Students' Cultural and Personality Factors as Predictors of their Asynchronous Online Discussion Behaviours

by

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Abstract

This study investigated the predictive relationships between cultural/personality factors and online speaking behaviours. First, when reporting online discussion behaviours, previous studies often emphasized the collective group processes, minimizing the individual perspective within the group. The current study conceptualized and tested several individual communicative acts of online speaking behaviours as outcome variables. Individual communicative acts will help us identify the inner workings of group processes that will expand our understanding of discussion behaviours in nuanced ways. Second, previous studies relied heavily on demographic characteristics to predict online discussion behaviours. Often, studies used the citizenship of students as a proxy for cultural characteristics and assumed their online discussion behaviours to be monolithic across the collective, ignoring their individual differences. These concerns were addressed by directly assessing cultural values and personality traits that were hypothesized to be causally proximate to online speaking behaviours. The current study used specific scales to directly measure those factors at an individual level--something that has often not been considered in previous studies. Finally, multilevel modeling procedures were used to predict relationships between cultural/personality factors and online speaking behaviours. It is important to account for group interactions in online discussions, but was often neglected in previous studies. Results of the study confirmed that a student's level of certain cultural/personality factors (conscientiousness, agreeableness and low context- based cultural values), significantly predicted multiple online speaking behaviours. Results also documented several interaction effects between collectivistic values, individualistic values and openness to experience traits, with students' local discussion groups on multiple online speaking behaviours. Extroversion, low power distance, and neuroticism were identified as potential predictors for future exploration. In conclusion, results of the study confirmed cultural and personality factors to be useful predictors of online speaking. Personality traits in general directly predicted several online speaking behaviours. However, cultural values did not. Further, the local discussion group context of students significantly moderated cultural and personality factors in predicting online speaking behaviours.

Keywords: Cultural Values; Personality Traits; Online Speaking Behaviours; Quantity of Speaking; Quality of Speaking; Interaction Effects.

Dedication

To my mother, Greeta Perera. Thank you for being my guiding star; my inspiration. You will always be my hero.

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List of Acronyms

IND	Individualistic Cultural Values
COL	Collectivistic Cultural Values
LPR	Low Power Distance Cultural Values
HPR	High Power Distance Cultural Values
LCT	Low Context-Based Cultural Values
HCT	High Context-Based Cultural Values
NEU	Neuroticism Personality Traits
EXT	Extroversion Personality Traits
OPN	Openness to Experience Personality Traits
AGR	Agreeableness Personality Traits
CON	Conscientiousness Personality Traits
FFI	Five Factor Inventory
AICS	Auckland Individualism and Collectivism Scale
ICC	Intra Class Correlations
MD	Mahalanobis Distance
RIRS	Random Intercept and Slopes Model
REML	Restricted Maximum Likelihood Ratio
ML	Maximum Likelihood Ratio

Chapter 1.

Introduction

Computer Mediated Communication (CMC) allows individuals and groups to interact with each other separated by space and time (Luppicini, 2007). This medium has been gathering momentum in the educational landscape for the last several decades as a tool that allows students to engage in educational discourse even when not together physically (Hew, Cheung & Ng, 2010). This dissertation will focus on the individual contributions of students and their communicative acts in a group context. The past and current research on CMC tends to emphasize a group account of learning through online discussions. Often studies in CMC ignore the individual perspective within a group context. This perspective is important because individual communicative acts are the essential drivers of group processes, and understanding them will help paint a full picture of learning in online discussions. An emphasis on individual contributions further warrants the investigation of student characteristics that may impact such contributions. Current studies, which do look at individuals tend to heavily rely on demographic characteristic (e.g., age, gender, ethnicity etc.) when reporting the online discussion patterns of individual students. While demographic chararacteristics may help us predict group behaviour, they are not as causally proximate to individual discussion behaviour as personality and cultural values are. This study will address these gaps in the literature by focusing on the individual communicative activities generated within by students a group in the context of text-based asynchronous computer-mediated communication. It will investigate specific student characteristics such as cultural values and personality traits that can potentially influence the manner in which students engage in online discussions, and explore their relationships to the comments students make in discussions.

1.1. The Value of Asynchronous Online Discussions

The defining feature of asynchronous online discussion is that students are not required to engage in the discussion in real time. The time delay that is allowed through asynchronicity can provide many benefits to learners. The flexibility to interact with each other at a time of their choosing is one such benefit. This allows students to view messages multiple times and read them in depth, long after the message is posted by their colleagues (Hew, et al., 2010). This in turn, affords them the time and the opportunity to reflect on their own and others' ideas (Levinson, 1990; Jaffee, 1997) as well as carry out further research in supporting their point of view. The ability to access the discussion forum from geographically dispersed locations is another major benefit offered by this medium (Harasim, 1987, 1989; Kaye, 1989). Harasim (1989) described how CMC offers opportunities for shy students to participate in group discussions who may not do so in a typical face-to-face setting. Marttunen and Laurinen (2001) provided examples of how students who engage in online discussions outperform students in face-to-face environments in choosing alternatives and identifying relevant grounds to form an argument on a given topic. Jonassen and Kwon (2001) documented that students engaged in asynchronous online discussion-based courses are more satisfied when completing well- and ill-structured problem-solving activities than students enrolled in face to face courses. They also reported different patterns of communications emerging in an online context as opposed to face-to-face situations.

Beyond these practical concerns, from a social constructivist perspective, asynchronous online discussions can provide a powerful platform for students to learn (Lipponen, 2002). During a typical online discussion session, students are required to develop individual ideas and build on others' ideas through a written communicative exchange. This process can lead to learning on several fronts. First, considering that students are expected to communicate their ideas in writing, carefully written ideas encourage reflection that can lead to higher order thinking (Newman, Johnson, Webb & Cochrane, 1997). Second, students are exposed to a variety of ideas as they engage with their colleagues' comments on the same issue/topic. This can lead to additional ideas and expand their thinking as they participate in various forms of argumentation that facilitate learning (Weinberger & Fischer, 2006). Finally, the negotiation of ideas back and forth

may eventually lead to the generation of new ideas with others in a collaborative manner (Pena-Shaff & Nicholls, 2004). The theoretical relationship between asynchronous online discussion and learning will be further expanded in chapter two.

1.2. Gaps in the Literature

1.2.1. Less Emphasis on Individual Communicative Acts within a Group Context.

There are many studies (e.g., Gunawardena, Lowe & Anderson, 1997; Garrison, Anderson, & Archer, 2000; Pena-Shaff & Nicholls, 2004; Weinberger & Fischer, 2006; Schellens & Valcke, 2006) that focus on group dynamics when accounting for learning through online discussions. The majority of these studies minimize or ignore the vital role played by individuals within the group context. It is equally important to consider the individual behind the discussion, as much as the group collectively, for several reasons.

a) A group is comprised of two or more individuals. Focusing on group processes without understanding individual actions paints only half a picture, depriving researchers of understanding how individual actions make up group processes.

b) Shortcomings of individual communicative acts during online discussions may affect the outcome of group process itself. Thus, focusing on individual actions will help researchers to understand factors that can contribute to the final outcome portrayed in group processes that account for learning.

c) Individual students that make up a group are, by no means, all alike. They bring in different perspectives influenced by cultural, personality, family background, skills, motivation levels and life experiences etc. Influenced by these characteristics, different students may perform different activities within the group. Capturing these and understanding them will help explain the final processes and outcome generated by the group.

d) Inspired by a social constructivist perspective on learning, online discussions are often designed and run as small groups. Such design effects can often allow

students with particular dominant personal characteristics to sway others to change their positions and influence the entire group outcome. Focusing on the individual can help understand how differences in personal characteristics can potentially impact the ways an individual interacts with the group at large.

In addition to these theoretical reasons, there is empirical evidence to support the value of studying the individual in the discussion. The body of work carried out by Wise and colleagues (Wise, Speer, Marbouti & Hsiao, 2013; Wise, Hausknecht & Zhao, 2014) is a good example of a line of research that focuses on individual communicative acts as students engage in online discussions. These authors demonstrated the importance of focusing on individual acts of students in great detail, to understand differences in what students do when they engage in an online context, and have discovered a great variety of patterns in the ways students participate in online discussions. This body of work will be reviewed in chapter two.

1.2.2. Limitations of Current Labels for Student Characteristics in Online Discussion Literature

While the role played by the individual in a group context in online discussions has received minimal attention, characteristics of students who engage in online discussions have received widespread attention in the literature. Many studies (e.g. Oblinger & Oblinger, 2005; Rovai & Baker, 2005; Bennett, Maton & Kervin, 2008; Dibiase & Kidwai, 2010) attempt to link online discussion behaviours with age, gender, ethnicity and citizenship differences of students. While demographic characteristics may provide useful insights about differences in behaviour collectively, they are not as useful as other potential variables to predict the behaviour of individual students. There is empirical evidence from the technology-based education literature to support this. In a series of provocative articles, Prensky (2001) categorized two categories of students based on their age known as digital natives and digital immigrants as to how they use technology for educational purposes. He labeled Millennials as digital natives and claimed such students tend to learn differently than their predecessor generations (digital immigrants). However, there are many studies (Bennett, Maton & Kervin, 2008; Guo, Dobson and Petrina, 2008; Bennett & Maton, 2010) that found evidence contrary to those claims made by Prensky.

Guo et al. (2008) did not find any statistically significant differences between the two generations of students' level of technology literacy. Bennett et al., (2008) reported the technological competencies millennial students claimed to possess were not as widespread as claimed and they were present in only a small percentage of digital natives sampled. They also found those technological competencies that defined digital natives to be limited to a few skills that did not necessarily translate well into educational technology. Bennett and Maton (2010) found the use of technology amongst students to be subtle and complex and not so straight forward as claimed by these broad dichotomous labels. This example demonstrates that while demographic characteristics may help us understand behaviours in general, they are not always the most useful variables to predict what an individual student will do.

Similarly, there are other studies (e.g. Rheingold, 2000; Geer, 2001; Kim & Bonk, 2002; Morse, 2003; Bing & Ping, 2008) that refer to citizenship of a student as a cultural characteristic to predict online discussion behaviours. This is a widespread practice, as Schaffer and Riordan (2003) reported close to 80% of studies published on culture between 1995 and 2001, using the nationality of the student as a proxy of their cultural characteristics. Such an approach suffers from the same problems discussed above.

