably a necessary stage to go through” (S8). Student 10 said that in cooperative learning:

You just do the reading and post your response. But that’s where a question has been given to you at the beginning of the week. You are not trying to build something. You are only trying to express your opinions in order to look at what themes emerge. It’s cooperation in the group fashion, I suppose. It’s not cooperative group structure. (S10)

Instructor 3 added the necessity of initial direction:

In the sense of building on the ideas, somebody needs to keep hold of where it’s going, or do we really want to follow that. In a human resource kind of thing, people say, ‘Well, you are to get together’, and sometimes step back from the actual discussion and talk about how you set the agenda and how our group is working. (I3)

He then went on to explain his belief that cooperative learning set the base for collaborative learning.

You can see in-between activities that are not strictly knowledge building. Every idea builds on from a kernel, but I would say that was a sign of collaboration. I think one is embedded in the other. I think you need a certain amount of cooperation to make collaboration work well too. That’s a sort of stepping stone on the way to collaboration. (I3)

After he confirmed the definition of collaboration from the literature review, Instructor 10 felt that collaboration works more effectively than cooperation in online discussions, to which most interviewees then agreed. He saw more collaborative activities in his classes:

They build on one another’s posts. Somebody will have an idea and somebody else will say ‘Oh, that reminds me, or I think this...’ so that collaboration will take an idea through sharing their experiences, sharing their knowledge, or sharing other things they know; then it gets exploring these ideas. They work collaboratively. (I10)

Student 8 preferred collaborative online discussions.

We definitely worked collaboratively. You can get a level above that where a student will take a note from student A and a note from student B and do a synthesis. These two ideas go together and can lead to a further idea. That’s one aspect of collaboration. We all like
to think that we collaborate to improve everyone’s understanding. I prefer collaboration because any errors or omissions can be corrected by your workmates. (S8)

All instructors agreed that both cooperation and collaboration happened in their classes. Instructor 3 said, “Despite the structure of the course, you almost always see some of each of them.” Instructor 4 suggested the reason, “Because not only do they have to put their own messages, but they also have to react to peers’ messages.” In Instructor 5’s classes, both cooperative and collaborative learning occurred. However, she felt that cooperation worked for group projects while collaboration worked for group discussions:

When it comes to group discussions, they build on each other’s work. But when it comes to their team project, they are cooperating because each member of the team decides what their area of responsibility is. They do their parts and bring it together. It’s a combination of the two. I provide for both of those experiences. I think both are valuable. All of these are happening simultaneously because they have more than one activity in the course. They have several types of discussions and several types of projects. (I5)

Most students sensed that their classes were designed to encompass both activities, though “they might be differently served for different students” (I2). Student 9 saw the two strategies as sequential, starting with cooperative learning and ended up with collaborative learning. She said, “You start working cooperatively by expressing an entry, and by initiating what aspect of the problem you are interested working on. But then you collaboratively discuss whatever the group is interested in” (S9). Student 8 saw the two as one alloyed process “where cooperation contained collaboration.”

Instructor 3 pointed out, “Cooperative learning, or at least the structuring aspects of it, is a precursor to collaborative learning; so, more frequently, it probably sets the limits on the learning that we could do.” Student 10 found problems in the assessment of collaborative discussions: “Collaboration has its own difficulties. I thought there were issues of whether the workload was even. The marking didn’t seem to reflect the contribution of individuals. There
were issues of uneven workload that weren’t recognized.” Most interviewees admitted that true online collaboration would help discussions. However, although they thought they had designed a collaborative learning environment, some of the instructors found that true collaboration in online discussions happened very rarely in their classes. Instructor 3 initially used the softer term “less frequent” to describe the occurrence of true collaboration in online graduate-level discussions. He added, “My experiences have been that not everyone gets there.” He then said he thought true collaboration “happens very infrequently”. He comprehended the value of true collaboration:

The question is, from a class and instructor’s point of view, that’s the best sort of thing. But you need to be structuring classes. You can’t get much out of it unless the students reach there [collaboration]. Only some of them are going to get there. (I3)

In online discussions “if you have neither collaboration nor cooperation, you’re going to have a miserable experience,” he said. “I’ve seen examples of all of those.” Further:

That might be quite destructive. A group of people really are getting off on following some ideas or something and left the need to get a project done, left the other people, first of all, feel isolated, and secondly, pretty angry of this group just taking off to do what they want to do. (I3)

Several students also thought true collaboration, though highly desirable, had rarely happened in their online classes, for a number of reasons. “Collaboration is more effective. I think it takes longer time to synthesize all those ideas before you can come up with the collaborative understandings,” Student 6 said. “That takes a little longer and it’s a little harder,” Student 8 agreed. Student 10 pointed out two problems: “I had to work harder with the collaboration, but not necessarily beneficial work. The marking didn’t seem to reflect the contribution of individuals. I found the cooperative smaller groups to be more beneficial.” Student 2 believed, “Collaboration happens so rarely, because there is too much work.”
4.3.4 Online Collaboration and Cooperation vs. Class Size

Responses to the question: “Do you think class size affects cooperative and collaborative learning?” are diverse, with most as “Definitely” (e.g. I5, I4, & S2), and “I think so”. “Class size does matter,” Instructor 4 said. “Definitely,” added Instructor 5. Instructor 3 said “I think so”, arguing that it was hard to cooperate in a large class: “Cooperation is focused on structure. If we view cooperative learning as structuring moves, then there would be fewer opportunities to do that in a large class.” He explained further:

You could only have so many structure moves. If five people decide they want to help structure how the final reports are going to go, and then they start to fight, then that’s likely, first of all, to be ignored by all the other 20 people. But again, it comes back to why the perfect group might be from five to seven people. There is room to do things and to discuss the cooperative move and to reach an agreement. How in the world do you reach an agreement with 20 people? Well, only if 18 of them stop participating. (I3)

Most instructors designed their classes on the basis of constructivism theory. As Instructor 4 put it, “I try to have diversity and I base all my intervention on constructivism, where each individual student brings to and shares in the construction of the knowledge.” Most interviewees felt that it was hard to achieve true collaboration in large online whole-class discussions and to construct knowledge in a large learning community, though Instructor 1 felt that larger class size helped in achieving diversity. Some students thought that their learning experience was neither cooperation nor collaboration, due to the large class sizes and consequent huge amount of information. Student 8, a doctoral student in educational technology field, contended that:

We know if we are going to work cooperatively or collaboratively, we need to know what the other people are talking about. If everybody responded to every posting in a moderately large class, it will be a tedious number of notes to read. But when you stop reading certain notes, you realize you’ve totally lost track of a particular discussion. (S8)
He offered his theory about the relationships among class size, information overload and collaboration:

So when we get a lot of postings, which has to happen in classes with large number of students, reading level goes down; and therefore the potential for cooperation and collaboration also decreases. That would be where the potential for collaboration and cooperation goes down to zero, because you are not participating in that area. (S8)

He also explained, “It can be quite depressing to log on and find many, many unread messages. It creates a pressure to read quickly, and that can lead to inattentive, superficial reading.” Most students felt that they did not have enough time to read the notes and discuss with their classmates because in the large classes there were too many notes. They just wrote a certain number of notes, based on the course reading materials, each week for the participation in this pattern. Instructor 1 said, “It is neither cooperative nor collaborative [learning], because they don’t help anybody else. They do not help themselves. They don’t relate to each other. They don’t catch each others’ ideas.” She argued further, “If you haven’t read my notes, and you just read something of your own, it doesn’t refer in any way to anything that I have ever said. That’s an isolated kind of thing.” She asked: “What’s the point if you don’t read others’ stuff?” because to her, “the reading is like listening for me” (I1). She concluded:

I don’t think that’s cooperation because it’s individual. That’s nothing to do with other people. In fact, it’s like everybody is working and putting a piece of paper on the table. You can’t call that cooperation because you just put the piece of paper on the table. You just happened to be in the same place. But they are not doing anything. They are not negotiating anything with each other. It’s not collaborative either. It’s missing the point. (I1)

4.3.5 Online Collaboration and Cooperation vs. Group Configuration

Many participants felt that the large number of students and information overload in large classes could make the online discussion forum more like a bulletin board. Student 4 said, “What happens in a large class, I think, is just this one person always contributes resources and another
person types up somebody else’s interviews. It’s broken down into tasks rather than in a collaborative kind of way.” Student 9 said, “If it’s a large class, a large whole-class discussion, it leads more to cooperative learning.” Instructor 10 seconded this, “You can’t collaborate with 20, but it’s a little bit easier to collaborate with eight” (I10). Student 4 reasoned, “I think that in a larger class, it is just cooperative, because there it is part of the course credit. They have to participate as part of the course grade. They are cooperating in that sense.” She admitted that sometimes collaboration occurs. However, she insisted, “I would classify that [large whole-class discussion] more as cooperative.” Student 9 provided an example:

If the large class discusses everything all together and the students are expected to read everyone’s contributions, I think it’s really too much work. They lose interest. They are just interested in doing their contribution because they know that’s what eventually is going to be evaluated. So, they start focusing on their own stuff. (S9)

Most interviewees felt that it was easier to collaborate in a small subgroup in a large class than in a large whole-class learning environment. The group size also determined collaborative learning as Student 2, who had online teaching experience as well, remarked:

The bigger the group (was) the harder for them to have an assignment done or a project done. For discussions, I would say the same. If you really want them to be collaborative, then the bigger that small group is, the less likely that’s going to happen. (S2)

Student 4 said, “I think in a small group there’s probably more collaboration involved.” Student 9 reasoned, “In a smaller class or a group, it’s easier to work on something, like an artifact, a project, a note, or an idea, or anything. I think it’s easier to collaborate. You have more opportunities to learn.” She also pointed out that students working in a smaller group will be more interested in reading all the posts and contributing. Student 2 found that in smaller groups, students “will connect more. They will challenge each other more. They will be a little comfortable doing so in a smaller group.” Instructors and students, who had experienced subgroup discussion, felt that subgroup discussions benefit collaborative learning more than
large whole-class discussions. “The smaller groups will become a little bit more collaborative,” Student 12 said. Student 8 agreed. Instructor 5 said, “Absolutely, smaller groups help collaboration more.” Student 9 suggested that subgroup collaboration would even benefit whole-class discussion:

I think in a smaller group there is probably more collaboration involved. Most people come up with very similar things, especially at the graduate level. If that is brought back into a whole-class discussion, then the similarities and differences are sort of brought together. I think it’s more collaborative. (S9)

Instructor 10 had another reason why small groups worked more collaboratively.

In that small group, there’s going to be a couple of people in there that I worked with in my last group. And lots have a couple more. So they’ll form those kinds of subgroups and that kind of collaboration. They will remind each other what they said before. (I10)

Student 4 said, “I think that collaboration is more effective. The cooperative learning from students’ perspective is more efficient, as they can get through reading those notes and doing their task without as much work cognitively.” Student 2 agreed, “Definitely collaboration is more effective. It’s just getting there is difficult.” Instructor 3 thought that collaboration was more likely and more effective in subgroup discussions: “In my experience, the really happy groups, the groups that are really proud of their work, would have had more collaborative activities than cooperative activities. I think collaborative learning would likely be more effective for discussions” (I3).

4.4 Summary

Findings from this mixed methods study revealed that, while the actual class size was six to 25, the optimal class size was 13 to 15. Different class sizes led to different online learning or teaching experiences. Statistical data analyses revealed significant positive correlations between class size and the total number of notes a student (188 to 1337 notes) or an instructor (217 to 1955 notes) read; a significant negative correlation between class size and the percentage of
notes a student read (90 % to 45 %); but revealed no significant correlation between class size and the percentage of notes instructors read (82 % on average). All interview participants confirmed that information overload came from reading notes, especially in larger classes. When the total number of notes that students had to read increased over a certain level, the reading rate went down. To cope with information overload, students chose notes to read by focusing on the topics or people they were interested in and ignored some notes that might contain important information. Instead of yelling at students, some instructors thought the optimal solution was to let students to make wise choices about what they read, which may result in students missing important information. Most instructors also agreed that reading notes was a lot of work for them.

Class size was significantly correlated with the total number of notes, average number of notes, note size, note Reading Ease Score, and note Grade Level Score. As class size increased, the total number of notes increased from the fewest 247 to the most 2194 notes in a class. The average number of notes per student wrote also increased from the fewest 26 to the most 126 notes in a class. Both students and instructors tended to write shorter, dialogic notes in larger classes. Notes by students in large classes had higher Reading Ease Score and conversely lower Grade Level Score, which meant their notes in larger classes contained less academic words. Class size did not influence instructors’ note Reading Ease Score and Grade Level Score significantly. Frequent long contributions had the potential to frustrate students than shorter, come-to-the-point notes. Frequency of instructors’ responding notes varied when class size changed. Instructors’ not responding enough was considered “absent”, especially in small classes, while their responding to every note was considered stifling. Instructors accessed student note reading and writing differently on the basis of different class sizes. Most instructors assessed students’ note writing by both quantity and quality, with a heavy orientation toward the quality.
Class size determined the number of subgroups in a class. The optimal group size was four or five students. Group configuration affected note reading and writing. Students read the highest percentage of notes in Small configuration but the lowest in Group configuration. However, they read similar total numbers of notes in Large and Group configurations, but much fewer notes in Small configuration. In contrast, instructors read the highest percentage of notes in Group configuration but the lowest in Small configuration, which might be a surprise to those students who complained about their “absent” instructors when in subgroup discussions. Students in Large configuration produced the most average total number of notes. However, students in Group configuration produced the most total number of notes in a class. There were no significant differences in students’ note size, Reading Ease Score and Grade Level Score between Group and Large configurations. Instructors wrote most in Large configuration. Each of the three group configurations had its advantages and disadvantages. Large configuration provided students with the diversity and larger amount of information. It helped students find people with the same interests or in the same fields.