A better alternative is to identify and report results based on individual characteristics that are hypothesized to directly influence online discussion behaviour. Cultural values and personality traits of individuals are good examples. These factors are more causally proximate to individual behaviours than the demographic characteristics described above. Culture relates to the values, beliefs and attitudes that can lead to behaviour. They can provide valuable insights into student behaviour in multiple settings. While cultural values are passed from generation to generation, they are also influenced by one's social settings. Similarly, personality traits of a student unveil the essential fabric of a person. They portray strong psychological characteristics of an individual influenced by their social surroundings. The personality of an individual is deemed to be consistent over a period of a person's life. It can account for how one thinks and behaves. Individual characteristics captured by an individual's cultural values and personality traits can transcend demographic characteristics such as age, gender, ethnicity etc.

While methods in reporting individual characteristics discussed above have not received much attention in the online discussion literature, the influence of student characteristics/cultural values on various behaviours have been investigated in nuanced and rich ways in other fields. This other work provides a solid foundation for online discussion researchers to use these methodologies to report cultural characteristics and their potential influence on online discussion behaviours.

1.2.3. Lack of Emphasis on Nested Group Effects on Individual Student Behaviours

In addition to the lack of attention to the individual in the discussion noted above, another gap in the literature on online discussions is a lack of consideration of the interdependence of individuals within the group context. Methodological researchers (Cress, 2008; Garson, 2013; Heck, Thomas & Tabata, 2013) argue that when individuals participate within groups, their discussion contributions are potentially influenced by the characteristics of the group of which they are a part. These researchers argue that not investigating group effects on individual behaviour in such circumstances substantially distorts results (Garson, 2013). They further argue such group effects violate the assumption of independence required for many standard statistical models. They call for the use of multilevel models to investigate predictive relationships in such circumstances. These concerns are important to address in investigating the predictive ability of cultural and personality characteristics that may influence the discussions behaviour of individual students in a group context. A detailed review of considerations in setting up multilevel models will be discussed in chapter four.

1.3. Focus and Usefulness of the Study

Taking a social constructivist perspective on learning, online discussion behaviour of individual students will be investigated while considering their group context. Exploring the influence of cultural values and personality traits on individual online discussion-based behaviours is a departure from current studies that report the influence of a student's gender, nationality, etc. Procedures adopted in this study can help researchers to think about reporting student characteristics in more nuanced and useful ways to predict online

discussion behaviours that are meaningful and helpful. Specifically, this study will address issues about the types of scales useful for measuring cultural values. Both theoretical and empirical review of these scales will provide detailed procedures required in selecting and testing scales that measure cultural values at an individual level. The use of multilevel models will help understand individual and group level effects that may influence the discussion behaviour of students with different cultural and personality characteristics. In the future, this can contribute to better support desired forms of discussion and eventually, learning outcomes.

1.4. Broad Research Question

To address the above issues, the following broad research question is presented for further investigation.

How and to what extent are online discussion-based behaviours of students predicted by their cultural values and personality traits?

This broad research question will be used to review the literature, conceptualize variables, hypothesize and develop predictive relationships for this study. Further, the broad research question will be dissected into specific research questions as different facets of online speaking behaviours, cultural values, and personality traits are explored in following chapters.

1.5. Chapter Framework

The chapters in the rest of this dissertation will be organized as follows:

Chapter two includes a review of literature that will provide the theoretical underpinning for this study. This chapter will first, examine the educational potential of online discussions and build a further case to support why understanding individual communicative acts in an online discussion is useful. A model of learning that is based on the notions of online speaking presented by Wise and colleagues (Wise, Speer, et al., 2013; Wise, Hausknecht et al., 2014) will be further elaborated. Online discussion

behaviours related to speaking will be conceptualized based on this and related bodies of work. Then the chapter will review current studies that characterize culture and that explain learning in an online discussion based environment. Gaps in current literature, cultural frameworks and factors used to understand online discussion behaviours will be further expounded. The last section of this chapter will review personality factors and their potential contributions to predicting online discussion behaviours.

Chapter three will lay out operational details pertaining to cultural values and personality traits. It will examine and select several scale types to measure these values and traits. Then it will review specific questionnaires to measure cultural and personality characteristics. This chapter will report the results of a pilot study and results from the main study confirming the internal consistency of the selected scales.

Chapter four presents the methodological underpinnings and the overall study framework. The broad research question will be further narrowed down into specific questions that reflect multidimensional cultural values and personality traits identified through the literature review. Hypotheses that indicate the predictive relationships of these multidimensional cultural values and personality traits in relation to online speaking behaviours will be detailed. The last section of this chapter will present the overall design of the study and considerations in setting up multilevel predictive models.

Chapter five will report the results of the study. First, a preliminary analysis to assess the tenability of statistical assumptions in running successful predictive models will be discussed. Second, the results of the successful predictive models run in this study will be reported.

Chapter six, the final chapter of this dissertation will examine the implications of results reported in this study. This chapter will also highlight limitations and conclude by discussing implications for future research and practice.

Chapter 2.

Literature Review

This chapter reviews literature on online discussion behaviours and cultural/personality characteristics.

2.1. Educational Potential of Online Discussions

The educational potential of asynchronous discussions has received widespread attention in the online discussion literature for the past several decades. Schellens and Valcke (2006) and Hrastinski (2008) reported findings from empirical studies (some as far back as 1990) which highlight that learning in an online environment takes place best when learners interact and collaborate with each other in a group context, such as an online discussion.

2.1.1. Epistemological Lenses on Learning through Online Discussions

Crotty (1998) reminds researchers the importance of reviewing their ontological (the nature of being) and epistemological (nature of knowledge) perspectives before embarking on a research study design. Wise and Paulus (2014) highlight perspectives on cognition, learning, and language to be three essential ontological and epistemological considerations, that need to be addressed when assessing learning through online discussions.

A definition of learning in the context of online discussions will depend on an individual's world view as to how they conceptualize nature of knowledge. There are several learning theories and epistemological lenses that can be used to characterize this. Two epistemological lenses that lend themselves more readily to learning in an online discussion based environment, are rooted in social constructivist and constructivist ideas.

The social constructivist perspective explains learning as an outcome of collective group process (Ertmer & Newby, 1993). In this kind of a context, students collaborate with each other, carrying out a series of co-ordinated activities and attempt to construct and maintain a shared conception of a given problem space (Rochelle & Teasley, 1995 quoted in Lipponen, 2002). Social constructivists view knowledge as a socially mediated product (Stahl, 2000). This perspective fits with an epistemology of knowledge creation, where the outcome of learning is knowledge that is co-constructed by the group through a process of social interactions. Studies that account for learning through online discussions that fit this perspective highlight this relationship between collaboration and knowledge construction (Gunawardena, et al., 1997; Schellens & Valcke, 2006; Pena-Shaff & Nicholls, 2004).

The constructivist perspective, which is more individually focused, highlights learning as a process where individuals create meaning from his or her experiences with the world (Cunningham & Duffy, 1996). According to this perspective, knowledge construction is accomplished individually rather than collectively. However, others may still play a role in an individual's knowledge construction. Piaget (1928) claimed that individuals organize their understanding of the world through mental structures called schema and adapt to their environment through a process of assimilation and accommodation (Huitt, & Hummel. 2003). Piaget argued that adaptation was a result of a disconnect between the current schema and information provided by the environment (Huitt, & Hummel). Thus, changes to an individual's knowledge (mental structures) are created as an outcome of interactions with the environment, and this environment includes other people (Cunningham & Duffy, 1996). The focus is on the individual, and how he or she interacts with the environment to develop meaning and knowledge based on this experience.

2.1.2. Group Processes in Accounting for Learning Through Online Discussions

Current studies on online discussion frequently take a social constructivist perspective in focusing on group processes in accounting for learning. Gunawardena, Lowe and Anderson's (1997) Social Construction of Knowledge Model, Garrison, Anderson and Archer's (2000) Cognitive Presence component of the Community of Inquiry

Model, and Weinberger and Fischer's (2006) Model of Group Argumentation, are a few popular ones that are reviewed below.

Gunawardena, et al. (1997) Model is an early attempt to conceptualize group processes in an online collaborative environment. They proposed five stages of knowledge construction. According to this model, learners start by sharing their ideas followed by discovering differences between them. Then learners negotiate meaning, test/modify the synthesized ideas eventually reaching consensus. These authors use the "metaphor of a quilt" in which they refer to members as individual pieces of cloth that make up a quilt. While these authors do mention the individual, the final emphasis of the model is the overall pattern created in the quilt, which they attribute to being the result of the collective.

Garrison, et al. (2000) Cognitive Presence Cycle in the Community of Inquiry Model, is yet another attempt to highlight the group epistemology in learning through online discussions. Grounded in critical thinking, their cognitive presence model included four phases similar to Gunawardena, et al (1997) model. The first phase relates to an initiation stage triggered by the discussion challenge. The exploration phase that follows is considered to be a shift between the private and the reflective world of the individual, where students are expected to comprehend the problem and gather additional information. The third stage, integration, relates to constructing meaning from ideas formed from the earlier phases. The final phase, the resolution, is arrived through collaboration and consensus. Again these authors emphasize the resultant knowledge to be a product of the collective group process.

Weinberger and Fischer's (2006) multidimensional model of group argumentation suggests specific discourse dimensions (participation, epistemic, argumentative and social modes) and the frequencies in which they occur as leading towards knowledge construction. In essence, they suggest learning through online discussions to take place as participants engage in argumentation and counter-argumentation-activities that eventually lead to group consensus in reaching a collective position. Although this model begins with the individual student, the final emphasis on knowledge construction (hence learning) is attributed to the collective wisdom of the group.

All of these models acknowledge the progressive nature of group actions from exploring individual ideas, to the integration of those ideas to the collective. They explain the possibility and the value of group activities that lead to learning through the act of discussion (Wise & Paulus, 2014). However, individual actions or the individual perspective that these group processes pivot on has received minimal attention in current online discussion literature.

2.1.3. Why Individual Communicative Acts Are Equally Important to Group Processes

In harnessing the full educational potential of online discussions, the individual communicative acts that make up group processes require equal attention. The theoretical models that account for learning through group processes presented in the earlier section do not deny the existence of the individual and the value of the individual contributions within the discussion. In Weinberger and Fischer's (2006) model, the presence of the individual is acknowledged within the four dimensions of knowledge construction. In Gunawardena et al.'s (1997) Social Construction of Knowledge Model, the first two stages relate to activities initiated by individuals refer to pieces of cloth that make up the final quilt. Garrison et al.'s (2000) Cognitive Presence Cycle, focuses on the individual when they refer to the private world of the participant. However, these models do not report detailed individual communicative acts that make up the group processes during the discussion. They minimize the role played by the individual and their perspective when accounting for learning through online discussions.

There are many reasons why researchers should pay equal attention to individual communicative acts, as much as group processes, when accounting for learning through online discussions. Individuals are the building blocks of a group. Thus, individual actions of students can impact the group outcomes at large. Wise, Hsiao, Marbouti & Zhao (2012) found evidence to suggest how an unjustified position taken by a dominant student, and the reluctance of some group members who valued reaching consensus over persuading others on their stance, affected the entire group outcome.

In addition, studies have provided empirical evidence highlighting the shortcomings of individual contributions during online discussions. Thomas (2002)

reported instances where students only read a small portion of the overall posts and did not meaningfully refer to others' messages. Hewitt (2003, 2005) found that many students took a single pass strategy focusing only on recent posts when composing messages. Hew et al. (2010) presented a number of shortcomings identified in studies that led to poor student contribution during online discussions. Identifying such shortcomings can help educators assist students to rectify them and improve student discussion contributions.

Another point to consider is how the individual relates to the final group outcome. The group may arrive at a consensus negotiated between a few dominant individuals while others take sides. People may reach different understandings of the outcome based on many factors--including their individual prior knowledge and experience especially if you take a constructivist view of learning as individual meaning-making. As educators, we should care about the individual outside their group activities as well. If learning is considered to be a result of collaboration within a group context, what about students who do not contribute ideas towards the discussion? Does this mean they do not learn during discussions? Knowlton (2005) referred to Lave and Wenger's (1991) notion of Legitimate Peripheral Participation when referring to students who do not post messages during discussions. Knowlton advises researchers to understand reasons for student non-posting behaviour rather than dismissing them as not interested in learning. While disregard of learning can be a potential cause, language issues or simply feeling overwhelmed by the number of posts in an online discussion could also deter one from posting messages. There could be an instance where a student who is reading and attending to others' ideas exposes him/herself to divergent views but does not post ideas of their own. Can this student learn something within this context? Only a researcher who focuses on individual communicative acts will have the opportunity to consider answers to such questions or these forms of behaviour.

To extend the above point further, individuals that make up the group can behave in different ways due to their personal characteristics. A researcher who attempts to understand individual communicative acts should also know what personal characteristics might influence students to behave differently within a group context. The cultural values and personality traits reviewed in the upcoming sections will help us understand their potential influences on online discussion behaviour.

The importance of the collective wisdom and its contribution towards learning is not discounted in this study by any means. The argument here is to highlight the importance of placing equal emphasis on the individual, as much as the group process in understanding learning that takes place through online discussions. The following section will elaborate on a model of learning that accounts for individual communicative acts of students as they engage in online discussions.

2.1.4. A Model of Learning that Emphasizes Individual Communicative Acts

As highlighted in chapter one, the body of work carried out by Wise and colleagues (Wise, Speer, et al., 2013; Wise, Hausknecht et al., 2014) is a good example of a genre of research that focus on individual communicative acts in online discussions. The key difference from the previous work reviewed so far is their continued and consistent emphasis on the individual participant in the conversation. Through empirical evidence, these authors highlight the importance of focusing on individual acts of students in significant detail, to understand what individuals do when they engage in an online discussion. They emphasized the interactions and the relationship between the different messages posted by individual students, explicitly incorporating how messages posted by a person are attended to, and taken up by others as a key part of their learning process (Wise, Hausknecht et al., 2014). Actions leading up to making posts, such as reading messages, revisiting older posts and the order in which this was done, were considered to be online listening behaviours by this group. Actions related to posting messages, in an online discussion such as making original posts, replying to the posts of others and editing one's posts, were referred to as online speaking behaviours. Ideas inspired by this body of work will be used as a foundation to inform the current study. Individual communicative acts of students may allow us to understand the individual perspective of students in ways that were not possible before.

2.1.4.1 Online Listening

Wise (2008) argues that "listening" in a digital context is similar to face-to-face circumstances, where an individual in both situations attends to ideas externalized through language. This work refers to listening more than simply hearing or the reception of ideas.

Instead, it articulates how students pay attention to consider other's ideas in more complex ways. Such acts can help students to not only understand others' positions, but even challenge or negotiate with others during discussions. These authors identified online listening activities to provide a platform, and a context for students to engage in meaningful posting activities, making connections with learning materials, others' ideas and their own.

Wise and colleagues provided empirical evidence, showing that listening activities make up a significant portion of the time of student's online discussion activities (Wise, Hausknecht & Zhao, 2013). Further, they observed diverse forms of listening behavioural patterns noted among students as they engage in online discussions. Some forms of listening patterns include coverage, focused, thorough and disregardful approaches (Wise, Speer et al., 2013). They claimed that listening acts such as receiving and integrating ideas that facilitate their exchange, may help students to externalize (speaking) their thoughts better. Such activities can lead to richer explanations during a discussion, that can spark further comments that lead to learning. They conclude such acts of individuals' knowledge construction lie at the heart of learning through online discussions.

2.4.1.2 Online Speaking

Complementing the work of "online listening", Wise (2008) has characterized posting behaviour of students as "online speaking". They refer to speaking as externalizing one's ideas in an online discussion. Typically, speaking behaviours identified during online discussions include posts made by students either elaborating on their thoughts or replying to others, editing previous posts made by them, etc. Posting behaviour of students as they engage in an online discussion has received wide attention among researchers over the past several decades. However, the models reviewed earlier under the group processes in learning mainly reports speaking behaviours related to the group collectively. In this study, online speaking activities that relate to individual communicative acts will be analyzed and discussed.

2.1.5. Dimensions of Online Speaking Behaviour

Online speaking behaviours are conceptualized in this section. Wise and colleagues (Wise, Speer et al., 2013; Wise, Hausknecht, et al., 2014) referred to speaking

in terms of quantity and quality. The quantity of speaking refers to the degree of participation that a student demonstrates in an online discussion. Wise and colleagues (Wise, Speer et al., 2013) have used the number of sessions with messages, the average number of words per message, the length of time taken to write a message and number of messages as ways to quantify a student's degree of speaking participation. As for quality of speaking, Wise, Hausknecht, et al. (2014), identified three speaking dimensions based on multiple schemes conceptualized and verified by previous researchers. These dimensions include discursiveness, content, and reflectivity.

The first speaking dimension conceptualized in the current study is 'attending to others'. Discursiveness as conceptualized by Wise, Hausknecht, et al. (2014) limits speaking behaviours students to ways they refer to their colleague's comments in a meaningful manner. 'Attending to others while addressing discursiveness, broadens its scope to refer to speaking behaviours that capture the presence of a student as they attend to others. For example, the social comments made by students, the tone depicted in their messages are other examples of attending to others in a discussion. Considering speaking quality beyond how they refer to others and also considering their presence in the conversation, will help predict speaking behaviour through cultural values and personality traits in a meaningful manner.

The second dimension identified by Wise and colleagues, refers to 'content', which is related to how students attend to the learning materials assigned in a thoughtful manner. The second speaking dimension conceptualized in the current study is 'attending to task content'. While focusing on reference to learning material, this dimension will broaden its scope to consider how students attend to the entire task at hand assigned during the discussion.

Finally, 'reflectivity' was conceptualized by Wise and colleagues as actions that students subject their learning process to for examination. How students engage in reflective actions after the fact may be influenced by their cultural and personality characteristics to some extent. However, unless students are explicitly directed to participate in reflective actions during a discussion, such actions are not typically generated during the ordinary course of the discussion (Wise, Hausknecht et al., 2014). This dimension is not considered in the current study.

The three dimensions related to speaking quantity and quality that will be used in the current study are summarized in Table 2-1 below.

Table 2-1 Summary of Speaking Dimensions

Emphasis on the Nature of Speaking	Speaking Dimension	Conceptual Definition
Quantity of Speaking	Degree of Participation	The extent to which a student takes part in the discussion during the assigned period
Quality of Speaking	Attending to Others	The degree to which a student attends to comments made by others during the discussion
	Attending to Task Content	The extent to which a student attends to the task content assigned during the discussion

2.1.5.1 Quantity of Speaking

Degree of Participation

Successful online discussions provide opportunities for students to engage in multiple tasks such as: reviewing assigned material, sharing their thoughts, responding to others' ideas, participating in debate and negotiating ideas (Woo & Reeves, 2007). Documenting a student's degree of participation during the online discussion will help us understand effective characteristics of speaking in several ways. First, a student who takes part in a discussion extensively will recognize and demonstrate his/her active role in the knowledge construction process, by proposing ideas and engaging with others, as opposed to a student who engages in the discussion in a passive way, thinking of "knowledge as something that is transmitted to them" (Knowlton, 2005, p.156). The degree of participation may reflect a student's outlook as to how they view their role in the knowledge construction process. Second, a student who posts many messages responding to others' ideas may be stimulated by what others had to say during the discussion. Wise, Hausknecht et al. (2014) confirmed that students who showed an interactive speaking pattern spent time reading and rereading what others had to say before making their posts. Engaging with others' ideas is a hallmark of a good discussion denoting effective collaboration. A student who spends time making a post, or uses a significant number of words to describe their ideas, and incorporate others ideas into theirs, provides reasons for us to think that they have read what others had to say. Further, they may use multiple words to incorporate evidence gathered from sources which leads

to higher quality posts. Lastly, a student who participates consistently throughout the discussion, may very well have contributed ideas multiple times, and may also help the group arrive at a consensus leading towards good discussion outcomes. Examples highlighted earlier relate to elements that represent a higher degree of participation that may improve the outcome(s) of an online discussion.