However, students were frustrated by information overload; repetition of ideas; branch-out, less in-depth discussions; lost in discussions; lack of social presence; and leadership problems. It was easier for some students to loaf, hide, or dominate in Large configuration. Small configuration provided better environment for social presence. Students were not frustrated by information overload and instructors had less marking. However, both students and instructors wrote less, thus, there was less information, limitation of participants’ experience, and lack of class stimuli. Instructors wrote a higher percentage of notes and initiated discussions more often, thus had a powerful role in the discussion. The participants who had experienced all three group configurations held positive attitudes toward their learning experiences in Group configuration.
Some advantages emerged out, supporting using subgroup discussions. For example, subgroup discussions reduced information overload; encouraged participation; facilitated more focused and in-depth discussions; gained ideas from reading notes in other groups; allowed instructors supervise all groups at the same time and supervise “behind the scene”; aided flexible schedule; strengthened group cohesion; assisted shy students; benefited large class discussions; enhanced social presence; and supported collaborative learning. Instructors utilized different strategies to divide students into subgroups, for instance, assigning students to subgroups; allowing students choose; combining both; basing on topics, goals, or course contents; mixing different characters, skills, professions, or gender; rotating group members or allowing moves; and setting subgroup discussions private or public to the class. However, the participants also pointed out some disadvantages and problems of subgroup discussions. They felt subgroup discussions may miss information in other subgroups, limit diverse interests, weaken group agreement, make domination permanent, and fail to notice teacher presence.

Both collaboration and cooperation appeared to play a key role in online discussion and their prevalence was related to class size and group configuration. The interviews revealed a common definitional confusion between online collaboration and online cooperation and yielded no clear definitions. Although some students thought both cooperation and collaboration happened in their classes, online instructors adopted cooperation more frequently, especially in subgroups when working on projects. Collaboration, though highly desirable, had rarely happened in online discourse, although most participants agreed that collaborative learning would likely be more effective for discussions. Most participants confirmed that class size definitely affected cooperative and collaborative learning. When students had to read a lot of postings in large classes, percentage of note reading went down; and therefore the potential for cooperation and
collaboration also decreased. Most participants felt that it was easier to collaborate in a subgroup in a large class than in a large whole-class learning environment. Collaboration was more likely and more effective in subgroup discussions.
CHAPTER FIVE: DISCUSSIONS AND SUMMARY

This chapter first discusses the major findings from Chapter 4 in light of the research questions and the literature reviews. Then, it reflects the suggestions and limitations of this study. Finally, the chapter summarizes the conclusions from the study and recommends some possibilities for future research.

5.1 Discussion of Key Findings

5.1.1 Size of Learning Community Matters

The results from both the quantitative and qualitative analyses suggest that different sizes of classes lead to different online learning or teaching experiences for students and instructors respectively. Class sizes in this study range from six to 22 in the quantitative datasets and six to 25 in the qualitative datasets. The students and instructors feel that a class of eight or fewer would not have enough stimuli of perspectives or interaction for a proper discussion, while a class of 18 or more would make a single conversation difficult and would become overwhelming and less manageable for both students and instructors. It appears that the participants’ ideal, manageable class size would be about 13 to 15. This size allows students to have a good sense of their peers and to read and respond to other participants’ contributions, while maintaining enough stimuli and diversity. The participants think that such classes are large enough to have lively discussions but not so large that students suffer excessively from information overload. The participants’ thoughts are in agreement with other research on this point. Viadero (2008) observed that in face-to-face classes, elementary students were “on task” less and the amount of teaching increased as class size grew, similarly to the online classes in this study. Online conferencing usually takes longer (Bordia, 1997; Boettcher, 2006; Clouder, et al., 2006). When
the amount of information in an online class is manageable, students’ learning experience is satisfactory.

However, “online teaching should not be expected to generate larger revenues by means of larger class sizes at the expense of effective instructional or faculty over-subscription” (Tomei, 2006, p. 531). Studies of class size in online courses should examine the optimum class size for quality education (Colwell and Jenks, 2004) and establish a discussion-board size that allows meaningful discourse (Frey & Wojnar, 2004). Reonieri (2006) proposes that “in the context of online learning, optimizing the number of students in a class means determining the minimum and maximum number of students participating in an asynchronous discussion board, where the potential for learning is maximized” (p. 22). Colwell and Jenks (2004) suggest, “Presumptive maximum course size should be twenty students for undergraduate courses and eight to fifteen for graduate courses” (p. 2). Palloff and Pratt (1999) report that collaborative environments of learning communities are generally groups of 15 to 20 students. Kimmerle and Cress (2008) calculate teaching loads in both traditional and online classes and assume that “The ideal traditional class size is 17 students while the ideal online class size is 12 students” (p. 57). Optimal class sizes “must be sufficiently large to encourage activity, but not so large that the sense of group connectedness is lost” (Colwell & Jenks, 2004, p. 7). When the latter problem is combined with information overload, students become overwhelmed and usually do not have much choice except dropping out. Thus, it is very important for online instructors, especially new online instructors, to have knowledge of the workloads resulting from different class sizes and to utilize proper strategies to deal with the issues involved.
5.1.1.1 Class Size Matters in Note Reading

Both quantitative and qualitative data analyses suggest that class size plays a pivotal role in supporting or impeding note reading. The quantitative analyses reveal significant mean differences in note reading loads due to class size; class size correlates positively with the average number of notes each student reads, but negatively with the percentage of notes each student reads. Obviously, one would expect students in larger classes to read more messages due to the larger number of students. In a class with fewer than 10 students, a student reads on average around 330 notes, while in a class with more than 16 students, the average is more than 900. However, when their reading load increases with class size, the percentage of notes students read decreases. When class size increases, average number of notes instructors read also increases, from around 320 in small classes to around 1300 in larger classes. However, class size apparently has little impact on the percentage of notes instructors read; the correlation between the two is not statistically significant. Instructors read more than 82 percent of the students’ messages, regardless of class size. This result contradicts some students’ perceptions of “absent” instructors in their classes; the instructors in this study are participating actively by reading students’ notes, especially in subgroup discussions, where they read 92 percent of them.

Graduate students are expected to read a lot and have deeper discussions. If they are not reading others’ notes, they are not participating and not learning. However, in online graduate courses, the reading load comprises articles plus notes. As class size increases, most students in large classes start to feel that there is always “a lot to read”. When the number of notes that students have to read increases beyond a certain point, the percentage of notes they actually read declines, mainly because of information overload. Information overload is mainly caused by increased numbers of students; so students in large classes are particularly vulnerable to information overload. When they log on and see all those unread notes, they sometimes become
disheartened. They feel that they cannot read too many messages closely, especially because they have to read a substantial number of messages before they can contribute their own. Besides, students do not all have the same amount of time to deal with their course work; an excessive reading load is particularly difficult for those students who have full-time jobs or have to log on later in the week. The students in the study admit that they use a variety of compensatory strategies to cope with overload: selective reading (by topic or author), scanning through messages quickly, skimming some messages, skipping reading some completely, or simply ignoring large numbers of messages. The consequences are significant: if students are not closely attending to each other’s notes in large classes, they may miss important information and collaborative learning may not be realized, contrary to some instructors’ intention of putting all students in one large group, so that they could be exposed to more information. The findings also imply that letting students choose which notes they want to read is not an ideal strategy. For example, students can select notes by reading the note titles only. In such a case, they still might miss important information in notes with less attractive titles. Students also find that the “Who has read this note” function in WebKF does not effectively encourage note reading in large classes.

5.1.1.2 Class Size Matters in Note Writing

The main learning for online students comes not only from reading other people’s notes but also from having to construct their own ideas in their own notes. Writing is essential for learning, even more so than reading. Generally speaking, a larger number of notes is supposed to further students’ understanding of the discussion and provide information and knowledge for the target learning. It also indicates active learning in the class. How to balance the time spent on reading and on writing becomes a crucial issue.
The findings suggest that class size may play a key role in the quantity and quality of instructors’ and students’ note writing. Increased class size is positively correlated with a larger total number of notes written in a class, a larger average number of notes written per student and per instructor, and higher note Reading Ease Scores by students. Yet, it correlates negatively with both students’ and instructors’ note sizes and students’ note Grade Level Score. One student participant explains thus: Larger class sizes mean more total notes and hence more notes to respond to. A student in a class of less than 10 students would write approximately 50 notes on average, while a student in a class of more than 16 wrote close to 80. More students produce more topics, and more topics may inspire more notes. Competition to establish students’ status in the large classes may also encourage more note-writing (Hewitt et al., 2007).

The findings also suggest that class size relates not only to note quantity but also to note length and writing style. As class size increases, note size and note Grade Level Score decrease and note Reading Ease Score increases; that is, students and instructors tend to write shorter notes with a simpler vocabulary in larger classes. The reason is unclear: one possibility, as some interviewees stated, is that students only have a certain amount of time to read and write notes. When they are facing information overload, they have less time to think about using more academic words and writing longer notes. They choose a simpler vocabulary and write shorter notes in order to dialogue. Several students report that when they “are competing” for participation marks in a larger class, they pay more attention to their numbers of notes and choose easier ways to convey their ideas than to write longer notes with more academic phrasing. Instructors, accordingly, also write more, shorter notes as the number of students increases in a class. However, the Reading Ease Score and Grade Level Score of instructors’ notes do not change significantly as class size increases. Consequently, when class size increases, it
influences students’ note writing behaviors more. A large number of classmates appear to “force” students to write shorter notes to save time and to “beat” their classmates in number of notes for participation marks. With limited time spent on a larger number of notes, note quality can decline.

To some extent, the instructors seem to believe that the more notes the students write, the more productive the class discussion will be and the more the students will learn. In the small classes in this study, sometimes less information is produced and the discussion tends to slow down, especially when instructors do not participate actively. Thus, instructors’ participation becomes even more important in small classes. Strategies instructors adopt to encourage note writing and keep the class discussion going may not always work as intended. For example, some instructors require a minimum number of notes from each student. However, some students say that they try to exceed the minimum requirement for postings only in order to secure a good participation mark. Such note-writing behaviour may reduce the quality of the note, which then does not contribute much knowledge to the learning community but adds to information overload.

Information overload is also correlated with improper contents and lengthy notes, because it relates to the time it takes to read a note. Discussions are arguably helped by shorter and to-the-point notes. Long rambling notes tend to lose readers and confuse the discourse. Especially in larger classes, some students report that when they open a lengthy note with copy-and-paste lengthy contents, an off-topic note, or a note like a mini-essay, they tend to skim it without really reading it carefully or skip it.

The findings also suggest that frequency of instructors’ note writing is associated with students’ note-writing activities. Instructors often find it hard to draw a line between participating too much and not enough. Instructors’ not writing many notes is perceived as
“absence” by students. It tends to discourage students’ note writing and even stop the discourse. Some students complain that their instructors ‘disappear’ this way sometimes, especially in smaller classes or subgroups, even though the instructors are actually reading the students’ notes; they just don’t respond too much. This perception is another reason for instructors to write more in small classes. Otherwise, the discussion tends to slow down or stop due to the lack of stimuli and the students’ perception that the instructor is neglectful. Students feel that instructors, in addition to reading notes or facilitating the discussion, should “teach” by writing a proper number of notes to “lead the discussion” instead of just giving answers to questions or not participating. But it can also be a problem if instructors are “too active” in writing. Some instructors feel that very active note writing (e.g., answering most questions) is perceived as their “dominating the discussion”. If instructors do dominate discussions, the students tend to respond to their instructors more than to their peers, thereby, losing opportunities to collaborate with their peers, especially in larger classes, and perhaps even halting the discussion. Instructors find different ways to participate in discussions by writing notes. For example, some write comment notes, bridge ideas by writing convergent notes, summarize at the end of a session, or guide students to take over and summarize the discussions. Instructors’ summary notes are welcome because they help students get a whole picture of the issues under discussion.

The study also finds that note-writing assessment can powerfully encourage and guide students’ note-writing activities, affecting how students interact. Some instructors assess students’ participation by requiring a certain number of notes (usually two to three) weekly, though some students do not feel comfortable at “being forced to write”. Some instructors count the total number of notes students write and give a specific mark for that. However, any quota system sometimes produces excess note writing to gain participation marks, with concomitant decline in
quantity and meaning. In contrast, some instructors assess note writing by quality, monitoring the content of students’ notes. These instructors value notes in which students have put a lot of thought and which have advanced the discussion. This study suggests that setting requirements for high quality notes will help in reducing information overload, particularly in larger classes. Nevertheless, most students feel that standards for high-quality notes are not as objective as judging by number of notes, and often involve unclear requirements or rubrics. To avoid bias, most of the instructors assess students’ note writing by both quantity and quality, with a rubric heavily oriented toward quality. This method appears to be more effective. However, this study finds that most instructors’ assessment of note writing has not taken class size into consideration.

5.1.2 Advantages and Disadvantages of Each Group Configuration

Most of the participants believe that it is a very effective strategy to interweave whole-class discussions with subgroup discussions in order to reduce overall information overload in large classes while providing more opportunities for interaction. The present literature review reveals no standard rubric on group configuration strategies and optimal group size for online graduate-level conferencing. Vrasidas and McIsaac (1999) reported in their study of online courses that “Participants felt that four students were not enough to engage in a productive asynchronous discussion” (p. 30). In the present study, group sizes vary from three to eight students, according to the numbers of students and of groups in a class. The participants largely perceive a group of four or five students as an ideal group size, though some participants prefer groups of six to eight for diversity and richer information. Instructors who taught more than nine years online, and who divide their classes into subgroups, believe that group stimuli and energy decide the ideal group size, that is, the group size should encourage effective collaborative
discourse and knowledge building. These instructors have developed strategies to facilitate small group discussions.

### 5.1.2.1 Small Whole-Class Discussion (Small Configuration)

Whole-class discussions in Small configuration have a ‘read higher percentage of notes’ advantage than discussions in Large and Group configurations. Students in small classes feel that they face less information overload due to the small total number of notes. Thus, they miss less information and can spend more time on writing longer notes of higher quality. Both students and instructors notice that their contributions count for more in the small class; thus, both have more sense of accountability. Most students feel that Small configuration enhances social presence; hence, it allows them to know each other better and have coherent discussions. Instructors find it easier for marking, checking participation, and getting to know students.

However, small classes have fewer students and may lack diversity of experiences and background knowledge. Instructors notice a consequent lack of stimuli in Small configuration, which makes it difficult to interest students and encourage their input into discussions. Both students and instructors in Small configuration write fewer notes on average than in Large or Group configurations, thus they produce comparatively less information to read, particularly given that even in Small configuration some instructors and students do not read all notes. Although they read a higher percentage of notes (80 % of 427 notes, which approximates to 333 notes), students in Small configuration receive comparatively less information than students in Large configuration (61 % of 1296 notes, about 917 notes) or in Group configuration (55 % of 1454 notes, about 910 notes). As a consequence, most students in Small configuration feel discouraged about the limited topics and information. Some complain that they have not learned much; others find it hard to find a middle ground in discussions, and may stop posting or even
drop the course. It seems that they miss the more intense interaction and wider diversity of Large and Group configurations. Hence, Small configuration seems to require both instructors and students to contribute more to keep a discussion going. In Small configuration, instructors’ contributions count for a very high percentage of the total information as compared with Large or Group configurations. I hypothesize that this may be due in part to the lack of diverse student expertise. Conversely, in small class discussions an instructor’s “absence” is more likely to inhibit or even halt the discussion, thus potentially discouraging students from taking online courses in future.

**5.1.2.2 Large Whole-Class Discussion (Large Configuration)**

The statistical analysis made it obvious that both students and instructors read and write more on average in Large configuration. However, notes in Large configuration are shorter in length and lower in Grade Level Score than notes in Small configuration. As one instructor states, it is a little less difficult for instructors in Large configuration to get students to post since participation is usually compulsory, “forcing” everyone to find their voice in a large crowd. Participants who favor Large configuration argue that more students of more diverse backgrounds provide richer information, which benefits discussion. Three of the 10 instructors interviewed adopt a large whole-class discussion strategy for this reason, hoping to give their students the freedom to choose whichever topics they want and opportunities to respond to issues that interest them. The rich information, diversity of thought and expertise in Large configuration may make it easier for students to find peers with the same interests or in the same fields. In addition, students apparently receive more information; in the study, each student in Large configuration read 917 notes on average, though this represents only 61 percent of the total number of notes.
Despite such advantages, most students and instructors report unpleasant experiences in Large configuration. The majority of participants report that Large configuration has received more complaints about information overload than Small or Group configurations. Students complain that it is difficult for them to read all notes and to follow branching discussion threads in Large configuration. In fact, they skip reading 39 percent of the total notes, tending to choose topics and select authors they like to read or respond to. Letting students choose to read whichever notes interest them may result in their missing important information. Those instructors who adopt Large configuration for discussions would be surprised to know that their students read a much lower percentage (61%) of total notes written in the class than they do (80%). Most students in Large configuration admit that sometimes they skim or skip some notes to save time for writing. This strategy can help them get higher participation marks and build their status in Large configuration, as Hewitt et al. (2007) hypothesized. Some students, unable to follow what is going on in a mass discussion, might get disheartened and give up. Thus, information overload in Large configuration has a deleterious influence on student learning and poses a great threat to successful collaborative learning. Large configuration also increases instructors’ workload, especially writing load. Tomei (2006) has correctly asserted that “distance education demands more of an instructor’s available time than the more traditional classroom delivery method,” a view increasingly shared by online educators and evident in my study. The more students a class has, the larger the total number of notes in that class will be, and the more notes the instructors will have to respond to. In searching for “a leader” in Large configuration discussions, students tend to build on the instructors initial notes.

Moreover, large whole-class discussion appears to give rise to other problems. Some students feel that it inhibits efficient, in-depth discussions because of repetitiousness or irrelevant
“branching out” off topics. Since some instructors assess students’ note writing by number of notes contributed, many students appear compelled to write numerous but less thoughtful notes. Some instructors still assume that large whole-class discussions provide diverse ideas, but these instructors fail to foresee that the large amount of information may bring about overload or unfocused discussions. They fail to take into account that the amount of information students can absorb, organize and comment on is limited by the time available. The findings suggest that focused, in-depth discussions play a far more important role in students’ learning than shallow ones.

The multiplicity of students may make it difficult for any students to establish leadership in Large configuration. Consequently, there may be either overt or silent conflicts to establish dominance, where some students “run the show” while others stop participating. The tendency in Large configuration is for “a polarization to occur with some members talking a great deal while others seldom speak” (Garvin, 1981, p. 79). Generally, the interviewees sensed that in Large configuration students may not be able to collaborate because that dilution of social presence makes it difficult to get a sense of people in the class. It tends to be more difficult for instructors to check or assess student participation. It can be easier for some students to hide or loaf, and easier for others to dominate the discussion.

5.1.2.3 Large Classes with Subgroup Discussion (Group Configuration)

Both the quantitative and qualitative data analyses disclose some striking advantages of the subgroup discussion strategy. Students hold positive attitudes towards their subgroup discussion experiences. Instructors who use subgroup discussion find it an effective strategy. Most instructors who have never adopted subgroup strategy also admit that subgroup discussion has its advantages.
Both students and instructors feel that subgroup discussions encourage participation because the students are “forced to talk”; it is difficult to hide in a small group. Students are more likely to write in small groups, thus they post even more notes in total than they do in large whole-class discussions. Students’ contributions account for a larger proportion (92 %) compared to instructors (8 %) in Group configuration as opposed to Large (87 % vs. 13 %) and Small (84 % vs. 16 %) configurations. However, dividing students into subgroups does not significantly change note size and note Grade Level Score compared with note size and note Grade Level Score in Large configuration. Instructors find it easier to check participation in subgroups as well. In addition to an overall class-size effect, there appears a strong indication that the performance of shy and minority students is enhanced in the small group setting. They may be able to “lead discussion” in subgroups. This outcome is also statistically confirmed in a study of face-to-face classes (Finn & Achilles, 1990). When students are really pushed for time they can alter their schedule and pay attention to their subgroup discussion only. Subgroups may also allow students to write their own opinions in their own groups even though similar opinions might be repeated in other groups. Thus, they can open opportunities for all students to start talking, thereby diminishing depersonalization and deindividuation and helping break the authority structure in discourse.

Most students appear to be in favor of subgroup discussions because it reduces the information overload caused by large whole-class discussions; they attribute this reduction to there being fewer notes to read. They find it easier to read everybody’s responses in smaller groups, so they can follow the entire discussion more easily and have more time to think about what they have read. Instructors utilize the subgroup strategy to make sure that students are not overwhelmed by too many notes and to avoid a lot of branching threads within the discussion.
The statistical analyses reveal that when in Group configuration students concentrate on their own groups and hence read a lower percentage of notes (55%) than when in Large configuration (61%). Some students suggest a better time to break up large classes for subgroup discussions is in mid-term, when students start to feel information overload.

Students feel that in Group configuration they receive more information than in Small configuration. They say they have the possibility to read many more notes and are exposed to more diverse interests and topics in subgroups than in Small configuration. Students in a subgroup, with fewer students than in a small class, still tend to write more, perhaps because smaller groups “bring pressure on members to participate” (Garvin, 1981, p. 79). Sitting at one “table” with their subgroup members in a large virtual classroom, students may feel that they need to participate actively to establish their status both in their subgroup and in the whole class. This dual incentive may explain why participants in Group configuration produced more notes on average than those in Small configuration. In addition, in a small class, the learning community is restricted to the six to 11 students, who will interact with each other for the whole course. In a large class divided into subgroups, group members can be switched around, so as to finally interact with everyone. Therefore, students in subgroups can read as many different views as in a large class and still have subgroup discussions with four or five group mates at certain times.

Serendipitously, this study reveals that students in subgroup discussions can gain ideas from reading notes in other groups. In most large classes, students work primarily in their home subgroups, the idea being to avoid information overload. However, they are in no way prohibited from participating in the discourse in other groups. The interviews report that most students visit other groups. Even if instructors assign students the same readings and questions, subgroups tend to follow their own directions of thought. Students “overhear” another subgroup going very well
may get ideas that help their own subgroups. They also have access to diverse ideas and opinions in other subgroups that can trigger new topics or threads in their home subgroup.

The interviews also reveal that subgroup discussions benefit large whole-class discussions. Small groups, as Stahl (2006) believes, “are most effective at building knowledge if members share interests but bring to bear diverse backgrounds and perspectives” (p.360). Instructors can divide a large class into subgroups, and assign topics and tasks that produce different insights the subgroups can then contribute to the whole-class discourse. Therefore, subgroup discussions are no longer only subgroup discussions per se, but rather building blocks for whole-class learning. Most student participants agree that they collaborate on tasks in depth with their subgroup peers and share the resulting insights with the rest of the large class. Most of the students feel that sharing is valuable and that subgroup and whole-class discussions benefit each other. Subgroups can post their viewpoints in whole class forum and invite feedback. Additionally, instructors can pick out some particularly valuable subgroup insights into important topics “in public” views to get some cross fertilization among subgroups.

Some of the instructors and students feel that using subgroups leads to more focused, in-depth discussions, because it is easier to maintain a shared focus in a subgroup without the distractions and confusions of whole-class discussions in large classes. In one student’s words, discussions in subgroups tend to be more focused and go a little deeper rather than covering more ground.

Some of the interviewees find that using online subgroups allows instructors to supervise all subgroups at any time and to supervise “behind the scene”. In face-to-face subgroup discussions instructors can only sit in on one group at a time. Online subgroup discussions make it easier for instructors to keep track of participation and arguments. Besides, there are no obvious interruptions
from instructors’ participation or observation as there are in face-to-face classes. In fact, the statistical analyses show that instructors’ direct participation drastically decreases during subgroup discussions. According to Miller and Benz (2008), ‘teacher talks little’ is a major characteristic indication of collaborative learning. In subgroup discussions, instructors initiate posting much less than they do in large or small whole-class discussions. Though it may decrease their writing load, this strategy may increase their reading load. “Leading from behind” (Storck & Storck, 2004) in Group configuration can increase opportunities for students to post. Unlike small whole-class discussions where instructors tend to dominate, subgroup discussions comprise more students’ contributions, which statistically make up a higher percentage of the discussion. Instructors find it more productive to merely guide students in subgroup discussions and point out directions. The student interviewees explain that instructors function mainly as facilitators for subgroups rather than as primary source of factual domain knowledge (Stahl, 2006); they let students take the lead. In Ikpeze’s (2007) words, “Such learning situations change the role of the instructor to a co-facilitator or co-learner and promote a more student-centered approach in which students become responsible for their own learning” (p. 384). Putting students in subgroups each with a student facilitator can help manage the quantity and quality of online discussions. As Wang et al. (2003) write, “Small group discussions facilitated by students and monitored by the instructor are necessary for building better social relationship and a sense of community” (p. 54). The instructors’ role at the beginning of subgroup discussion is to scaffold the group discourse; that is, to provide tasks, structure, guidance and support. As students learn how to direct their own collaborative discussions, many instructors gradually withdraw their support, “like the superstructure of scaffolding around a building under construction, which is removed when the building can stand on its own” (Stahl, 2006, p.296).
The interviews suggest that small group discussions enhance social presence and strengthen group cohesion. Subgroup discussions make it difficult for students to sit back or not to participate, because it is noticeable if a student does not participate. There is more peer pressure to contribute, because the students know that not contributing means letting their subgroups down. The students feel that they are more accountable as subgroup members. As one student said, one person missing may make a significant difference. In a subgroup of four students, one student represents 25 percent of that discussion, so that student’s absences or contributions are very important. More people take responsibility because everybody has a crucial role. Small groups, for example, of about four to eight members, can “demand and produce more intimacy than larger groups” (Garvin, 1981, p. 79). In this study, instructors who use the subgroup strategy intend to provide opportunities for students to intervene more and to provide more substantial input. The students report that they like the closer relationships in subgroups because they can interact more often and more comfortably.

Students feel that Group configuration, more than just serving as an instructional strategy, can also be a means of supporting collaborative discussion. Most of the students and instructors agree that smaller groups tend to be more collaborative and help collaboration more than large whole-class discussions. Students realize that they need to get to know group members before working collaboratively, because “everyone is from a different background bringing different sets of views to start with” (Murphy & Cifuentes, 2001, p. 293). In Large configuration that is never split into subgroups, students feel harder to get into that collaborative frame of mind unless instructors create small-group opportunities. The students agree that it is easier to achieve collaborative learning in subgroups. Because discussions in small groups tend to be dialogic (Wells, 1999), the students feel encouraged to communicate with their subgroup peers as
individuals and develop their interpersonal skills. These exchanges can help them greatly reduce their dependence on their instructors.

Despite the many obvious advantages of subgroup discussions, this study finds some disadvantages as well. The instructors who do not adopt a subgroup strategy have a common concern about the limited diversity of interests and knowledge in subgroups. On the one hand, the small number of members might limit the information to which the members have access; on the other hand, a lack of common interest and knowledge in a subgroup might make it difficult to establish a common ground for discussion. One student says that domination by one or two members is more prevalent in a subgroup than in large whole-class situation. Some other students find it harder to break down domination in their subgroup discussions because of the limited choice of peers to talk to and the phenomenon of “early-bird” domination. Although they prefer to stay in more focused discussions in their own subgroup, some students worry about missing information in other groups when they do not have time to visit or visiting is forbidden. Despite the fact that instructors tend to read more notes and the highest percentage of notes in Group configuration, some students think instructors should have more presence in subgroups in order to establish clear guidelines or expectations for subgroup discussions. Quite a few student interviewees complain about their “absent” instructors, who may in fact be “supervising behind the scene” quietly and invisibly without commenting much.

In general, the findings strongly imply that the advantages of the subgroup discussion strategy outweigh its disadvantages. Most of the participants, especially the students, have a favorable attitude toward subgroup discussions, especially when they are integrated into large whole-class discussions.
5.1.3 The Role of Class Size and Group Configuration in Student Learning Experiences

Because students are the ultimate learners, I chose 12 graduate students as main participants in this study. These students help the study assure at an essential finding that students in different sizes of classes experienced different learning processes. This notion has been widely expressed but with little evidence in the research literature. However, analyses of both quantitative and qualitative data in this study provide evidence that both class size and group configuration affect students’ learning experiences. Their feedback and opinions are essential and pertinent. Most new online students start with the illusion that online courses need less time. That might be true for a class in Small configuration in this study, in which information is limited to about 360 notes on average plus course reading materials. However, the knowledge students gain from such courses restricted to the background knowledge of the limited number of members. The students feel the varied backgrounds of their peers contribute to more diverse discussions and learning experiences. They favor being exposed to more ideas than would have been possible with a more homogeneous small learning community (Robertson, 2007). However, complaints about information overload come mainly from large whole-class discussion as well. In the study, students in Large configuration have workloads of reading more than 1700 notes on average plus course reading materials. As a result, they complain that it is impossible for them to digest the huge amount of information in large classes. Some of them feel lost in the crowd. Thus, most students report that they have frustrating and exhausting learning experiences in large whole-class discussion. Students welcome the design of subgroup discussions embedded in large classes, because it allows them more interactions with their peers and an escape from mass, large whole-class discussion. They feel less frustrated when having more intimate, more focused discourse in small groups. They may experience the formation of a
sense of online learning community among members (Dawson, 2006; Shea, Sau Li, & Pickett, 2006; Rovai, 2002; Ball Foundation, 2002).