While a high level of involvement can indicate better engagement during discussions, it is important to highlight that a student's low degree of participation may not necessarily mean a lack thereof. As discussed, Lave and Wagner's (1991) notion of "Legitimate Peripheral Participation" (LPP) can be used to explain passive forms of participation. Knowlton (2005) referred to those who do not contribute ideas during online discussions to be passive participants in the periphery and hesitated to label them as non-participants. Hew, et al. (2010), after a review of multiple studies, concluded that not knowing what to contribute, not keeping up with the discussion, and not seeing the need for online discussions as possible reasons that for passive participation during asynchronous discussions. Differences related to cultural values and personality traits may also explain why some students generate many posts while others don't. While the quantity of participation is necessary, focusing on it alone will not fully help understand elements of a good online discussion (Wise & Paulus, 2014). Therefore, quality of participation needs to be investigated to help us think about speaking as we try to understand a student's online discussion behaviours.

2.1.5.2 Quality of Speaking

Attending to Others

This dimension of speaking can help unpack how students collaborate with each other around ideas and engage in learning. There are several specific ways to consider how students regard comments made by others during a discussion. The level of discursiveness, the degree of social presence exhibited, and the tone displayed by students in their messages are a few such examples. These, in turn, are likely to be influenced by students' cultural and personality characteristics.

Discursiveness explains how students refer to others' comments and the views suggested by their peers, which form the core of collaboration during a discussion. At a

broader level, whether a student attends to ideas presented by others when making their posts or not would be the first indication of receptivity. As for students who attend to other's ideas, this may further display yet another form of receptivity-the degree of agreement and/or disagreement with others' ideas. There are many references in the literature that highlight how a higher level of disagreement may improve the overall speaking quality during discussions. Paulus (2006) asserted that disagreement among participants allowed individuals to understand their position more clearly. According to this author, when a person proposes an idea, disagreement by others will help the originator defend their position. Price, Cappella and Nir (2002) reported that a post originator faced with disagreement will attempt to generate more reasons and ground their claims with evidence to defend their position. Clark, Sampson, Weinberger and Erkens (2007) noted how students who engage in rebutting others' ideas provide high-quality reasons in return. Dennen and Wieland (2008) stated disagreement during discussions leads towards the emergence of different alternatives, and prompts students to negotiate, providing a further opportunity to consider comments made by each other during a discussion. By contrast, frequent levels of agreement among participants can dilute the substance and the quality of solutions, since group members may subject themselves to group think, or engage in shallow levels of reasoning during online discussions (Veerman, 2003; Chinn, 2006; Dennen & Wieland, 2008). These studies also reported students showing greater tendencies to agree than disagree with others during online discussions. Both agreement and disagreement as elements of responsiveness to ideas, have a tendency to impact on the overall speaking quality, since they allow researchers to understand how students learn during online discussions by relating to each other's ideas.

Garrison, et al. (2000), in their Community of Inquiry Model, referred to social presence as "the ability of participants in a community of inquiry to project themselves socially and emotionally as real people" (P. 94). In this model, social presence is articulated as an expression of emotion, open communication, and group cohesion. Each student's social presence can enhance a sense of community that can lead to the development of trust during discussions. Garrison et al. (2000) argued that the establishment of cognitive presence (an element of the Community of Inquiry Model where students construct meaning through shared participation) can be enhanced and sustained by establishing social presence during discussions. Rovai (2007) argued that students

who are engaged in distance learning programs are more susceptible to social isolation due to the physical separation from their fellow students and their institution. This author encouraged instructors and students to enhance their social presence during online discussions, citing that they may encourage interaction with others because students feel the presence of others like them within the discussion space. Knowlton (2005) acknowledged that social interaction may lead to social motivation, which in turn encourages students to engage with each other. However, speaking quality during a discussion may be diluted and may even suffer if students only acknowledge each other, or engage in non-task related social conversations (Knowlton, 2005). Further, cultural and personality characteristics can influence the degree of social presence displayed by a student during an online discussion. Thus, understanding how social presence can encourage students to engage with each other meaningfully and improve the quality of their speaking endeavours, will be significant.

The tone depicted by students in their messages is another way to think about the quality of speaking as how students relate to others in the discussion. Many authors (Ting-Toomey, 1999; Rovai, 2001) draw attention to the tones associated with autonomy and connectedness during conversations in an interpersonal communications context. Ting-Toomey referred to the “I” and the “we” identity related to these message tones. An “I” identity in messages emphasizes assertive, independent thoughts while a “we” identity often refers to submissive relational thoughts. An autonomous message tone will use pronouns that refer to a singular first person. First person pronouns communicate an intention to relay a point of view. The use of ‘I’ (first person singular) in relating to other(s), draws attention inward to the self and denotes an assertive intention to express a point of view. This inward orientation has roots in individualistic, low power distant-based values and extroverted personalities. The use of ‘we’ (first person plural) in relating to others, indicates a person attempting to situate them self within a group context. It draws attention away from the self to a collective. The use of first person plural pronouns is a less assertive approach rooted in collectivistic, high power distance-based cultural values and agreeableness personality.

Blum (1999) and Rovai (2001) reported literature on online communications relating to these tonalities identified in messages. They concluded that students who

depicted an independent voice to be assertive, and those with a connected voice to support others' ideas. Belenky, Clinchy, Goldberg and Tarule (1986) reported message tones to represent two distinct epistemological levels known as "separate knowing" and "connected knowing". Students who demonstrated separate knowing emphasize objectivity, reasoning, debate, analysis and evaluation during conversations, while students with connected knowing emphasized acceptance and harmony during discussions. Message tone is important in determining speaking quality as individuals attend to others' ideas in many ways. A student who maintains an autonomous tone will be able to provide objective ideas offering potential solutions to the task at hand. Further, a student with an autonomous voice may also act as the devil's advocate within the group, keeping other's ideas in check. If the majority of students in the group follow this tone, they will generate multiple ideas affording many alternatives to be considered during a discussion. Generation of multiple ideas may expose others within the group to further cross-fertilize them, resulting in higher quality speaking outcomes. In turn, this may force students to negotiate ideas in reaching a consensus. A student with a connected tone early in the discussion seeks harmony and may concede to ideas not adequately challenging other's comments. However, the generation of a "we" tone towards the end of the discussion will help students to reach a consensus, which is a critical learning outcome in online discussions. Identifying message tones to think about speaking quality thus may provide valuable insights as to how students attend to others' ideas.

In summary, discursiveness, social presence and message tone may be subjected to the influence of a student's cultural and personality characteristics, and are important speaking behaviours that help conceptualize the ways students attend to the presence of others during online discussions.

Attending to Task Content

This speaking dimension will focus on what a student may say in a post as they attend to the task at hand. It can help us think as to how students (individually and/or as a group) approach the assigned learning task and what specific cognitive actions are initiated, to analyze, conceptualize and externalize their ideas. It can also show us the inner workings of the knowledge construction process that takes place in a collaborative environment. How students engage in argumentation, use evidence to support thinking,

and structure messages to convey meaning are a few ways to understand this speaking dimension.

Argumentation is a major component that leads to learning through asynchronous discussions (Weinberger & Fischer, 2006). There are many references made in the literature as to how argumentation leads to learning. Clark and Sampson (2008) reported that "argumentation is central to analyzing data and information, writing persuasive explanations and engaging in direct dialogue" (p, 254). They claimed that asynchronous learning environments provide a rich medium for students to engage in argumentative discourse.

Researchers (Pena-Shaff & Nicholls, 2004; Weinberger & Fischer, 2006; Clark & Sampson, 2008) have conceptualized speaking behaviours related to argumentation in asynchronous online discussions in numerous ways. The following paragraphs will exhibit different components of argumentation actions.

During an online discussion, students are typically assigned a task to solve a problem or address a challenge. Weinberger and Fischer (2006) stated that in order to form a cohesive argument, a student will first need to understand the issue at hand. This process helps a student examine their thinking more carefully and communicate a clear position. Taking a firm stance on a given issue or another individual's idea(s), (full or partial agreement or disagreement) is an important first step in eventually developing a strong argument.

Chinn and Osborne (2010) asserted that argumentative forms of actions can nurture critical thinking and reasoning abilities among students. The provision of reasons in an argument, exposes one's viewpoint in defending a position taken by that individual. This process further provokes commentary by others who may agree or disagree with those reasons or with the position at large. A student who can provide insightful reasons to support their position(s) would make their arguments stronger than those who do not provide reasons. A student who uses multiple reasoning to support their position will further strengthen their arguments.

Evidence or grounds used to back the thinking/position raised during discussions is yet another indication of stronger argumentation. Grounds with reasons typically make a position more valid during argumentation (Weinberger & Fischer, 2006). A student who uses grounds provides legitimacy and believability of the position claimed. A statement backed with evidence will give the reader the sense that the issue at hand has been previously addressed in the past, thereby enhancing believability. The use of proof to support statements/claims can help others to consider an individual's point of view seriously, since it takes a fair amount of effort to gather relevant evidence. Further, evidence can help a student understand the issue at hand more clearly since it provides a contextual reference to previous situations. The use of evidence can also help students develop skills associated with reasoning and argumentation, which augments the quality of speaking during discussions.

Weltzer-Ward (2011) presented a list of resources typically used to aid thinking in many previous studies. These resources ranged from hard forms such as empirical data, citations, and direct quotes (which are verified by third parties), to soft forms such as generalizations, opinions, examples or anecdotes (generated by the students). Soft and hard forms of evidence in messages convey differing degrees of authenticity to claims made by students. The latter can be independently verified by third parties whereas hearsay evidence, often seen in soft evidence, cannot. Students who use hard evidence may be striving for this authenticity while those who use soft evidence may be more trusting of what others say. Cultural and personality characteristics of students may influence the type of evidence used in supporting claims.