5.1.4 The Role of Instructor Teaching Strategies in Different Class Sizes and Student Learning Experiences

This study finds that students’ learning experiences vary with instructors’ online teaching strategies in different sizes of classes. The 10 instructors interviewed adopt different strategies due to their experiences with different sizes of classes. Small whole-class discussion works well and receives positive reflections from students, according to one instructor who has taught only small classes in her five years of online teaching experiences and consequently can maintain the strategy of whole class discussions. One new instructor has whole-class discussions in her large online class and is distressed that there are more dropouts than in her face-to-face classes. She has never thought of utilizing the subgroup strategy, because she does not have solid information about the different workloads in different sizes of classes. She plans to use large whole-class discussions again in her next online course. She says she has noticed that her one-on-one note responding practice in large whole-class discussions has weakened student participation. She also notices that in her large class students tend to have fewer opportunities to “talk” with their peers or to initiate discussions. Three instructors use the large whole-class discussion strategy for its benefits of diversity. These three instructors usually have large classes. Their strategy is to let students choose which notes to read or respond to. Two of them have not thought of dividing students into subgroups; while one feels that subgroup discussions might limit students’ exposure to diverse ideas. Students in large classes like theirs complain about information overload more. Five out of the 10 instructors interviewed use the subgroup strategy to reduce information overload in large classes and to provide students with small intimate learning environments. Before the interviews (in 2006), all of these five instructors taught online graduate-level courses
with different class sizes for more than nine years; among them are pioneers in online teaching at the institute and in the world. On the basis of their years of online teaching experiences, when they have small classes, they usually adopt a whole-class discussion format and participate more actively as a member in the class. When they have large classes, they usually introduce the class members and course contents in whole-class settings. Later, for certain weeks they divide students into subgroups, aiming to promote focused, in-depth discussions. The subgroups’ insights input back to benefit large whole-class discussions. To preserve the advantages of diversity in large classes, they rotate the students through different subgroups and make the subgroup discussions public to the whole class. When assigning students to subgroups, they group or mix students with different skills, professions, gender and characters. They allow students to choose subgroups on the basis of topics, contents or interests. Their students appreciate the strategies these instructors use to deal with reading and writing loads in different sizes of classes, reporting that their learning experiences are thereby made more satisfactory.

5.1.5 The Role of Class Size and Group Configuration in Online Cooperation and Collaboration

This study reveals that cooperative learning is more frequent than collaborative learning in online courses, especially for projects. Some of the instructors feel that cooperative learning sets the foundation for later collaborative learning. This finding confirms Paulus’s (2005) statement: “groups chose to cooperate more than collaborate, with application task groups taking a significantly more cooperative approach and synthesis task groups a significantly more collaborative approach” (p. 111). However, some participants say that participants’ reading course materials and contributing their thoughts without building on each other’s notes constitutes a kind of cooperative discussion. Yet, some instructors do not agree with this notion due to the lack of “the co-thing”. A common agreement from the interviews is that discussions
are usually an “embedded” process where cooperation contains collaboration. Sometimes the two terms are used interchangeably (Hutchinson, 2008). Henri (1995) argues that participation does not equal interaction. Social interaction is common to both cooperation and collaboration, but is a key characteristic to collaboration (Biggs & Collis, 1982; Coleman, 1995; Hathorn and Ingram, 2002a). Thus, intense interaction is a very important indicator of collaboration (O’Donnel & Sansereau, 1992; Bielaczyce & Collins, 2006; Harasim, 1990; Guzdial, 1997). However, this study discloses that true collaboration defined by Rochelle and Teasley (1995) rarely occurs in online discussions because of many factors, a major one being class size. Gunawardena et al. (1997) find that students’ perception of their interactions in the learning community affect student learning and community building. Successful collaboration is based on coherence and harmony in the learning community.

Since the purpose of collaborative groups is to achieve consensus and shared classroom authority (Bruffee, 1999), individual accountability becomes central to ensuring that all the participants in the group develop by learning collaboratively (Hutchinson, 2008). Students are responsible for their own learning as well as for the achievement of their peers (Abrami and Bures, 1996). The basic tenet of social constructivism is that knowledge is constructed through social interaction and collaboration with others, generated, established, and maintained by a community of knowledgeable peers (McDonald & Gibson, 1998). Research findings have proved that group collaboration allows group members to solve problems that require access to knowledge beyond that of any particular member (Faidley, et al, 2000; Biemans & Simons, 1995). Group processing provides group members with the procedures for analyzing the functioning of their group and their own use of interpersonal and small group skills (Waggoner, 1992). A group can construct knowledge that no one individual could have constructed alone by
a synergistic effect that merges ideas from different individual perspectives (Stahl, 2006). In this study, students who report high levels of interaction with their classmates also report higher levels of satisfaction and higher levels of learning from the discourse (Swan, 2001). Without interdependence, there can be no collaboration (Palloff & Pratt, 1999), and ultimately no community (Murphy & Cifuentes, 2001). This study provides evidence that, whether in mass discussions in large classes or in slow discussions in small classes, “when students do not receive feedback, they do not continue to post messages” (Vrasidas & McIsaac, 1999, p. 33). In a small class with insufficient information and stimuli, or in a large class with information overload, it can be difficult to gain the desired coherence and harmony in a learning community.

Collaboration can be especially difficult when classes are large (Miller & Benz, 2008). Therefore, in this study the analysis of class size can lead to “an evaluation of the levels of collaboration at work among learners” (Henri, 1995, p. 128). Evidence from this study suggests that an optimal class size tends to facilitate collaboration. The efficacy of collaborative learning depends on the complex interactive environment between three components: the individual participants, the small groups in which they become closely involved, and the larger learning communities (classes) in which they participate in.

It could be argued that successful participation in discourse in large classes is heavily influenced by group configuration. Students in large whole-class discussions often feel lost and frustrated by information overload. Hathorn and Ingram (2002b) identify group size as a context variable that may impact collaborative outcomes. Stahl (2006) provocatively states that “small groups are the engines of knowledge building”. Yukawa (2006) stresses that “collaborative learning practice is the promotion of group discourse” (p. 28). Gill (2006) surmises that when “employed creatively, a properly designed discussion group” (p. 382) allows collaboration. The
evidence from this study indicates that large classes with subgroup discussions receive more notes written and fewer complaints of information overload. Most of the student participants agree that these small group discussions tend to be more collaborative.

5.2 Recommendations

The findings suggest that not all instructors and students may notice the impact of group configuration in online learning, though some of them have realized the impact of class size. Nevertheless, some instructors still tend to use the same ways they have been teaching for years. Consequently, many online courses designed as collaborative learning environments are not effective due to the failure to consider class size and group configuration. Some experienced online instructors do utilize effective strategies but keep these stored in their own mental “attics” rather than broadcasting them to benefit more online instructors and students. As a result, online students, especially new ones, tend to participate in discussions mechanically without noticing that some of the problems they encounter may be caused by improper class size and group configuration. In the literature on online learning, there is a lack of research on these factors. The results from this study suggest some instructional strategies and technological changes that may help remedy problems relating to class size and group configurations in online graduate courses.

5.2.1 Instructional Strategies

There is a growing tendency for instructors who previously taught face-to-face classes to teach online with insufficient knowledge of online teaching. Moore and Kearsley (1996) found that some “distance education courses were developed and delivered in a very piece-meal and unplanned fashion” (p. 6). A similar situation still exists. The literature review for this study finds no set of principles or detailed guidance for instructors and students to cope with different situations and workloads in different sizes of online classes. We need to build pedagogy or
instructional strategies to enhance the online educational experience for instructors and students alike (Xu, & Morris, 2007). There follow some preliminary recommendations for instructional strategies based on the findings from this study.

*Pre-informing Participants*

This study suggests when pre-informed of possible reading and writing workloads and other issues that might arise due to class size, students and instructors can learn or teach better. Many students may experience course load anxiety. New students are more likely to be dissatisfied when attempting their first online course (Wuensch, et al., 2008; Neuhauser, 2004). They need to know how to identify the dynamic group learning processes (Nevgi, et al., 2006) and workloads. This study suggests that instructors should emphasize the effects of class size while informing students about their workloads. They need to make their intentions and strategies obvious to the students. Pre-assessing students before they register for or at the beginning of an online course may provide instructors with knowledge of their students’ previous online learning experiences (Milligan & Buckenmeyer, 2008; Barnard, et al., 2007) and skills. It may also provide students with an initial understanding of the expectations placed on them. The research indicates the need to assist students in learning self-regulatory strategies in online learning environments (Barnard, et al, 2007). Orientation video or audio clips and detailed rubrics may help address advantages and disadvantages of different class sizes and group configurations. Tutorials seem necessary to provide instructors and students with information about possible problems due to class size. Instructors need open discussion forums to exchange their experiences and strategies. It can be beneficial to collect and assemble sets of instructional strategies for instructors’ reference. There should be a place, such as a blog, for both senior and junior online instructors to share their experiences and insights on how to overcome problems they have encountered due to class size. It
can be a forum where students can provide their feedback and insights from their online learning experiences. It can also be a forum where instructors and students meet to discuss issues arise.

**Providing Proper Guidance**

This study suggests when their instructors guide them properly, students can learn better. Instructors’ presence and facilitation affect how students interact (Dennen, 2007). Instructors “cannot expect the groups to manage themselves without appropriate guidance in the first instance” (Hutchinson, 2008, p. 357). This study shows evidence of students orienting toward instructors more often in small or large classes rather than to their peers as the primary audience for their contributions, particularly where formal assessment is involved (Dennen, 2006; 2007). Instructors’ pre-structuring discussions can significantly increase the number of times students challenge each other (Brooks & Jeong, 2006). However, scripting collaborative interactions involves the danger of the instructor providing too much or too little guidance (Hamalainen, et al., 2006). Proper instructor participation may reduce students’ anxiety about being left to continue the discussion on their own (Maurino, 2007), especially in subgroups. This study suggests that instructors direct students to visit other subgroups in order to get more diverse opinions on the discussion topics or assign a student to summarize their group’s findings in order to achieve higher levels of knowledge construction (Schellens, et al. 2007; Hutchinson, 2008). The participants regard instructor summary notes as guiding students more effectively in large whole-class discussions. Proper instructor presence is seen to play a key role in subgroup discussions. “Supervision behind the scene” needs to become “visible” to let students know that instructors are reading their notes. Instructors need to recognize the interplay of learning at the individual, subgroup, and class levels. Even if allowing students to self-organize subgroup discussions, instructors still need to guide the subgroup discussions in order to support and direct
the knowledge-building process on both the individual and group levels within the whole-class context.

**Assigning Appropriate Workloads**

This study suggests when the information produced in a class is manageable, students can learn better. Both the quantitative and qualitative data analyses suggest that the instructors’ expectations for students’ participation need to be adjusted to fit different class sizes in order to achieve effective collaborative discourse. Requiring a certain number of notes each week seems a necessary but not sufficient way to stimulate note writing in all sizes of classes. This study suggests that the required number of notes should be higher in Small configuration than in Large configuration in order to guarantee participation and class energy. Notes in Small configuration can be expected to be better-quality and be longer. The percentage of notes students are required to read should be adjusted according to class size and the amount of information produced. It is unrealistic to ask students to read 100 percent of notes in a large class (more than 1700 notes on average in this study); however, it is reasonable to suggest that students read all notes in a small class (approximately 360 notes on average). How instructors evaluate students’ note writing in whole-class and subgroup discussions should be stated clearly in course rubrics and standards. It may be more satisfactory to assess note writing by both quantity and quality, with an emphasis on quality. Requiring high-quality notes may reduce information overload and achieve better discussions. Standards should set out how to write “good” notes with proper length and “come-to-the-point” contents. Examples of “good” and “bad” notes will help guide students to write properly.

**Segmenting the Semester**
This study suggests when instructors segment the semester to achieve different goals and to meet different needs, students can learn better. Usually, at the beginning of a semester instructors tend to use whole-class discussions to meet diverse participants and to get diverse ideas. After four to six weeks, slow discussion might start in small classes. Instructors’ participation becomes more important and strategies to encourage students’ participation are needed. Meanwhile, mid-semester is often a time when students start complaining about information overload in large configuration. Subgroup discussion provides one strategy to reduce information overload and to create an intimate environment for collaboration. Small group discussions “mediate between the individuals and the community, providing a manageable social setting for students learning interaction skills” (Stahl, 2006, p.296). Instructors can then combine whole-class and subgroup discussions to reduce information overload and bring insights back to the whole class. Particularly, at the end of a semester, instructors should get students back to the whole class to summarize the course.

**Utilizing Multimedia Technologies**

This study suggests when using multimedia to reduce information overload and to solve problems due to text-only communication, students can learn better. Large class size plus text-only communication causes heavy workloads of note reading and writing. Current technologies still cannot support large whole-class synchronous communication with audio or video functions. However, it can be helpful to use audio and video clips to introduce the course and the weekly discussion topics. Students can use pictures to get to know their classmates, especially in large classes, in order to humanize the learning environment. It is possible to employ free software with audio and video functions to support small-group synchronous dialogues on a more humanize and intimate scale. Small-group video conferencing may serve the purpose of a
“blended” discussion combining face-to-face and online discussion practices. Computer-based multimedia can support collaborative discussions and reduce information overload in large classes.

Creating Coherent Environments

This study suggests when class size is appropriate to support a coherent learning environment, students can learn better. Findings from this study suggest that a class of 13 to 15 students is an ideal size. Instructors may need strategies to manage classes smaller or larger than the ideal size in order to achieve collaborative discourse. In small classes, keeping all students in one group may increase participant accountability and encourage participation to compensate for the lack of information and thus support a coherent learning environment. In larger classes, dividing students into subgroups appears an effective strategy to create opportunities for coherent discussion environments. Numerous studies indicate that the desired effects of small group discussion often fail to emerge (Schellens, et al, 2007) and the failure is more likely to occur on a social rather than a technical level (Gunawardena, 1995). Increasing discussion-group effectiveness may require instructors to identify principles for effective management of online collaborative groups (Hutchinson, 2008), strategies for organizing classroom processes and course designs (Gill, 2006), and “a collaborative learning environment with interpersonal and group dynamics” (Cox & Cox, 2008, p. 553). To encourage collaborative discussions, “instructors need to facilitate the adaptive functions and minimize the destructive functions of the group individuation process” (Smith, 2005, p. 196). One suggestion from this study is when they divide large classes into subgroups, instructors should target topics and tasks to generate insights in the small groups that can be brought back to contribute to whole-class discussions. The problem of group formation is one of the first issues (Stahl, 2006). Strategies suggested by
this study are: assigning students to subgroups; allowing students to choose groups on the basis of topics; combining both or using multiple methods; mixing students with different characters, skills, professions or gender; rotating group members; allowing moves; and making subgroup discussions public to the whole class. Convergent notes will help in bridging multiple subgroup discussions in large classes to achieve coherence in the large classes.

**Enhancing Individual Learning**

This study suggests that when the course design and instructional strategies target individual learners, students can learn better. Individual learners are nested in groups (Poole et al., 1999), in which, ideally, the individuals will bring their own unique knowledge and perspectives to construct knowledge in a collaborative learning environment (Puntambekar, 2006), since learning involves “both a personal construction of meaning and a socially negotiated meaning” (Ikpeze, 2007, p. 386). However, “ultimately it is individuals who learn, not groups” (Brookfield, 1986, p. 60). Gill (2006) argues that for any discussion group to succeed, it requires the sense that one’s contribution to the “pool of knowledge” will not put the individuals at a disadvantage in their learning. Schellens et al. (2007) point out, “Research on collaboration has largely neglected the importance of the individual and his or her characteristics” (p. 226). An et al. (2008) surmise that “the lack of individual accountability may be a more serious problem in online environments, since students are not always exposed to the pressures and responsibilities of group based work found in face-to-face environments” (p. 67).

To move toward collaboration, “assessments would require targeting to both individual and shared components of work.” (Puntambekar, 2006, p. 349) Although there are demands that the higher-level processes of collaboration need to be more explicitly and effectively promoted (Murphy, 2004), many educators seem to overlook the basic fact: The major function of
collaboration is to provide individual learners a learning environment where they learn from their peers (Smith, 2005). Focusing on only one level at a time seems problematic, because cross-level interactions can influence the outcome (Hox & Kreft, 1994). Theoretical positions about the unit of learning — whether based on shared cognition (Resnick, Levine, & Teasley, 1991) or distributed cognition (Solomon, 1993) — take on values along a continuous spectrum from individual to group. No one can deny that individual learners care more about what they can learn from the course and what they can apply in their future work. Collaborative group experiences should demonstrate dynamics and processes that are characteristic of both individual development and group development (Ikpeze, 2007; Smith, 2005). The group-as-a-whole is a way to conceptualize the collaborative group as an entity that grows and develops much like the individual group members (Smith, 2005), moving from knowledge assimilation to knowledge construction (Brescia, et al., 2004). Students feel that group discussion should enable individuals to coordinate different points of view so as to promote shared knowledge construction (McKnight, 2000). Thus, instructors need to maximize the opportunities for individual students to construct their own meanings in learning environments where they can benefit from group discourse. Ultimately, the ideal class size or group size is one that serves the purpose of supporting individual learning. The quantity and quality of note writing should be designed to benefit individual learners who have different interests as well as to allow learning in the group. Requiring students to write a certain number of notes based on course reading materials may create a collection of ideas that leads to “cooperative discussions”. This strategy guarantees participation and takes a necessary first step towards collaborative learning.

The synergy of collaboration may arise from the tensions among different perspectives and interpretations. Each discussant develops an individual interpretation of the meaning of the
discourse (Stahl, 2006). Knowledge construction occurs both collaboratively and cooperatively. Allowing “cooperative discussions”, cooperation in the group fashion, can bridge individual understanding and knowledge building in a learning community. Ideally, students can self-regulate their discussions and participate actively in a collaborative manner. Realistically, requiring students to read a certain percentage of notes and respond to a certain number of peers each week can be a strategy to “force” students to initiate collaborative discourse. It also avoids the problem of students’ loafing or hiding from the discussions in large classes. Asking students to write convergent notes can lead students to read notes in related discussions. Assigning students to summarize subgroup discussions will help individual students gain an overall view of the discourse. Appointing students as discussion leaders in subgroups may help students learn better through “leading discussions”.

In conclusion, we need to take class size into consideration rationally and place more emphases on effective student learning with appropriate strategies. Any instructor who is blind to this point may pay a heavy price: their students’ failures in online learning.

5.2.2 New Software Features

Educational researchers need to find technologies which best contribute to making online learning effective (Xu and Morris, 2007). Hutchinson (2008) suggests that “the more effective deployment of existing technologies may be part of the solution” (p. 357). Software WebKF has “Who has read this note?” feature designed to help students check who has read their notes. It aims to provide instructors with a way to check students’ participation as well. However, the large classes in this study produced more than 1700 notes on average. Students find it difficult to open and check all notes to see who has read a note. To make participation-checking convenient and transparent, Janssen et al. (2007) suggest some kind of visual record of participation. My
suggestion would be to make “Who has read this note” function obvious beside or underneath
the note title by designing a feature similar to the rating marks on some customer service
websites. For example, marks such as ***** can be used to show how many participants have
read the note or the percentage of participants who have read the note. A different mark such as *,
representing instructor note reading, can signal instructor presence and help students notice that
their instructors “are listening” to their discussions.

In large classes in this study, students only read on average 60 percent of the notes
produced. It would be helpful to create functions to let students choose which note to read: for
instance, searching (by key words or topics), browsing (for notes in other groups), checking
(note length), marking (important convergent or summary notes), filtering (by topics), tailoring
(references or quoted contents) and linking (convergent notes). These functions may help
students choose the important notes to read, produce higher quality notes and reduce information
overload. It would also be helpful to create a function to check workloads in a class and the
percentage of notes that class members have read.

The majority of online education systems are still mainly text-based (Wuensch et al.,
2008). Advanced multimedia applications, such as graphs, audio, and video are less frequently
used. Some instructors suggest a movement “from e-learning to m-learning” using streaming
synchronous audio and video technologies (Keegan, 2002). Haley et al. (2008) publish a
practitioner's guide to creating online courses, including actual examples of multimedia support,
aimed to help instructors build successful online courses. Heavy reading and writing loads in
large classes in this study may be reduced by creating functions using audio and video
technologies or by creating links to ‘invite’ existing computer-based multimedia technologies.
Threaded discussion has the advantage that it can be implemented in large classes (Miller & Benz, 2008). However, threaded discussion and chat systems are often used for the relatively superficial exchange of opinions rather than deep, interactive knowledge building (Stahl, 2006). Hewitt’s recent research (2005) suggests that traditional threaded computer-conferencing software lacks critical supports for knowledge building and promotes diverging, add-on style discourse rather than the more sophisticated operations, such as synthesis, required for progressive knowledge work. Further, Suthers et al. (2008) find that users of knowledge maps elaborate and converge more than users of threaded discussions, suggesting greater collaboration. In large classes, the large number of threads, with some accidental thread initiation, makes threaded discussions even more superficial. Thus, it may be helpful to create features for divergent links to categorize notes. An obvious mark or bold key words in the title for the start note of a thread or major branch-outs might help avoid accidental thread initiation.

Computational support could further strengthen a group’s ability to construct and refine their understanding or theories (Stahl, 2006). Kimmerle and Cress (2008) believe that “group-awareness information is only available via technical support” (p. 57). Buder and Bodemer (2008) design a group awareness tool to support small-group discussion. Nevgi et al. (2006) create a test system consisting of two measures to assess the effectiveness of group discussion processes. Monahan et al. (2008) create a Collaborative Learning Environment with Virtual Reality — group meeting rooms for real-time group collaboration with text and voice chatting. Janssen et al. (2007) find that visual media encourage more equal participation in a group. However, current technologies still cannot support large-scale synchronous video conferencing, especially when class size is too large. Creating effective technical support and models for small-group synchronous discussions using video can be a realistic solution. One suggestion is to make the
best use of existing technologies (e.g., Webinar) that support small-group synchronous video conferencing (Wang & Hsu, 2008). Doing so can increase real-time collaboration between learners, especially when integrated into courses that are otherwise asynchronous (Beldarrain, 2006). Video and audio clips can reduce reading and writing loads and enhance social presence in asynchronous conferencing in both large classes and subgroups. Some researchers (e.g., Beldarrain, 2006) suggest using wikis, blogs, and podcasts to foster student interaction in online learning. However, instructors should take into consideration that extensive text-based add-on blogs and wikis to the main forum discussion might increase information overload. Any of these various functions and steps to subgroup collaborative discussions should be embedded in courseware and be automated, as Mowbray (2007) suggests.

### 5.3 Limitations

Some experts (e.g., Green et al., 2006) stress the advantages of utilizing mixed methods in educational research. The mixing of methods in this study yields converging findings, which aid my interpretations in complementary ways. Such complementary functions underscore the interdependence of quantitative and qualitative methods for asking questions and understanding meaningful processes and themes (Greene & Caracelli, 1997). Generally speaking, the samples for both quantitative and qualitative data in this research are large enough for a dissertation study. Apart from the availability and reliability of data from the institute WebKF database, the study assumes that the institute has a relatively strong claim to represent graduate-level online education in the world. However, due to the limitations of dissertation research, this study has only explored the impact of class size and group configuration from the participants’ practices and their experiences. Reading the data may lead to an understanding of the impact of class size and group configuration on student learning experiences. Nevertheless, since the samples for
both quantitative and qualitative methods are collected from one institute, the generalization of
the conclusions to worldwide CMC graduate-level classes needs to be approached cautiously. It
can be difficult to justify studies restricted to an individual institute.

Less than ideal data extraction is one constraint this study encountered. Specifically, the
data on note reading and note opening are not ideally accurate. For the purposes of this study,
students who “opened” a note on their computer screen are considered to have “read” the note.
A note “saved” is counted as one written note regardless of how many times it is edited.
Obviously this is not an ideal metric for studying note reading and writing, because students can
open a note for viewing without fully reading it or edit a note several times with new ideas.
Nevertheless, this is a necessary limitation of the study, since it is impossible to determine with
the current software whether a student actually reads a particular note or what contents are added
after a student edits a note many times. To improve on this situation, future researchers could
consider appropriate data extraction to achieve more precise note-opening, note-reading, and
note-editing records.

What also clouds the conclusions is the permeability of the research findings from this
study. Many factors contribute to the success of online learning. Online class size and group
configuration are only two of them, though this study finds these two factors play important roles
in online graduate-level discourse. While confirming a number of hypotheses, this study still
leaves some questions unanswered, due to less than ideal data extraction, limited scope of
research, and temporal and fiscal constraints. It is hoped that persons or organizations with better
financial resources will do more exhaustive studies to further explore the relationships indicated
in this study.
5.4 Conclusions

This study explores class size and group configuration in online learning in more detail than other studies, which tend to leave some of the most intriguing aspects as mysteries. The findings have illuminated some effects of class size and group configuration on online graduate-level conferencing. They provide information about note-reading and note-writing loads in different sizes of classes and the relationships between group configuration and participants’ practices and sense of online discourse. Closely examining workloads and relationships is a necessary way to understand the impact of various types of discussion groups on individual learning. As a result, I cast subgroup discussion in a distinctive light as particularly relevant to collaborative discussion and learning.

The findings point to class size as a major factor affecting note reading and writing. When class size is too small, students may have access to insufficient information. Not being heavily loaded with reading, they can afford the time to write longer, more thoughtful notes. Yet, due to course members’ limited background knowledge and the shortage of stimuli in the class, small-class discussions may tend to be slow. The instructor’s participation usually determines whether a small-class discussion will be successful or not. As class size increases, note reading load for both students and instructors increases greatly. When class size increases beyond an optimal size, information overload may start and students’ complaints arise. Instructors’ note reading activities in larger classes are not obviously seen; therefore, some students think that their instructors often are not participating in discussions, especially in subgroup discussions. As class size increases, note-writing load increases accordingly. Both students and instructors tend to write more notes of shorter length and with fewer academic words. Discussions appear to approach to a dialog. Instructors’ responding to notes appropriately often seems to encourage
students’ note writing. Assessment of note writing has an impact on quantity and quality of student note-writing behaviors. Different class sizes can play an important role in students’ learning experiences and the amount of knowledge the students learn. Instructors’ teaching experiences in different sizes of classes lead to their developing different strategies to cope with different class situations, which then may affect students’ learning experiences. Finally, the study reports that class size and group configuration affect how collaborative the online discourse becomes: larger groups tend to be more cooperative and less collaborative.

This study finds that splitting classes into subgroups serves as a strategy to reduce information overload and to encourage focused, in-depth small group discussions. Instructors who utilize this subgroup discussion strategy have developed some strategies of how to divide students into subgroups and how to supervise the discussions from behind the scene. All three configurations — large whole class, small whole class, and large classes with subgroups — have their own advantages and disadvantages. However, the advantages of subgroup discussions outweigh those of the Small and Large configurations. Group configuration into proper-size groups may reduce students’ reading load and inspire their note writing. This study suggests that Group configuration can encourage collaborative online discourse. It appears not true that the smaller the class size is, the merrier the class discussion will be. It seems also not true that the larger the class size is, the disastrous the class discussion will be. Optimal class size and group size, and effective strategies such as appropriate group configuration, contribute to more interactive and productive online conferencing.

Many factors affect the success of online graduate-level discourse; class size and group configuration are only two of them. This dissertation does not provide final answers to some questions or define recipes for instructional design. Rather, it opens up a suggestive window by
pointing out practices and opinions from some representative participants. I hope it contributes in some modest measure to future success in understanding, supporting, and engaging in effective online graduate-level discourse, and that its fundamental conclusions hold true not only for online courses in the institute examined but also for online courses in many other institutes.

5.5 Recommendations for Future Research

Online education will continue to shape the way some people learn in the 21st century (Wuensch, et al, 2008). While e-learning systems have improved with time, they still have some problems that need to be resolved in order to achieve a truly stimulating and realistic learning experience (Monahan, et al, 2008). The findings from this study may have implications for both practitioners and researchers. They could serve as a base for researchers to further explore the issue of class size and seek optimal ways of group configuration to achieve more fruitful online conferencing.