Some students may encounter others who disagree with their positions or reasons during discussions. When a student encounters disagreement by others in the group, he/she will be exposed to alternative viewpoints that may broaden their thinking horizons. Disagreements are rebuttals that indicate a potential objection to a claim. In forming a rebuttal, the student will attempt to provide more reason(s) and evidence (Price et al., 2002) to counter-argue and stand their ground. These actions can lead to further argumentation in online discussions.

Therefore, taking a firm position, providing reasoning and evidence to support a position and engaging in and/or encountering rebuttals all indicate stronger forms of argumentation that allows students to relate to the task at hand in a meaningful way. These actions may further trigger commentary by others to participate in the discussion, thereby taking the overall speaking quality to a higher level.

Another way to think about speaking quality in terms of attending to the task is the manner by which students externally structure their ideas, thoughts, feelings or arguments through messages. Bennett (1998) reported linear versus circular/contextual forms of message structures used in written communications. In a linear message structure, a student may explain the point in a sequential manner trying to link one idea to another. However, in a circular message structure ideas are not presented sequentially, but the reader is expected to infer meaning through the context and thoughts may be organized organically to complement the context. Ting-Toomey (1999) refers to this as linear logic versus spiral logic respectively. Bennett asserts that in addressing controversial and confrontational topics, the use of direct and indirect styles by individuals in organizing and convening their thoughts and feelings are significant. An individual using a direct approach will address the confrontational issue at the outset, providing reasons highlighting their agreement or disagreement. In turn, an individual who does not want to deal with the issue directly may use third party inferences without directly relating to their feelings (Bennett). This particular message structure has cultural implications and will be described later in the review. The structure used in a message may influence the quality of speaking during a discussion. For example, a student who uses a circular structure to convey messages may not be able to garner the attention of others resulting in poor response levels. In contrast, a student who presents information in a linear and explicit manner, will find it easy to make a strong argument and improve the overall speaking quality of discussions. Responses posted by such students may gain the attention of others and garner a following of these comments. Further, the use of clear, direct (perhaps confrontational) ideas will generate comments by others, supporting them or arguing against them. Higher levels of interactivity spawned as a consequence may result in many alternative ideas generated through the discussion. Such alternatives can eventually lead to negotiations between group members creating higher level cognitive actions. Further, a student who can present clear, logically-arranged thoughts will also be in a position to synthesize ideas

effectively and help the group arrive at a consensus. Actions related to consensus building constitute higher levels of speaking quality. These students may further take on the responsibility of writing up final solutions/position arrived by the group, helping the completion of the assigned task successfully. Thus, the use of message structure to determine the quality of speaking is useful on many fronts.

The above review highlighted the educational potential of online discussions. A case was presented as to why understanding the individual perspective is as equally important to the group processes that are currently emphasized in online discussion literature. Further, specific individual communicative acts pertaining to online speaking were reviewed and conceptualized.

To understand the individual behind the discussion and their speaking behaviours, it is also important to think about their personal characteristics and the potential influence of these on discussion behaviour. Two ways to think about the qualities of an individual are their cultural and personality characteristics. There are many studies (e.g. Geer, 2001; Seufert, 2002; Morse, 2003; Ellis, 2003; Wang, 2004; Chen & Carapreso, 2004; Ingram & Hathorn, 2005; Nussbaum, Hartley, Sinatra, Reynolds & Bendixen, 2004; Warden, Chen, & Caskey, 2005; Buchanan, Johnson & Goldberg, 2005: Selinger, 2004; Johari, Bently, Vawn-Tinney & Chia, 2005; Rogers, Graham & Mayes, 2007; Bing and Ping, 2008 among others) that document the influence of cultural and personality characteristics on discussion behaviour in general, although not specifically on online speaking behaviour. The following sections will identify cultural and personality factors and their potential impact on online discussion behaviours. Potential predictive relationships between cultural/personality factors and specific online speaking behaviours will be conceptualized during this process.

2.2. Culture and Online Discussion Behaviours

2.2.1. Culture Defined and Conceptualized

The concept of culture remains complex and elusive (Levy, 2007; Balwin, Faulkner, Hecht and Lindsley, 2006). There are many definitions found in the literature

that explain this concept (Gunawardena, Wilson & Nola, 2003). Baldwin et al. (2006) presented evidence of over 300 definitions of culture across multiple disciplines. These authors provided a good sense of the breadth and the depth of this topic along with multiple interpretations presented over a period (Levy, 2007). Robins (2005), Terracciano, Abdel-Khalek, Adam, Adamovova, and Ahn, (2005) reported psychological research that has presented a perspective that refers to cultural differences at the individual level. The following definitions are presented to conceptualize culture to reflect individual differences as emphasized in this study.

> Culture is the set of attitudes, values, beliefs and behaviours shared by a group of people, but different for each individual, communicated from one generation to the next (Matsumoto, 1996, p. 754).
>
> The epistemology, philosophy, observed traditions and patterns of action by individuals and human groups (Branch, 1997, P.38)
>
> Individual's values found across groups or countries (Yoo & Donthu, 2005, p.10).

Cultural values, beliefs, and attitudes that are shared by people will draw them together, as well as influence their behaviour. Cultural characteristics are passed down from one generation to another through observed traditions and patterns of human actions, shaping behaviours of individuals. Behaviours influenced by cultural characteristics are said to be relatively stable over a period of a person's life (Taras, Rowney & Steel, 2009). However, it is important to note that individuals that are drawn together may not always behave in a similar manner due to their individual differences. Still, cultural characteristics of an individual may provide useful insights into ones' behaviour in multiple settings. Their stable nature and the ability to differentiate behaviour, both at the individual and the collective level, make cultural characteristics a potential indicator in predicting online discussion behaviours of students.

2.2.2. Concerns and Challenges in Reporting Cultural Values

Earlier in chapter one, the tendency to link online discussion behaviours of students to their demographic characteristics (e.g. age, gender and etc.) were discussed. While demographic characteristics provide useful insights, it was claimed that they are not

as useful as other potential variables which are more causally proximate to discussion behaviours.

2.2.2.1 Citizenship as a Proxy of Cultural Characteristics in Reporting Online Discussion Behaviours

Tankari (2012) highlighted many situations where researchers used the nationality or the ethnic origin of an individual as a proxy of their cultural characteristics. Previously, Taras et al. (2009) reported related to this as he reviewed cultural studies during the last half a century. Here are a few specific examples: Offermann and Hellmann (1997) quoted in Taras et al., referred to the cultural background of individuals based on their citizenship and passport status. Trubisky, Ting-Toomey and Lin (1991) reported individualistic and collectivistic values, based on the participant's country of origin. Schaffer and Riordan (2003) reported closer to 80% of cross-cultural studies published between 1995 and 2001, used the citizenship of an individual as a proxy of their culture. This was a common practice in many studies and is a cause for concern. Here are a few examples from literature.

Bing and Ping (2008) investigated online discussion behaviours of students across cultural backgrounds. They categorized students based on their nationality to represent different cultural characteristics. They concluded that students from different national cultural backgrounds demonstrated varied online discussion behaviours. In explaining possible reasons for such differences they reported that societies like in China, where there is a high power distance between students and teachers, many students tend to ask fewer or no questions in an online environment. Warden et al. (2005) who studied posting behaviours also categorized students as Western versus Asian students and reported that the latter posted fewer messages than their Western colleagues. They went on to explain that the "master" status given to teachers in Asian societies, led students to minimize self-expression and criticism during online conversations, to avoid embarrassment and "save face" during discussions. Geer (2001) reported results that accounted for variations in online discussion behaviours due to differences in attitudes towards conflict, approaches in completing a task, and decision-making styles across different ethnicities and nationalities of students. In this study, he presented an example of a Chinese student educated in Confucianism principles and taught to respect teachers, who sees a picture

of a fellow student in the discussion forum whom she thought looked like a teacher. This perception affected her attitude and interaction style in that online environment. Rheingold (2000) reported how Japanese students' reluctance to debate in a public forum affected their online conversations by not asking difficult questions.

Gudykunst and Ting Toomey (1988) identified several communication styles that relate to online learning and cultural context. They were "direct" versus "indirect" forms of communication, "elaborate" versus "succinct" styles, "personal" versus "contextual" styles and "instrumental" versus "affective" forms of communication. They reported North American students used a "direct," "extracting," "personal" and an "instrumental" style of communication in an online conversation, while Chinese students used an "indirect," "succinct," "contextual" and an "affective" style.

The studies above tend to use ethnicity and nationality of students as proxies of their cultural characteristics. Conclusions from these studies tend to assume all students that belong to a given ethnic, or a citizenship category, to be monolithic, i.e. identical to all those reported by the category at large. These general claims often do not consider the complex and nuanced behavioural differences that exist within individuals across these ethnic and citizenship categories. Thus, while ethnicity and citizenship of an individual may provide some useful insights, they are not as useful as other potential variables that are more causally proximate to discussion behaviours. In most cases, students do not have a choice in the selecting their nationality and ethnicity as they are conferred at birth. There is a danger to assume all that belong to a category will demonstrate the same or similar online behaviours without understanding why.

2.2.2.2 Ecological Level Measures Reporting Individual Cultural Characteristics

Studies that measure culture make references to several levels as they relate to the unit of analysis. The most commonly referred to levels are, the "individual", the "group" and the "national/cultural level". Some studies refer to the latter as the "ecological level" (Vinken, Soeters, Esther, 2004). Many researchers use multiple terminologies interchangeably to refer to these same levels often causing some confusion to the reader. The following terms, therefore, are used to refer to levels of culture in this study to avoid any confusion.

First, studies that refer to cultural values and behaviours of individuals are known as “the individual level.” Second, cultural differences between different generational, gender and ethnicity and who live in the same country are referred to as “the collective level.” Finally, studies that measure culture as shared values and behaviours of a society as a whole or that relates to the entire country at large (Hofstede, 1984) are referred to as “the national level.” The unit of analysis for the national level is the culture at large and not individuals (Miramontes, 2011).

Hofstede (1991) and Traindis (1995) caution researchers against attaching cultural values of a nation (ecological level) to the individual level. Traindis points to thousands of cultures that exist across 186 countries around the world (citing UN statistics at that time). He argued that cultural values and behaviours are not bound by political, national or ethnic boundaries. He points out that many cultures exist within a single country, region, organization, or a small group of people.