Nevertheless, a number of concerns suggest a variety of additional questions for further research. There is a need to clarify the definition and processes of effective online collaboration in order to support productive subgroup discussions. There is a necessity to research systematic applications of existing theories of learning to guide graduate-level online discourse, especially in subgroup discussions. Another area requiring further research concerns further exploration of other potential technologies to support collaborative online discussions.

The current study has the virtue of accounting and explaining the macro-scale data analysis from one institute. Constrained by the complex nature of online learning, it can draw conclusions. The findings might not cover any problem of variations in individual student’s behavior or might contain some individual biases. Further studies are needed. Such studies would allow a fruitful scrutiny of particular ways of looking at class size and group configuration.
in different aspects. Thus, one possibility would be to look at the issue in a macro context by inviting more samples from other institutes globally. Conversely, another possibility is to explore the issue from a micro perspective at the single class level. If a large-scale study supports the present findings, then a follow-up single case study may consider testing them in one select class and its subgroups in order to examine students’ experience more closely. Much could be gleaned from comparing weeks with subgroup discussions and weeks with whole-class discussions as well.
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Appendix A: Ethical Review Statement

This statement is for the ethical review of my research titled The Relationship between Group Divisions and Note Reading, Note Writing, Discussion Thread Development, and Instructional Design of Group Discussions in Online Conferencing. The first phase of this research involves an online course data analysis, which is based on my supervisor Jim Hewitt’s research project approved in July 2004 with reference number #12127.

Computer mediated conferencing is no longer a new topic. Many researchers have done a lot of in-depth studies on online participation, online learning strategies, online collaboration and knowledge building. However, not many researchers have analyzed online course databases to explore the relationship between group divisions (whole class discussion and subgroup discussions) of online courses and the students’ note reading, note writing and discussion thread patterns. It is hypothesized that information overload caused by larger groups has a negative impact on participation patterns. This research will produce objective research results to prove or reject the research hypotheses. Using software SPSS and S-Plus for quantitative data analyses, the research results of this phase will be displayed in tables and advanced graphs to effectively display the research findings.

All data generated during this study will remain confidential. The data extraction process (see #12127) ensures the anonymity of the data. Neither the students’ and instructors’ names nor the names of the courses will be displayed or used in the published study. All datasets are numerical and anonymous. There will be no risk to anyone since the research involves the analysis of the anonymous data. Only my supervisor, Dr. Jim Hewitt, and I will have access to the primary numerical and anonymous data. All data will be destroyed once the study is concluded.

Sincerely,

Mingzhu Qiu
Appendix B: Ethics Protocol

* This Ethics Protocol extends approved Ethics Protocol # 15566 (Oct. 6, 2005), by adding an interview component.

1. Background, Purpose, Objectives

Computer mediated conferencing is no longer a new topic. Many researchers have done a great deal of in-depth study on online participation, online learning strategies, online collaboration and knowledge building. However, not many researchers have examined the effects of class size and group divisions in online conferencing courses. My dissertation will explore theories and methods concerning online discussion group divisions. I will compare the research results from quantitative analyses of WebKF (Web Knowledge Forum) databases with the results from the qualitative grounded theory study to answer the following research questions: How do different group divisions and class sizes affect student participation in online discussion? How do instructors and students experience differences in class sizes and group divisions? What group sizes appear to be optimal?

2. Research Methodology

Mixed methods research produces both objective and subjective research results by capitalizing on the advantages of both quantitative and qualitative research methodologies. The sequential mixed methods approach is employed in this study, in which the researcher systematically uses the quantitative research paradigm for the first phase of the research study and the qualitative research paradigm for the second phase. Based on the previous quantitative study, the qualitative study in this mixed methods research will be conducted as an in-depth follow-up. Grounded theory approach will be adopted to provide in-depth perspectives from graduate students with online learning experience and instructors with online teaching experience. The software NUD*IST (version 6) and Nvivo will be used for qualitative interview transcript data analyses. The researcher will study the results from both quantitative data analyses of the databases and qualitative interviews and find out the answers to the research questions.
3. Participant
Participants (10 graduate students and 3 instructors) in this research will be graduate students with online learning experiences and instructors with online teaching experience using the software package WebKF.

4. Recruitment
Participants will be recruited to participate through individual agreement on a voluntary basis. The participants are graduate students taking OISE/UT online courses with WebKF. They can be first time WebKF users or experienced online learners with WebKF. The researcher will not approach individuals directly, or go to any classes to recruit participants. Instead, the researcher will advertise online for participation to recruit volunteers. The researcher will tell the participants the background, the goal and the objectives of the research, the methodology used in this research, the basic principles of the research, and how they and others will benefit from the research. If the participants feel that they would like to help in the research, the researcher will ask the interview participants to read the information letter and the consent form first and ask the participants to sign the consent form as an agreement between the researcher and the participants. There is no risk involved in participating in this research.

5. Risks and benefits
There will be no risks for participants in this research. Participants may request a copy of the summary of the study, and may of course access the entire dissertation once it is published as they wish.

6. Privacy and confidentiality
All data generated during this study will remain confidential. Student names will be replaced with codes or pseudonyms. Neither the participant names nor the names of their workplace will be used in the published study, and only the researcher, Mingzhu Qiu and her supervisor Dr. Jim Hewitt will have access to the primary data. All data, including audiocassettes, will be destroyed once the study is concluded. Participants will be free to raise questions or concerns with the researcher Mingzhu Qiu and her supervisor Dr. Jim Hewitt throughout the study, and may
withdraw at any time if they choose. They will be informed under no obligation to agree to participate in the interviews.

7. Compensation
Participants will not be compensated for their participation in this research.

8. Conflicts of interest
There are no conflicts of interest in this research.

9. Informed Consent Process
An information letter and a consent form will be included with this protocol. The participants will read the information letter and the consent form before they participate in this research. Before they sign the consent form, the participants will have an opportunity to ask questions or request clarification through e-mail or phone calls.

10. Scholarly review
Not applicable (Risks are minor.).

11. Additional ethics reviews
Additional ethics reviews will not be necessary.

12. Contracts
There will be no contracts under this research.

Student Investigator’s Signature: ____________________

Date: ______________
Appendix C: Interviewee Recruitment Notice

February, 2006

Research Study Participants Needed

I am a PhD student at OISE/UT, working on my dissertation under the supervision of Professor Jim Hewitt. I am conducting a research study titled A Mixed Method Analysis of Class Size and Group Divisions in Online Conferencing Courses.

I invite you to participate in this study. Your participation is going to help generate a more in-depth understanding of online course group divisions and students’ note reading, note writing, discussion thread development and instructional design of group discussions in online conferencing. Your online teaching or learning experiences will help answer the following research questions: How do different group divisions and class sizes affect student participation in online discussion? How do instructors and students experience differences in class sizes and group divisions? I am inviting you to assist me by agreeing to participate in the research study. During that time, I will be asking you, at a time convenient for you, to conduct a one-on-one interview that will last about 30 minutes. The interview will be tape-recorded. It will focus on your online learning experience relating to group divisions and note reading, note writing, discussion thread development and instructional design of group divisions in online conferencing.

Thank you for your consideration. Please contact my supervisor or me with any concerns you may have at:

**Principal Investigator**
Name: Mingzhu Qiu
Tel: 
Email: 

**Project Supervisor**
Name: Jim Hewitt
Tel: 
Email:
Appendix D: Ethical Information Letter

Information Letter

Date:

Dear Sir/Madam,

I am a PhD student at OISE/UT, working on my dissertation under the supervision of Professor Jim Hewitt. I am conducting a research study titled A Mixed Method Analysis of Class Size and Group Divisions in Online Conferencing Courses.

I invite you to participate in this study. Your participation is going to help generate a more in-depth understanding of online course group divisions and students’ note reading, note writing, discussion thread development and instructional design of group discussions in online conferencing. Your online teaching or learning experiences will help answer the following research questions: How do different group divisions and class sizes affect student participation in online discussion? How do instructors and students experience differences in class sizes and group divisions?

For these reasons, I am inviting you to assist me by agreeing to participate in the research study. During that time, I will be asking you, at a time convenient for you, to conduct a one-on-one interview that will last about 30 minutes. The interview will be tape-recorded. It will focus on your online learning experience relating to group divisions and note reading, note writing, discussion thread development and instructional design of group divisions in online conferencing.

All data generated during this study will remain confidential. Neither your name nor the name of your workplace will be used in the published study, and only my supervisor, Professor Jim Hewitt, and I will have access to the primary data. All data, including audiocassettes, will be destroyed once the study is concluded. You will be free to raise questions or concerns with Professor Jim Hewitt or me throughout the study, and may withdraw at any time if you choose. Please be assured that you are under no obligation to agree to participate in the interview.
Through your participation, you will be contributing to the research, which is intended to provide some findings on online course group divisions and students’ note reading, note writing, discussion thread development, and instructional design of group discussions in online conferencing. You may request a copy of the summary from the study, and may of course access the entire dissertation once it is published as you wish.

Thank you for your consideration. Please contact my supervisor or me with any concerns you may have at:

<table>
<thead>
<tr>
<th>Principal Investigator</th>
<th>Project Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: Mingzhu Qiu</td>
<td>Name: Jim Hewitt</td>
</tr>
<tr>
<td>Tel:</td>
<td>Tel:</td>
</tr>
<tr>
<td>Email:</td>
<td>Email:</td>
</tr>
</tbody>
</table>

Sincerely,

Mingzhu Qiu
Appendix E: Consent Form

Consent Form

I, _________________________, agree to take part in the research study titled A Mixed Method Analysis of Class Size and Group divisions in Online Conferencing Courses.

I understand that, as a participant in the study, I will be participating the interview and answer questions. The interview will take about 30 minutes and will occur at a time and place that is convenient for me.

I understand that I am under no obligation to agree to participate in the interview. I understand that I may refuse to answer any questions, to stop the interview at any time or withdraw from the study at any time for any reason. I understand that my specific answers and comments will be kept confidential. I understand that neither my name nor the name of my workplace will be identified in any report or presentation, which may arise from the study. I understand that only the principal researcher and her supervisor will have access to the information collected during the study. All data, including audiocassettes, will be destroyed once the study is concluded.

The information gained from this study will help both researchers and education professionals better understand the relationship and patterns between group divisions and online course note reading, note writing, discussion thread development, and knowledge building in OISE/UT online. I understand that a summary of the findings of the study will be sent to me, and that if I wish I might upon request obtain a copy of the dissertation in full.

I understand what this study involves and agree to participate. I have been given a copy of this consent form.

________________________________________  ______________
Signature                                      Date

If you have any questions or concerns about this study, please contact the investigators:

Principal Investigator  Project Supervisor
Name: Mingzhu Qiu         Name: Jim Hewitt
Tel:                     Tel:
Email:                   Email:
Appendix F: Interview Questions (for students)

1. Do you prefer to participate in asynchronous discussions in a small whole class (5 to 14 students), in a large whole class (16 to 26 students), or in a large class (more than 21 students) broken down into small groups (3 to 6 students) during certain weeks in online conferencing? Why?

2. Please describe personal online discussion incidents that you have experienced in a small whole class, a large whole class, and/or a large class with subgroup discussions. Have you experienced productive or frustrating incidents in large class discussions and/or in small group discussions in a large class? Please cite an instance or instances about your experiences.

3. Do you prefer to be a leader or a follower in leading discussion threads? Why? When and how often do you prefer to lead discussions? When and how often do you prefer to follow discussions?

4. What do you think instructors expect students to do when the large classes are divided into subgroup discussions? What did your instructor(s) do to help group discussions? What change could your instructor(s) make to help you be more successful in group discussions regarding to discussions in different sizes of classes?

5. How did your instructor divide the whole class into subgroups when there were subgroup discussions? What do you feel are the better ways to divide students into smaller groups that will perform more effectively in online discussions?

6. What did you do to help your group discussions? What can you do to help better group discussions if you have next time? How did you and your group members work as a group in group discussions, cooperatively, collaboratively, or both? How?

7. Which happens more often in your online learning, cooperative learning or collaborative learning? Which do you feel is more effective in online discussions? Is this relating to class sizes and group divisions? Why?

8. Have you found any differences between face-to-face small group discussions in a large class and online small group discussions in a large online class? Do you prefer to lead discussions in a face-to-face class or an online class? Why? Do you prefer to lead discussions in face-to-face small group discussions or online subgroup discussions? Why? Which helps discussions more? Which helps cooperative learning and collaborative learning more? Why?

9. Is there anything else relating to online group discussions that you would like to share?
Appendix G: Interview Questions (for instructors)

1. As an instructor, do you prefer to divide a large whole class (more than 21 students) into subgroup discussions (with 3 to 6 students) during certain weeks or to keep the large class as whole class discussions for a whole term? Why?

2. Please describe personal online discussion incidents that you have experienced in a small whole class (5 to 14 students), a large whole class (16 to 26 students, or more), and/or a large class (more that 21 students) with subgroup discussions (3 to 6 students). Have you had productive or frustrating experiences teaching in small group discussions in a large class? Please describe your experience.

3. As an instructor, do you prefer to start discussion threads or to follow the discussion threads started by students? Why? When and how often do you prefer to lead discussions? When and how often do you prefer to follow discussions?

4. What do you expect your students do when the large class is divided into subgroup discussions? What did you do with your students in subgroup discussions? As an instructor, what can you do to help better group discussions in your next online course?

5. What did you do to help your students in their group discussions? What change would help your students to be more successful in group discussions regarding to discussions in different sizes of classes?

6. How did your students work as a group in group discussions more often, cooperatively or collaboratively? How? Why? In courses you taught, which happens more often, cooperative learning or collaborative learning? Which do you feel is more effective in online discussions? Is this relating to class size and group divisions? Why?

7. How did you divide your classes into group discussions when there were subgroup discussions? What do you feel are the better ways to divide students into smaller groups that will perform more effectively in online discussions?

8. Have you found any differences between face-to-face small group discussions in a large class and online small group discussions in a large class? Do you prefer to lead discussions in a face-to-face class or an online class? Why? Do you prefer to lead discussions in face-to-face small group discussions or online subgroup discussions? Why? Which helps discussions more? Which helps cooperative learning and collaborative learning more? Why?

9. Is there anything else relating to online group discussions that you would like to share?
Appendix H: Descriptions of the 14 Variable Dataset Derived from the Original 25 Courses

The following table lists the variables in the set of 14 variables derived from the original datasets and specifies each variable’s type, format, and permissible values (and, where appropriate, what those values mean).

<table>
<thead>
<tr>
<th>Variable Number</th>
<th>Variable Name</th>
<th>Variable Label</th>
<th>Variable Description</th>
<th>Variable Type and Format</th>
<th>Permissible Values</th>
</tr>
</thead>
</table>
| v1              | Class Type    | Class Type     | The Three Types of Classes | Numeric | 1 = a large class with subgroups  
|                 |               |                |                      |                          | 2 = a large whole class  
|                 |               |                |                      |                          | 3 = a small whole class  |
| v2              | Class ID      | Class ID       | Classes’ ID Number   | Numeric |                         |
| v3              | Participant ID| Participant’s ID | Participant’s ID Number | Numeric |                         |
| V4              | Participant Type | Type of Participant | Types of Participant | Nominal | S = Student  
|                 |               |                |                      |                          | I = Instructor     |
| V5              | Gender        | Gender of Participant | Gender of Each Participant | Numeric | 1 = Male  
|                 |               |                |                      |                          | 2 = Female         |
| V6              | Total Number of Notes Written | Total Number of Notes Each Participant Wrote | The Total Number of Notes Written by Each Participant | Numeric |                         |
| V7              | Avg. Note Size | Average Size of a Note Written | Average Size of a Note Written by a Participant | Numeric |                         |
| V8              | Notes Read    | Total Number of Notes Each Participant Read | The Total Number of Notes Each Participant Read | Numeric |                         |
| V9              | Avg. Size of Notes Read | Average Size of Notes Read | Average Size of Notes Each Participant Read | Numeric |                         |
| V10             | Threads Initiated | Total Number of Threads Initiated by Each Participant | The Total Number of Threads Initiated by Each Participant | Numeric |                         |
| V11             | Max. Thread Length | Maximum Length of the Longest Thread Initiated by Each Participant | The Maximum Length of the Longest Thread (with the most number of buildon notes) Initiated by Each Participant | Numeric |                         |
| V12             | Total Notes in Threads | Total Number of Notes Built on Each Participant’s Threads | The Total Number of Notes Built on Each Participant’s Total Number of Threads | Numeric |                         |
| V13             | Grade Level Score | Average Grade Level Score of Notes | Average Grade Level Score (Flesch-Kincaid Grade Level Scores) of Notes | Numeric |                         |
| V14             | Reading Ease Score | Average Reading Ease Score of Notes | Average Reading Ease Score (Flesch-Kincaid Reading Ease Scores) of Notes | Numeric |                         |
## Appendix I: A List of Extra Tables

### Table I 1

Percentage of Notes Read, Average Number of Notes Read, or Total Number of Notes Read by a Participant, a Student, or an Instructor in the 25 Courses

<table>
<thead>
<tr>
<th>ID</th>
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<th>Whole Class</th>
<th>Students</th>
<th>Instructors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Size</td>
<td>%</td>
<td>Avg.</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>325</td>
<td>5</td>
<td>83.45</td>
<td>271.20</td>
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<tr>
<td>2</td>
<td>8</td>
<td>344</td>
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<td>79.44</td>
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<td>8</td>
<td>298</td>
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<td>727</td>
<td>7</td>
<td>75.14</td>
<td>546.29</td>
</tr>
<tr>
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<td>75.94</td>
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<td>276.40</td>
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<td>66.73</td>
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<td>49.16</td>
<td>575.69</td>
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<td>17</td>
<td>56.78</td>
<td>916.41</td>
</tr>
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<td>19</td>
<td>1146</td>
<td>18</td>
<td>67.68</td>
<td>775.56</td>
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<td>19</td>
<td>1128</td>
<td>18</td>
<td>57.83</td>
<td>652.33</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1993</td>
<td>18</td>
<td>58.54</td>
<td>1166.78</td>
</tr>
<tr>
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<td>20</td>
<td>1308</td>
<td>19</td>
<td>59.74</td>
<td>781.42</td>
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<tr>
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<td>1597</td>
<td>19</td>
<td>54.26</td>
<td>866.53</td>
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<tr>
<td>23</td>
<td>20</td>
<td>2194</td>
<td>19</td>
<td>57.74</td>
<td>1266.89</td>
</tr>
<tr>
<td>24</td>
<td>21</td>
<td>1525</td>
<td>20</td>
<td>57.06</td>
<td>870.10</td>
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<tr>
<td>25</td>
<td>22</td>
<td>1404</td>
<td>21</td>
<td>55.80</td>
<td>783.48</td>
</tr>
</tbody>
</table>

*Note. ID = Class ID. Size = Total number of participants, students, or instructors in a class. All Notes = All notes written in a class. % = Percentage of the average number of notes all participants, students, or instructors read in each class. Avg. = Average number of notes all participants or students read in each class. Total = All notes instructors read in a class.*
Table I 2

Correlation Coefficients between Class Size and Note Reading Activities

<table>
<thead>
<tr>
<th>Change of Note Reading</th>
<th>Differences</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>average total number of notes each student read</td>
<td>.777***</td>
<td><em>p</em> &lt; .001</td>
</tr>
<tr>
<td>average total number of notes each instructor read</td>
<td>.902***</td>
<td><em>p</em> &lt; .001</td>
</tr>
<tr>
<td>% of notes each student read in a class</td>
<td>-.801**</td>
<td><em>p</em> &lt; .01</td>
</tr>
<tr>
<td>% of notes each instructor read in a class</td>
<td>.367</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Note. *N* = 25

** *p* < .01. Correlation is significant at 0.01 alpha levels (two-tailed).

*** *p* < .001. Correlation is significant at 0.001 alpha levels (two-tailed).

Table I 3

Correlation Coefficients between Student and Instructor Note Reading Activities

<table>
<thead>
<tr>
<th>Change of Note Reading</th>
<th>Differences</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>total number of notes students and instructors read</td>
<td>.929***</td>
<td><em>p</em> &lt; .001</td>
</tr>
<tr>
<td>% of notes students and instructors read in a class</td>
<td>.055</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Note. *N* = 25

*** *p* < .001. Correlation is significant at 0.001 alpha levels (two-tailed).

Table I 4

Percentage of Notes Written, Average Number of Notes Written or Total Notes Written by All Participants, Students, or Instructors in 25 Courses

<table>
<thead>
<tr>
<th>ID</th>
<th>Size</th>
<th>Total</th>
<th>Avg.</th>
<th>Size</th>
<th>%</th>
<th>Total</th>
<th>Avg.</th>
<th>Size</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>325</td>
<td>54.17</td>
<td>5</td>
<td>74.15</td>
<td>241</td>
<td>29.00</td>
<td>1</td>
<td>25.85</td>
<td>84</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>344</td>
<td>43.00</td>
<td>7</td>
<td>81.40</td>
<td>280</td>
<td>40.00</td>
<td>1</td>
<td>18.60</td>
<td>64</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>298</td>
<td>37.25</td>
<td>7</td>
<td>88.93</td>
<td>265</td>
<td>37.86</td>
<td>1</td>
<td>11.07</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>727</td>
<td>90.88</td>
<td>7</td>
<td>91.20</td>
<td>663</td>
<td>94.71</td>
<td>1</td>
<td>8.80</td>
<td>64</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>247</td>
<td>30.88</td>
<td>7</td>
<td>82.19</td>
<td>203</td>
<td>29.00</td>
<td>1</td>
<td>17.81</td>
<td>44</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>462</td>
<td>51.33</td>
<td>8</td>
<td>89.39</td>
<td>413</td>
<td>51.63</td>
<td>1</td>
<td>10.61</td>
<td>49</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>456</td>
<td>50.67</td>
<td>8</td>
<td>76.32</td>
<td>348</td>
<td>43.50</td>
<td>1</td>
<td>23.68</td>
<td>108</td>
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</tbody>
</table>
### Table I 5

**Average Size, Reading Ease Score, or Grade Level Score of Notes by a Participant, a Student, or an Instructor in the 25 Courses**

<table>
<thead>
<tr>
<th>ID</th>
<th>Whole Class</th>
<th>Students</th>
<th>Instructors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Size</td>
<td>Ease</td>
<td>Grade</td>
</tr>
<tr>
<td>1</td>
<td>484.29</td>
<td>44.12</td>
<td>15.50</td>
</tr>
<tr>
<td>2</td>
<td>329.14</td>
<td>53.80</td>
<td>12.29</td>
</tr>
<tr>
<td>3</td>
<td>340.85</td>
<td>41.54</td>
<td>12.64</td>
</tr>
<tr>
<td>4</td>
<td>168.81</td>
<td>58.88</td>
<td>8.95</td>
</tr>
<tr>
<td>5</td>
<td>391.37</td>
<td>50.84</td>
<td>11.06</td>
</tr>
<tr>
<td>6</td>
<td>308.38</td>
<td>52.18</td>
<td>10.55</td>
</tr>
<tr>
<td>7</td>
<td>304.11</td>
<td>50.69</td>
<td>11.11</td>
</tr>
<tr>
<td>8</td>
<td>175.21</td>
<td>60.24</td>
<td>9.12</td>
</tr>
<tr>
<td>9</td>
<td>477.28</td>
<td>47.67</td>
<td>11.52</td>
</tr>
<tr>
<td>10</td>
<td>254.90</td>
<td>50.17</td>
<td>11.33</td>
</tr>
<tr>
<td>11</td>
<td>199.57</td>
<td>57.28</td>
<td>9.88</td>
</tr>
<tr>
<td>12</td>
<td>204.48</td>
<td>47.47</td>
<td>11.41</td>
</tr>
</tbody>
</table>

*Note.* ID = Class ID. Size = Total number of participants, students, or instructors in a class. % = Percentage of the average number of notes all participants, students, or instructors wrote in each class. Avg. = Average number of notes all participants or students wrote in each class. Total = All notes students or instructors wrote in each class.
<p>| | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
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<td>12.31</td>
<td>223.38</td>
<td>43.82</td>
<td>12.52</td>
<td>155.77</td>
<td>57.36</td>
<td>9.01</td>
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</tr>
<tr>
<td>14</td>
<td>135.95</td>
<td>65.36</td>
<td>7.88</td>
<td>141.06</td>
<td>64.44</td>
<td>8.09</td>
<td>54.29</td>
<td>79.99</td>
<td>4.53</td>
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<td>15</td>
<td>264.79</td>
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<td>10.73</td>
<td>270.22</td>
<td>53.88</td>
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<td>177.93</td>
<td>51.61</td>
<td>11.79</td>
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<td></td>
</tr>
<tr>
<td>16</td>
<td>225.09</td>
<td>55.59</td>
<td>10.17</td>
<td>229.60</td>
<td>55.98</td>
<td>10.07</td>
<td>148.39</td>
<td>48.98</td>
<td>11.93</td>
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<tr>
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<td>9.76</td>
<td>186.28</td>
<td>56.47</td>
<td>9.82</td>
<td>227.81</td>
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<td>8.74</td>
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<td></td>
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<td>212.58</td>
<td>59.28</td>
<td>9.58</td>
<td>166.27</td>
<td>65.74</td>
<td>8.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>210.48</td>
<td>59.32</td>
<td>9.34</td>
<td>213.65</td>
<td>59.67</td>
<td>9.21</td>
<td>153.33</td>
<td>52.90</td>
<td>11.65</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>49.68</td>
<td>11.10</td>
<td>198.41</td>
<td>49.08</td>
<td>11.25</td>
<td>149.08</td>
<td>61.09</td>
<td>8.26</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>119.35</td>
<td>60.64</td>
<td>8.69</td>
<td>116.40</td>
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<td>166.63</td>
<td>53.58</td>
<td>11.28</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>10.60</td>
<td>183.62</td>
<td>54.71</td>
<td>10.60</td>
<td>178.00</td>
<td>55.61</td>
<td>10.61</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>235.47</td>
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<td>233.29</td>
<td>65.18</td>
<td>8.67</td>
<td>276.98</td>
<td>62.97</td>
<td>9.89</td>
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<td></td>
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<td>56.07</td>
<td>10.27</td>
<td>211.82</td>
<td>56.05</td>
<td>10.26</td>
<td>223.36</td>
<td>56.49</td>
<td>10.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>185.13</td>
<td>59.49</td>
<td>9.35</td>
<td>183.85</td>
<td>59.53</td>
<td>9.35</td>
<td>211.85</td>
<td>58.76</td>
<td>9.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. ID = Class ID. Size = Average note size by a participant, a student, or an instructor in a class. Ease = Note Reading Ease Score of notes by a participant, a student, or an instructor in a class. Grade = Average Note Grade Level Score of notes by a participant, a student, or an instructor in a class.