Taras et al. (2009) in their meta-analysis on measuring culture, concluded that many studies that report ‘national level’ differences relied on bipolar measures. These measures categorized countries into silos and suggested citizens in a country that are high on (for example) individualistic values to be low on collectivistic values. Taras et al. reported that data collected through bipolar measures do not accurately reflect cultural differences at the individual level. They argued that differences at this level are much more complex than initially thought, and require orthogonal scales to reflect their differences in a meaningful manner. Other cultural researchers (Traindis, 1995; Hofstede & Minkov, 2010; Shulruf, Alesi et al., 2011) have echoed these findings. These authors warn against crossing levels and using ecological measures to report cultural values at the individual level.

Hofstede et al. (2010) make the following comments about studies that use national level cultural data to refer to the individual-level.

> The study of national culture dimensions belongs to anthropology; the study of individual personality belongs to psychology. The first is to the second as studying forests is to studying trees. Forests cannot be described with the same dimensions as trees, nor can they be understood as bunches of trees. What should be added to the analysis at the forest level is the interaction between different trees and other plants, animals, organisms and climate factors, together described by the term biotope. In

> reverse, trees cannot be described with the same dimensions as forests. At best one can ask what kind of forest this tree would be most likely found, and how well it would do there. (Hofstede et al., 2010, p.3)

Attempts to relate cultural values of a nation to an individual are said to suffer from the Ecological Fallacy (Pettigrew, 1997 as quoted in Hofstede & McCrae, 2004; Sharma, 2010). Gunawardena, Nolla, et al. (2001) referred to this as the Fallacy of Homogeneity, where nations are characterized as "being connoted to internal sameness" (p.117). Some researchers refer to reporting what is general in culture as 'etic' measures and what is specific within one culture as 'emic' measures. When researchers report findings across different cultural levels or between etic and emic using data collected from one level, they subscribe to Cross Level Fallacy (Jogodzinski, 2004).

Further, Hofstede and McCrae (2004) explain the three units of analysis/levels of analysis in measuring culture and caution researchers not to cross these levels in making inferences to cultural values and behaviours.

> In comparing studies of individuals, organizational cultures, and national cultures, Hofstede, 1995 has used the metaphor of flowers, bouquets and gardens. Contextual social psychologists [such as] Pettigrew, 1997 have also pointed out the ecological and compositional fallacies of assuming that the characteristics of a group must mirror the characteristics of group members. A group's ethos need not resemble the collective personality because different processes occur on group and individual levels. This holds even more for higher levels of aggregation (Hofstede & McCrae, 2004, P.66)

Gunawardena, Nolla, et al. (2001) refer to using cultural values and behaviours gathered at the collective level to make inferences at the individual level, as the Fallacy of Monolithic Identity. They explain this as a problematic "assumption that individuals in groups have no differential identities" (p. 117).

It is important to highlight that in this study the value of recognizing cultural values and behaviours that exist at the collective or the national level is not discounted or disregarded. There can be genuine differences between ethnicities at the collective level or between citizenship groups across nations. Referring to such differences is useful in certain situations. However, it is problematic when online discussion researchers' cross

levels and make inferences about individual behaviour based on data collected at the collective or the national level. For example, Traindis (1995), Taras, Rowney et al. (2009) and Shulruf, Alesi et al. (2011) reported individualistic and collectivistic values to be orthogonal when they were measured at the individual level as opposed to their bipolar characterization by Hofsetde (1991). Predictive results obtained by arranging these two cultural values as bipolar versus orthogonal constructs will report very different results. Not paying attention to these nuanced differences can potentially distort the predictive relationships obtained between cultural values and online discussion behaviours. Given the focus of this study is to characterize cultural values at the individual level, their properties will be investigated closely in chapters to follow.

2.2.3. Cultural Values

There are many cultural frameworks identified in the literature. The cultural framework introduced by Hofstede (1984) is one of the most frequently cited. Many cultural frameworks developed after Hofstede's work were influenced by this seminal model. Some of the other popular frameworks include Schwartz's multidimensional cultural values model, Inglehart's World Values Survey, the GLOBE study etc. Additionally, Taras (2013) listed over 62 unique cultural factors identified across multiple studies and Gupta (2012) identified 30 factors that related to managerial decision-making. Many others expanded on Hofstede's work. Sharma (2010) developed ten personal, cultural orientations as offshoots of Hofstede's cultural factors. Parrish & Linder-VanBerschot's (2010) Cultural Dimensions of Learning Framework (CDLF) model, emphasized how researchers should consider cultural differences among students in designing instructional interventions. Their framework included factors with particular reference to learning, but the main dimensions had similar footprints to Hofstede's work. However, this instrument had far too few questions and used a single bipolar scale to capture each cultural factor.

Despite the wide variety of frameworks. Hofstede's original work remains widely used especially in the context of online discussions. The following sections will report Hofstede's work on cultural factors in detail.

2.2.3.1 Hofstede's Cultural Factor Model

Although some studies have attempted to quantify cultural characteristics as far back as 1950, the interest on this subject exploded after Hofstede's seminal work on "cultural consequences" in 1980 (Taras, Rowney et al., 2009). Hofstede's cultural framework was multidimensional and was based on work looking at values that spanned across 72 countries among 88,000 IBM employees (Taras, Rowney et al.). Between 1989 and 2001, Hofstede's work has been cited over 1800 times in the Social Science Citations Index in cross-cultural research (Kirkman, Lowe & Gibson, 2006). By 2004, Hofstede's cultural framework was the most cited work in the Social Science Citations Index (Drenth, 2004). Further, Taras, Rowney et al. reported a vast majority of instruments out of the 121 they reviewed used Hofstede's cultural factors.

2.2.3.2. Cultural Values Depicted in Hofstede's Model

Hofstede's framework included four major national level cultural values that characterize differences in work-related values, beliefs, norms and behaviour across countries (Minkov & Hofstede, 2011).

First, power distance between groups was defined as "the extent to which less powerful members within a country expect and accept power to be distributed unequally" (Hofstede et al. 2010, p.61). He described that the degree of power distance people perceive can lead to different behaviours as to how individuals within that society react to differences in authority.

Second, individualistic-collectivistic values highlight the relationship between the person and the group. Hofstede et al. (2010) characterized individualistic values as those in which an individual's personal interests supersedes that of the group. In contrast, collectivistic values were characterized as those in which a person takes on group interests even when their individual interests may conflict with the collective. Individualistic-collectivistic values have led to the development of alternative frameworks by many researchers. Some of these models will be reviewed later.

The third cultural value was masculinity and femininity. Hofstede et al. (2010) characterized societies to be masculine or feminine cultures. Individuals living in

masculine societies were expected to focus on values such as recognition, advancement, challenge etc. while those living in feminine societies emphasized co-operation, security, harmony etc.

The fourth factor was uncertainty avoidance. Hofstede defined this cultural value as “the extent to which the members of a culture feel threatened by ambiguous or unknown situations” (Hofstede et al., 2010, p.191). Hofstede characterized uncertainty avoidance as a feeling without a subject and clearly differentiated it with risk avoidance which was expressed as a percentage of probability of a particular event.

A fifth dimension, short and long term orientation, was added to the framework in 1998 based on work carried out by Bond (Sharma 2010). Long term orientation was defined as “virtues oriented toward future rewards such as perseverance and thrift” (Hofstede et al., 2010, p.239). Short term orientation was defined as “fostering virtues related to the past and present with respect for tradition, preservation of face and fulfilling social obligations” (Hofstede et al., p.240).

Many studies (e.g. Geer, 2001; Morse, 2003; Wang, 2004; Warden, Chen, & Caskey, 2005; Bing and Ping, 2008, and Selinger, 2004; Johari, Bently, Vawn-Tinney & Chia, 2005; Rogers, Graham & Mayes, 2007) have used Hofstede’s framework to pinpoint cultural differences as students engage in an online environment. Bing and Ping (2008) reported Hofstede’s cultural framework as being cited by numerous researchers to report cross-cultural variations among students that participate in online learning environments. Hofstede developed the Value Survey Module (VSM) instrument to measure cultural differences based on the above dimensions at the national level. He maintained that this tool is relevant to assess cultural values at the national level only. However, Taras, Kirkman and Steel (2010) reported over 598 studies that used Hofstede’s dimensions and the VSM instrument to report individual and collective-level behaviours, ignoring Hofstede’s concerns.

2.2.4. Cultural Values that Reflect the Individual Level

As reported earlier, Hofstede’s work inspired many researchers to explore methods to measure and conceptualize cultural values. It is important to highlight that,

although the VSM instrument developed by Hofstede is not applicable to measure cultural values at the individual level, the cultural dimensions presented by Hofstede can be used with specific other measures to report cultural differences at the individual level. The following section will review specific cultural dimensions and derivations of Hofstede's work to select factors to measure cultural differences at the individual student level.

There are few studies (Tapenes,Smith & White, 2009; Tankari, 2012) that report the impact of uncertainty avoidance on distance learning. In general uncertainty avoidance and term orientation has received little or no attention in the online discussion literature. Due to their limited scope, these two cultural values are not considered in this study.

Hofstede conceptualized masculinity and femininity as values influenced by a person's social and cultural conditions as opposed to biological gender-based differences noted between men and women. However, many gender-based researchers (Lippa, 2001; Stake & Eisele, 2010; Zheng & Zheng, 2011) refer to masculinity and femininity as components of personality traits that explain individual differences. Personality traits will be discussed in the next section. Masculinity and femininity as described by Hofstede, therefore, are not discussed in this study.

2.2.4.1 Power Distance

Power Distance as a Cultural Value

Power distance-based cultural values have received a fair amount of attention in the online discussion literature. Understanding an individual's willingness to accept or reject their perceived differences of equality and authority within a group setting is a significant cultural value that can influence online discussion behaviour. In addition, power distance issues come into play whenever there are social relationships like those created in online discussion environments (Parrish & Linder-VanBerschot, 2010). Earlier in the review, examples from online discussion studies were presented to demonstrate how students with high power distance-based values may react differently to those they perceive as individuals with authority.

Power Distance and its Influence on Online Speaking Behaviours

Sagie, Mainiero, and Koslowsky (2000) argued that individuals with high power distance values accept responsibility and decision-making authority. They accept that this power only rests with a few individuals since they believe that some students are more knowledgeable, capable or experienced than others. We may expect a student with high power distance-based cultural values to generate a smaller number of posts in comparison to their counterparts, deferring the authority of speaking in the discussion to others. Therefore, students with high power distance-based values may tally a lower degree of participation during discussions. Couto and Vieira (2004) reported students with low power distance-based values expected cooperation and problem-solving responsibility to be distributed amongst all participants in a group. If we compare the degree of participation between high and low power distance students, we may expect a difference between the number of messages, the length of a post etc. where students with low power distance account for the majority of behaviours during discussions.

Students with high power distance-based values were less inclined to engage in self-expressive thoughts or raise questions during discussions (Couto and Vieira, 2004). These students are often reluctant to participate in argumentative discourse in public (Rheingold, 2000) or with their teachers or students whom they perceive to possess power (Bing & Ping, 2008). This reluctance is mainly due to their attempt to save face minimising the potential embarrassment caused by engaging in confrontational discourse. Therefore, it is reasonable to envisage students with high power distance values to show a lower level of discursiveness when engaging in confrontational topics. Given their tendency to defer responsibility and authority to those they perceive to be of high power, they may not take a firm position in their messages as they relate to issues about the task at hand during argumentation. A high power distance student who is forced to take some position may be inclined to hinge more on others' ideas than their own. In such situations, they may show a tendency to disagree less with others' ideas in order save face during discussions (Rovai, 2007).

Further, students with low power distance-based values can be more discursive and generate a higher number of posts that challenge each other. Their acceptance of an equality of power, status and the belief that responsibility rests with all in finding solutions,

may account for a higher number of speaking behaviours during discussions. These students typically may take a firm position to assert their ideas and tend to use reasoning and apply hard evidence to support their position vigorously. Their enjoyment in challenging others' ideas on a frequent basis and their inclination to consider debate as a natural course of online discourse, will lead them to rebut others' ideas frequently, accounting for a higher degree of disagreement during discussions.

Power distance as cultural value, therefore, has the potential to influence speaking behaviours such as (a) degree of participation (b) extent to which they attend to others in the discussion (level of disagreement) and (c) extent to which they engage in argumentative discourse such as taking positions, reasoning and the use of evidence.

2.2.4.2 Individualistic and Collectivistic Cultural Values

Tanaka (2002) identified specific psychological qualities of students with individualistic and collectivistic cultural values. This author relates to individualistic values as follows

> A sense of personal identity, self-actualization in terms of striving to be one's true self, internal locus of control which generally mirrors one's willingness to accept personal responsibility for life's happiness and sorrows, principled moral reasoning that is universal and guides one's right to action (Tanaka, 2002, p.4)

Further, Tanaka identified collectivistic values as follows

> A syndrome of feelings, emotions, beliefs, ideology and actions related to interpersonal concern reflected in seven categories: consideration of implications of one's own decisions and/or actions for other people; sharing material resources; sharing of nonmaterial resources; susceptible to social influence; self-presentation and face work; sharing of outcomes; feeling of involvement in others' lives (Tananka, 2002, p.6)

Markus and Kitayama (1991) describe independent and interdependent construal as derivatives of individualistic and collectivistic values at the individual level. The independent construal was defined as "an individual whose behaviour is organized and made meaningful primarily by reference to one's own internal repertoire of thoughts, feelings and action" (p.226). The interdependent construal was defined as "seeing oneself as part of an encompassing social relationship and recognizing that one's behaviour is

determined, contingent on, and, to a large extent organized by what the actors perceive to be thoughts, feelings, and actions of others in the relationship" (p.226). Singelis and Brown (1995) reported these two selves (independent and interdependent self-construal) to co-exist in varying degrees within an individual.

The essential tenets of individualistic values, therefore, reflect on one's desire for self-expression, self-reflection, and self-reliance. This internal focus will influence the world view of a person and sway actions in their daily lives. In contrast, students with collectivistic values focus their energy to position themselves ingraining their identity with the group. Their prime motivation is to promote the group cause even if it means sacrificing self-interest. This outward orientation influences their world view as they interact with others.

Individualistic and collectivistic values have received enormous attention in cultural literature. First, the seminal work done by Hofstede on the Individualistic and collectivistic dimension has garnered enormous popularity among cultural researchers with over 170 studies reviewing implications of this dimension during the last several decades (Oyserman, Coon & Kemmelmeier 2002). Second, various authors (Hui, 1984; Gudykunst & Ting-Toomey,1998; Triandis, 1995; Frymier, Klopf & Ishii,1990; Gudykunst & Nishida, 1986; Sueda & Wiseman, 1992; Ting-toomey,1998 as quoted in Ohashi, 2000; Drenth, 2004) have identified IND-COL as a major value that explains cultural variability. Third, studies (Hall & Hall, 1990; Trandis, 1995; Singelis, Traindis, Bhawuk & Gelfand, 1995; Hall, 1998; Moemeka, 1998; Lim, Kim & Kim, 2011) have developed different variations associated with IND-COL cultural dimensions. Fourth, these cultural values have historical roots that go beyond Hofstede's work. Oyserman et al. (2002) traced back historical roots of Individualism and collectivism going as far back as the French revolution. Similarly, Trandis (1995) reviewed the historical roots in philosophy and social sciences, and provided evidence to suggest how this dimension goes as far back as the Greek philosophers in the fifth century B.C. Due to its widespread use and popularity, there are plenty of options to select apt instruments and scales to measure cultural differences for Individualism and collectivism.

Individualistic and Collectivistic Values and its Influence on Online Speaking Behaviours

Individualistic and collectivistic values can affect online speaking dimensions in many important ways. Students with individualistic values can be expected to post a significant number of messages during a discussion. Their desire for self-expression can drive them to convey their thoughts eagerly in some situations. Hwang and Francesco (2010) reported students with high individualistic values tend to express a greater number of ideas during discussions. Further, we can expect these students to use a substantial number of words in expressing their thoughts. Considering all this, it would be reasonable to assert students with individualistic values to record a higher degree of participation during discussions.

Individualistic and collectivistic values may also affect the quality of speaking in varying degrees. Hwang and Francesco (2010) reported students with high individualistic values desired to work alone during discussions. Their strong internal focus on self-beliefs, values and thoughts may not motivate them to hear what others have to say or engage with them. Therefore, these students may be less inclined to refer to others' comments (suggesting a low level of discursiveness) in comparison to their counterparts. Their interest in self-expression and the higher tendency to focus on themselves may provoke these students to use autonomous message tones in conveying their ideas. In situations where they wish to make an impartial statement without owning the idea, these students may also use a more impersonal tone. They will not hesitate to disagree with others to assert their position. Individualistic students may also show a greater propensity to engage in argumentative forms of speaking. They may take a firm stance and provide detailed reasoning and apply evidence to assert their positions. Given their inclination to be objective, they may use a higher degree of hard evidence to support their claims. In organizing their thoughts, they may use a linear and a logical approach to convey their ideas during the discussion.

Hwang and Francesco (2010) reported students with higher levels of collectivistic values showed a greater interest in taking part in online discussions. Due to the collective nature of their world view, they may genuinely be interested to hear what others have to say. Thus, they may read posts generated by others more carefully. Further, they may be

inclined to relate to others' ideas more frequently indicating a higher level of discursiveness. Given their keen interest in seeking agreement and harmony, they may tend to agree with others more frequently and support others' ideas than taking a position of their own. To establish harmony and save face, they may avoid confrontational discussions and show a tendency to disagree less with others. In situations when they need to show disagreement, these students may soften it by agreeing with a non-related point first. To justify their positions, they may show an interest to build on others' ideas and direct the discussion to a state of reaching consensus at the earliest possible point. However, they will be less inclined to provide detailed reasons to support ideas. A genuine interest to engage with others may motivate these students to display a higher degree of social presence and connected tones in their messages. They may also use soft forms of evidence to support ideas rather than relying on hard evidence to prove a point. In terms of using evidence, these students may only refer to evidence rather than applying it.

The above are a few examples as to how students with individualistic and collectivistic values may influence the quantity and quality of speaking behaviours. Individualistic and collectivist cultural values may have the potential to affect a student's (a) degree of participation (b) attention to others regarding social presence, message tone and (c) completion of the task assigned and argumentation during online discussions.

2.2.4.3 High and Low Context-Based Cultural Values

Understanding High and Low Context-Based Cultural Values in a Communications Context

Hall in 1976 introduced high and low context-based cultural values to explain communication differences that exist between societies. This model has been widely cited in cross-cultural communications research (Rogers et al., 2002 as quoted in Kittler, Rygl & Mackinnon, 2011) with over 200 articles published in numerous academic journals between 1980 to 2010. The above studies reported on instruments and scales that measured high and low context-based values. Hall reported that people within a culture could use both these values during communications. However, he argued that one tends to predominate over the other (Gudykunst, Matsumoto et al.,1996). Ohashi (2000), Richardson and Smith (2007) among others developed instruments that measured Hall's high and low context-based values at the individual level. These will be reviewed in

chapter three. Hall explained how cultures differ in the manner in which they use context to create and communicate meaning. High context-based values combine verbal and nonverbal messages during communications. A listener must read between the lines and add nonverbal nuances to understand the message fully. In contrast in low context-based values, individuals rely on the literal and precise meaning of the words when they communicate with others (Hall & Hall, 1990). Salleh (2005) differentiates high and low context-based cultural values based on four characteristics. Table 2-2 below will highlight these differences.