Table I 6

Correlation Coefficients between Class Size and Note Writing Activities

<table>
<thead>
<tr>
<th>Change of note reading, writing, and thread initiation</th>
<th>Differences</th>
<th>Sig. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>total notes by a student in a class</td>
<td>.498**</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>total notes by the instructor in a class</td>
<td>.554**</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>note size by students</td>
<td>-.613***</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>note size by instructors</td>
<td>-.365</td>
<td>n.s.</td>
</tr>
<tr>
<td>note Reading Ease Score by students</td>
<td>.517**</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>note Reading Ease Score by instructors</td>
<td>.041</td>
<td>n.s.</td>
</tr>
<tr>
<td>note Grade Level Score by students</td>
<td>-.555**</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>note Grade Level Score by instructors</td>
<td>.072</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Note. N = 25
* p < .05. Correlation is significant at 0.05 alpha levels (two-tailed).
** p < .01. Correlation is significant at 0.01 alpha levels (two-tailed).
*** p < .001. Correlation is significant at 0.001 alpha levels (two-tailed)
Table I 7

Correlation Coefficients between variables in Note Writing Activities

<table>
<thead>
<tr>
<th>Change of note reading, writing, and thread initiation</th>
<th>Differences</th>
<th>Sig. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>total number of notes by students and by instructors</td>
<td>.518**</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>average number of notes by students and note size by students</td>
<td>-.598**</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>total number of notes by instructors and note size by instructors</td>
<td>-.407*</td>
<td>p &lt; .05</td>
</tr>
<tr>
<td>average number of notes by students and Reading Ease Score</td>
<td>.640***</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>total number of notes by instructors and note Reading Ease Score</td>
<td>-.051</td>
<td>n.s.</td>
</tr>
<tr>
<td>average number of notes by students and Grade Level Score</td>
<td>-.584**</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>total number of notes by instructors and note Grade Level Score</td>
<td>.154</td>
<td>n.s.</td>
</tr>
<tr>
<td>note size by students and note Reading Ease Score</td>
<td>-.647***</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>note size by instructors and note Reading Ease Score</td>
<td>-.339</td>
<td>n.s.</td>
</tr>
<tr>
<td>note size by students and note Grade Level Score</td>
<td>.759***</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>note size by instructors and note Grade Level Score</td>
<td>.286</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Note. N = 25

* p < .05. Correlation is significant at 0.05 alpha levels (two-tailed).
** p < .01. Correlation is significant at 0.01 alpha levels (two-tailed).
*** p < .001. Correlation is significant at 0.001 alpha levels (two-tailed)

Table I 8

Multiple Regression Analysis to Test Hypothesis III (1)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>avg. notes written on avg. notes read (by a student )</td>
<td>.064</td>
<td>.007</td>
<td>.876***</td>
</tr>
<tr>
<td>avg. notes written on avg. notes read on class size (by a student )</td>
<td>-2.271</td>
<td>.650</td>
<td>-.458**</td>
</tr>
<tr>
<td>avg. notes written on avg. notes read ( by an instructor )</td>
<td>.095</td>
<td>.029</td>
<td>.567**</td>
</tr>
<tr>
<td>avg. notes written on avg. notes read on class size (by an instructor )</td>
<td>3.944</td>
<td>7.064</td>
<td>.225</td>
</tr>
</tbody>
</table>

* p < .05. ** p < .01. *** p < .001.

Table I 9

One-way ANOVA of Students’ Note Reading on Group Configuration to Test Hypothesis IV (1)

<table>
<thead>
<tr>
<th>Variable and source</th>
<th>SS</th>
<th>MS</th>
<th>F(2, 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>avg. total notes read</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>1888467.000</td>
<td>944233.545</td>
<td>20.964***</td>
</tr>
<tr>
<td>Within groups</td>
<td>990879.300</td>
<td>45039.970</td>
<td></td>
</tr>
<tr>
<td>% of notes read</td>
<td>2742.204</td>
<td>1371.102</td>
<td>29.911***</td>
</tr>
<tr>
<td>Between groups</td>
<td>1008.472</td>
<td>45.840</td>
<td></td>
</tr>
<tr>
<td>Within groups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>avg. note sizes read</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>82907.949</td>
<td>41453.974</td>
<td>7.835**</td>
</tr>
<tr>
<td>Within groups</td>
<td>116402.900</td>
<td>5291.042</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05. ** p < .01. *** p < .001.
Table I 10

*One-way ANOVA of Instructors’ Note Reading on Group Configurations to Test Hypothesis V (1)*

<table>
<thead>
<tr>
<th>Variable and source</th>
<th>SS</th>
<th>MS</th>
<th>F(2, 22)</th>
<th><em>p</em>&lt;.05, **p&lt;.01, ***p&lt;.001</th>
</tr>
</thead>
<tbody>
<tr>
<td>total Notes Read</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>5701735.000</td>
<td>2850867.680</td>
<td>50.974***</td>
<td></td>
</tr>
<tr>
<td>Within groups</td>
<td>1232836.000</td>
<td>56038.018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Notes Read</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>603.060</td>
<td>301.530</td>
<td>2.367</td>
<td></td>
</tr>
<tr>
<td>Within groups</td>
<td>2802.460</td>
<td>127.390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>avg. Note Sizes Read</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between groups</td>
<td>88571.370</td>
<td>44285.680</td>
<td>7.367**</td>
<td></td>
</tr>
<tr>
<td>Within groups</td>
<td>132254.600</td>
<td>6011.570</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05. **p < .01. ***p < .001.

Table I 11

*Independent-samples t-tests of Note Reading by Group Structure Indicator to Test Hypothesis VI (1)*

<table>
<thead>
<tr>
<th>Source</th>
<th>WM</th>
<th>WSD</th>
<th>GM</th>
<th>GSD</th>
<th>WM-GM</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>total notes a student read</td>
<td>616.88</td>
<td>352.92</td>
<td>872.43</td>
<td>250.81</td>
<td>-255.55</td>
<td>-1.863</td>
<td>.097</td>
</tr>
<tr>
<td>% of notes a student read</td>
<td>70.06</td>
<td>12.08</td>
<td>54.80</td>
<td>3.42</td>
<td>15.25</td>
<td>-4.913</td>
<td>.000***</td>
</tr>
<tr>
<td>total instructors read</td>
<td>752.40</td>
<td>487.43</td>
<td>1452.20</td>
<td>339.70</td>
<td>-699.80</td>
<td>-3.743</td>
<td>.005**</td>
</tr>
<tr>
<td>% of notes instructors read</td>
<td>79.85</td>
<td>12.00</td>
<td>92.05</td>
<td>4.23</td>
<td>-12.21</td>
<td>-3.717</td>
<td>.001***</td>
</tr>
</tbody>
</table>

Note. df (degree of freedom) = 23. WM = Means in classes without subgroups. WSD = Standard Deviation in classes without subgroups. GM = Means in classes with subgroups. GSD = Standard Deviation in classes with subgroups. *p < .05; **p < .01; ***p < .001; two-tailed.

Table I 12

*One-way ANCOVA of Average Number of Notes Read on Group Structure to Test Hypothesis VI (1)*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>2</td>
<td>1935381.820</td>
<td>967890.910</td>
<td>19.682***</td>
<td>.641</td>
</tr>
<tr>
<td>Intercept</td>
<td>1</td>
<td>78889.718</td>
<td>78889.718</td>
<td>1.605</td>
<td>.068</td>
</tr>
<tr>
<td>Class size</td>
<td>1</td>
<td>1626900.441</td>
<td>1626900.441</td>
<td>33.089***</td>
<td>.601</td>
</tr>
<tr>
<td>Small/Large classification</td>
<td>1</td>
<td>1081667.689</td>
<td>42443.929</td>
<td>.863</td>
<td>.038</td>
</tr>
<tr>
<td>Error</td>
<td>22</td>
<td>14554470.900</td>
<td>49166.713</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>3017049.508</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $R^2 = .641$ (Adjusted R Squared = .609) * p < .05. **p < .01. ***p < .001.
Table I 13

One-way ANCOVA of Percentage of Notes Read on Group Structure to Test Hypothesis VI (1)

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>2</td>
<td>2036.778a</td>
<td>1018.389</td>
<td>17.254***</td>
<td>.611</td>
</tr>
<tr>
<td>Intercept</td>
<td>1</td>
<td>12489.647</td>
<td>12489.647</td>
<td>211.603***</td>
<td>.906</td>
</tr>
<tr>
<td>Class size</td>
<td>1</td>
<td>1268.379</td>
<td>1268.379</td>
<td>21.489***</td>
<td>.494</td>
</tr>
<tr>
<td>Small/Large classification</td>
<td>1</td>
<td>21.147</td>
<td>21.147</td>
<td>.358</td>
<td>.016</td>
</tr>
<tr>
<td>Error</td>
<td>22</td>
<td>1298.529</td>
<td>59.024</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>118134.300</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $R^2 = .611$ (Adjusted R Squared = .575)

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table I 14

One-way ANOVA of Students’ Note Writing on Three Group Configurations to Test Hypothesis IV (2)

<table>
<thead>
<tr>
<th>Variable and source</th>
<th>SS</th>
<th>MS</th>
<th>F(2, 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>total notes written</td>
<td>Between groups</td>
<td>5915265.000</td>
<td>2957632.320</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>2021424.000</td>
<td>91882.891</td>
</tr>
<tr>
<td>avg. notes written</td>
<td>Between groups</td>
<td>5499.263</td>
<td>2749.632</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>10188.531</td>
<td>463.115</td>
</tr>
<tr>
<td>% of notes in a class</td>
<td>Between groups</td>
<td>165.919</td>
<td>82.959</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>840.022</td>
<td>38.183</td>
</tr>
<tr>
<td>avg. note size</td>
<td>Between groups</td>
<td>88872.708</td>
<td>44436.354</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>143880.200</td>
<td>6540.007</td>
</tr>
<tr>
<td>Reading Ease Score</td>
<td>Between groups</td>
<td>302.098</td>
<td>151.049</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>733.325</td>
<td>33.333</td>
</tr>
<tr>
<td>Grade Level Score</td>
<td>Between groups</td>
<td>19.629</td>
<td>9.814</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>52.777</td>
<td>2.399</td>
</tr>
</tbody>
</table>

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table I 15

One-way ANOVA of Instructors’ Note Writing on Three Group Configurations to Test Hypothesis V (2)

<table>
<thead>
<tr>
<th>Variable and source</th>
<th>SS</th>
<th>MS</th>
<th>F(2, 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>total notes written</td>
<td>Between groups</td>
<td>83567.240</td>
<td>41783.620</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>112201.000</td>
<td>5100.045</td>
</tr>
<tr>
<td>% of notes in a class</td>
<td>Between groups</td>
<td>165.967</td>
<td>82.983</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>840.137</td>
<td>38.188</td>
</tr>
<tr>
<td>avg. note size</td>
<td>Between groups</td>
<td>179330.500</td>
<td>89665.266</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>835679.700</td>
<td>37985.439</td>
</tr>
<tr>
<td>Reading Ease Score</td>
<td>Between groups</td>
<td>4.376</td>
<td>2.188</td>
</tr>
</tbody>
</table>

* $p < .05$. ** $p < .01$. *** $p < .001$. 
Within groups: 2305.795, 104.809
Grade Level Score
Between groups: 5.352, 2.676, .486
Within groups: 121.049, 5.502

\* p < .05, \*\* p < .01, \*\*\* p < .001.

**Table I 16**

Independent-samples t-tests of Note Writing by Group Structure Indicator to Test Hypothesis VI (2)

<table>
<thead>
<tr>
<th>Source</th>
<th>WM</th>
<th>WSD</th>
<th>GM</th>
<th>GSD</th>
<th>WM-GM</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>total notes a student wrote</td>
<td>62.53</td>
<td>26.90</td>
<td>76.28</td>
<td>17.19</td>
<td>-13.75</td>
<td>-1.408</td>
<td>.191</td>
</tr>
<tr>
<td>total notes an instructor wrote</td>
<td>126.50</td>
<td>99.24</td>
<td>131.60</td>
<td>46.21</td>
<td>-5.10</td>
<td>-1.168</td>
<td>.869</td>
</tr>
<tr>
<td>total notes all students wrote</td>
<td>830.20</td>
<td>559.87</td>
<td>1446.60</td>
<td>339.56</td>
<td>-616.40</td>
<td>-3.132</td>
<td>.010**</td>
</tr>
<tr>
<td>% of notes students wrote</td>
<td>85.78</td>
<td>6.69</td>
<td>91.81</td>
<td>1.67</td>
<td>-6.03</td>
<td>-3.607</td>
<td>.001***</td>
</tr>
<tr>
<td>% of notes instructors wrote</td>
<td>14.22</td>
<td>6.69</td>
<td>8.19</td>
<td>1.67</td>
<td>6.03</td>
<td>3.607</td>
<td>.001***</td>
</tr>
<tr>
<td>average note size</td>
<td>264.43</td>
<td>98.59</td>
<td>187.13</td>
<td>43.55</td>
<td>77.30</td>
<td>2.628</td>
<td>.019*</td>
</tr>
<tr>
<td>Reading Ease Score</td>
<td>52.98</td>
<td>6.21</td>
<td>59.20</td>
<td>4.07</td>
<td>-6.23</td>
<td>-2.720</td>
<td>.023*</td>
</tr>
<tr>
<td>Grade Level Score</td>
<td>10.81</td>
<td>1.66</td>
<td>9.53</td>
<td>.88</td>
<td>1.28</td>
<td>2.272</td>
<td>.035*</td>
</tr>
</tbody>
</table>

Note. df (degree of freedom) = 23. WM = Means in classes without subgroups. WSD = Standard Deviation in classes without subgroups. GM = Means in classes with subgroups. GSD = Standard Deviation in classes with subgroups.

**Table I 17**

One-way ANCOVA of Total Number of Notes Written on Group Structure to Test Hypothesis VI (2)

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>2</td>
<td>6757308.607*</td>
<td>3378654.304</td>
<td>27.888***</td>
<td>.717</td>
</tr>
<tr>
<td>Intercept</td>
<td>1</td>
<td>387166.365</td>
<td>387166.365</td>
<td>3.196</td>
<td>.127</td>
</tr>
<tr>
<td>Class size</td>
<td>1</td>
<td>5212259.607</td>
<td>5212259.607</td>
<td>43.023***</td>
<td>.662</td>
</tr>
<tr>
<td>Small/Large classification</td>
<td>1</td>
<td>24906.644</td>
<td>24906.644</td>
<td>.206</td>
<td>.009</td>
</tr>
<tr>
<td>Error</td>
<td>22</td>
<td>2665329.393</td>
<td>121151.336</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>38636663.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. R² = .717 (Adjusted R Squared = .691)

\* p < .05, \*\* p < .01, \*\*\* p < .001.

**Table I 18**

One-way ANCOVA of Average Number of Notes Written on Group Structure t Test Hypothesis VI (2)

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>2</td>
<td>5008.397*</td>
<td>2504.198</td>
<td>4.896*</td>
<td>.308</td>
</tr>
<tr>
<td>Intercept</td>
<td>1</td>
<td>674.391</td>
<td>674.391</td>
<td>1.318</td>
<td>.057</td>
</tr>
<tr>
<td>Class size</td>
<td>1</td>
<td>4393.406</td>
<td>4393.406</td>
<td>8.589**</td>
<td>.281</td>
</tr>
<tr>
<td>Small/Large classification</td>
<td>1</td>
<td>200.232</td>
<td>200.232</td>
<td>.391</td>
<td>.017</td>
</tr>
<tr>
<td>Error</td>
<td>22</td>
<td>11253.263</td>
<td>511.512</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>135474.414</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. R² = .308 (Adjusted R Squared = .245)

\* p < .05, \*\* p < .01, \*\*\* p < .001.