Table 2-2 Differences between Low and High Context-Based Cultural Values

	Low Context Communications	High Context Communications
Emotions in a close relationship	Uses the logical part of the brain. Tend to be less personal during communication interactions. (p.3)	Uses emotions and close relationship affiliations among participants during interactions (p.3)
Directness of the message conveyed	Participants expect the other to communicate clearly, explicitly, be direct and precise. (p.4)	Participants talk about things and leaves the listener to fill in the gaps and pick up cues (p.3)
Use of non-verbal communication	Relies on direct communication to enable someone to understand the message (p.4)	Participants tend to understand each other through non-verbal responses. They tend to provide missing links and makes comprehension intuitive (p.4)
Use of digital or analogous language	Bennette (1998) quoted in Salleh (2005) highlighted verbal and written the language as digital, meaning words symbolizing phenomena the same way codes symbolize numbers in a computer. The language of English is considered to be strongly digital (Hall, 1976 as quoted in Salleh, 2005) highlighting that there are many words to describe many situations (p.4)	Bennette (1998) cited in Salleh (2005) contrasts some languages to be analogous since it creates a context that provides an experience. A language like Japanese is considered to be more analogous than digital as it expects speakers to imply and infer meaning from different context used during a discussion (p.5)

Adapted from Salleh, 2005, p 3-5

High and Low Context-Based Values in Asynchronous Online Discussions.

Morse (2003) highlighted the importance of considering high and low context-based values in asynchronous online discussions, which solely rely on written forms of

communications. The importance of using language in relation to the context was highlighted as follows.

> Language is one means of establishing context among participants of a particular cultural group. In low context cultures, language must be specific and defined to provide the contextual definition in which to interpret the communication. On the other hand, in a high context culture, language may be vague, lacking the specificity of the low context culture, as the environment within which communication takes place clarifies the specific meaning of language. (Gundykunst & Ting-Toomey, 1997; Hall & Hall, 1990 quoted in Morse, 2003, p.41)

In asynchronous online discussions, communication is encoded and decoded in a textual format. The lack of a face-to-face medium, deprives the communicator of nonverbal and environmental clues that can represent the context (Morse, 2003). Due to this, the context is represented within the language itself in communicating and interpreting the intended message.

Differences between high and low context-based values are expected to have an impact on how students write and relate to written messages in an online discussion environment (Salleh, 2005). In asynchronous discussions, meaning is exclusively communicated through written form, favouring students with low context-based values. This is said to put students with high context-based values at a disadvantage (Rovai, 2007).

Frank and Toland (2002) reported how students from high and low context-based backgrounds use e-mail and discussion boards for learning purposes. They identified different levels of engagement and debate among students who displayed high and low context-based values. These authors did not measure a student's cultural context-based values but instead based their findings on student's nationality affiliation with those values. They reported that across cultures students from low context-based countries to post a significantly higher number of messages than those from high context-based countries. Kim and Bonk (2002) reported observing high and low context behaviour among American, Finnish and Korean students. They reported students with high context-based values related to their feelings, integrated the social situation and requested feedback on their opinions rather than addressing the discussion task. In contrast students with low

context-based values were more action-oriented-seeking and providing solutions based on related theoretical concepts.

Morse (2003) reported on online discussion experiences of 24 students. He categorized these students using high and low context-based values based on their nationality. Students were asked to rank their perceptions about advantages and disadvantages of engaging in an online discussion. Results indicated significant differences in opinions across context groups. For example, high context-based students valued their ability to reflect on the contributions made by their peers, while low context-based participants valued their ability to think about their contributions.

High and Low Context-Based Values and its Influence on Online Speaking Behaviours

Following are some reasons to think how high and low context-based values can potentially affect online speaking behaviour.

As identified by earlier studies, students displaying high context-based values had reportedly posted fewer messages than those with low context-based values. Similarly, students with high context-based values may use a fewer number of words in a message assuming their colleagues may infer meaning conveyed through the context. In comparison, those with low context-based values may use a high number of words, having to explain both the context and the content in their messages. We would, therefore, expect students with low context-based values to have a greater degree of participation during discussions.

How students with high and low context-based values may organize their thoughts in messages is also worthy of discussion. Given the direct, explicit, and pointed nature of communication styles used by students with low context-based values, we would expect them to use a more linear organization of thoughts in their message structures. These students may state their position up-front explicitly or may present points in a systematic manner justifying their position in the end. We would expect students with high context-based values to use a more circular approach to delineate their views in their messages. Further, we may not expect an explicit position articulated within a message.

Regarding argumentation, little or no disagreement would be expected amongst students with high context-based values. The context is already presumed to be known by their fellow students. Thus, there is a lesser need to take a firm position or rely on reasoning during discussions. During argumentation, we can expect these students to show less inclination to engage in reasoning. Earlier it was reported that students with high context-based values relate to their feelings and opinions in messages (Salleh, 2005). The use of soft evidence such as feelings, anecdotes, and opinions may allow these students to relate to their context better allowing their fellow students to infer meaning and conclusions. Students with high context-based values may display higher social presence in their messages due to their collectivistic roots. In contrast, the use of direct and precise statements allows students with low context-based values to use hard forms of evidence and apply them to support their claims whenever possible. When referring to others, students with low context-based values may use more autonomous tones. Their propensity to use direct and precise language to express their ideas and to assert their stance on a given issue may motivate them to own their ideas thus may use first person singular pronouns more frequently in their messages. These students would thus show a greater tendency to take a firm position and provide reasons to support them.

2.3. Personality Traits and Online Discussion Behaviours

2.3.1. Personality Traits in Identifying Individual Differences

In the previous section, the impact of cultural values on the individual communicative acts of students in an online environment was discussed. In understanding individual differences of students, personality traits also play a major role. Hofstede and McCrea (2004) highlight research on trait psychology dating back to the ancient Greeks. Quoting many contemporary researchers in the field of psychology, these authors provided evidence that shows how personality traits explain a variety of differences in individual behaviour.

Triandis and Suh (2002) explained the genetic and the psychological makeup of personality traits, and how environmental conditions influence them. McCrea and Costa (2004) highlighted that personality traits are rooted in human biology but influenced by

environmental factors. Quoting various studies, the above authors highlighted the role socialization plays in influencing personality traits of individuals. These biological, psychological and sociological influences captured in personality traits are said to explain behavioural differences amongst individuals. McCrea and Costa (2004) reviewed results across many studies that report the relatively stable nature of one's personality traits through a period of their life. Many studies report relationships between cultural values and personality traits. These associations will be reviewed later in this section.

In moving forward, the following definitions will contextualize personality traits and how they relate to individual behavioural differences.

> Personality refers to those characteristics of the person that account for consistent patterns of feelings, thinking, and behaving (Pervin, Cervone & John, 2005, p. 6).

> Personality is the set of psychological traits and mechanisms within the individual that are organized and relatively enduring and that influence his or her interactions with, and adaptations to, the intrapsychic, physical, and social environments (Larsen & Buss, 2005, p. 4)

> Personality refers to an individual's characteristic patterns of thought, emotion, and behavior, together with the psychological mechanisms – hidden or not – behind those patterns (Funder, 2004, p. 5).

The above definitions highlight personality traits to ascertain individual differences in behaviour. They highlight the consistent nature of behavioural differences attributed to different personality traits, as well as environmental and sociological influences on them. Research on individual differences and personality goes as far back as 1884 (Goldberg, 1990). In 1915, Webb documented the impact of personality on the academic performance of students (Poropat, 2009). In a meta-analysis of the famous Five-Factor Model of Personality, Poropat provided evidence across studies that highlighted the impact of personality traits on students' academic performance. Personality is a vital human trait that is capable of explaining individual differences in behaviour.

Researching personality differences of students along with their cultural differences (measured at the individual level), will facilitate the understanding of the individual behind the online discussion in a more holistic manner. The complementary

nature of personality traits and cultural factors, will provide an opportunity to understand how the interwoven and multidimensional nature of individual differences can predict online discussion behaviours of students.

2.3.2. Dimensions of Personality Traits

There are many models that highlight personality traits of individuals. Some of the popular models include the Eysenckian, the Cattellian, the Big Five (Boyle, Matthews & Saklofske, 2008) etc. Lippa (2001) highlights the growing acceptance of the Big Five model as presenting a comprehensive account of human personality. De Raad and Perugini (2002) recorded extensive studies that reported on the nuanced details of personality. McCrea and John (1992) argued that the intuitive nature of the Big Five, supported with the vast amount of empirical evidence make this a popular and a useful model to measure personality traits of individuals. These authors further assert

> ...its long history, cross-cultural replication, and empirical validation across many methods and instruments make the five factors model a basic discovery of personality psychology (McCrea & John, 1992, p. 207)

The Big Five factors were developed in stages with Neuroticism and Extroversion recognized as the early big two traits (Langstedt, 2011). The current model took its shape with three additional characteristics (Openness to Experience, Agreeableness, and Conscientiousness) added by McCrea and Costa in 1980 (Langstedt, 2011). Personality traits have long been used to understand the academic performance of students. Poropat (2009) in his meta-analysis reported that traits such as conscientiousness and openness to experience correlate significantly with academic performance. Turning to online discussions in particular, many studies (Ellis, 2003; Chen & Carapreso, 2004; Ingram & Hathorn, 2005; Nussbaum, Hartley, Sinatra, Reynolds & Bendixen, 2004; Buchanan, Johnson & Goldberg, 2005 among others) have reported that personality traits are useful in predicting online discussion behaviours of students. The following section will examine the nature of Big Five personality traits and their usefulness to understand and predict online discussion behaviour.

2.3.2.1. Extroversion

Extroversion as a Personality Trait

Extroversion is the most researched personality trait among the Big Five with over 8,500 citations in various studies (De Raad & Perugini, 2002). Further, this remains one of the initial big two personality traits that was identified as fundamental tenets of human personality (Langstedt, 2011).

Extroversion refers to an individual's tendency to express ideas and initiate action (Tidwell, Southard & Mooney, 2010). Extroverts spend a significant amount of their time socializing with others and showing tendencies of habitual outgoingness (De Raad & Perugini, 2002). Introverts, on the other hand, prefer to work alone and are characterized by an inward orientation to oneself (Boustani, 2006). Warmth, gregariousness, assertiveness, activity, excitement-seeking, and positive emotions are six sub-dimensions that explain the extroversion trait (Hurter, 2009).

Extroversion and Online Discussion Participation/Learning

Extroversion was demonstrated to influence the participation readiness, actual participation and quality of contributions made by students during online discussions (Blau & Barak, 2012). According to these authors, extroverts were more inclined to participate in online discussions. Their results confirmed this. However, regarding the quality of contributions made, introverted students showed significantly higher quality contributions in comparison to extroverts. Chen and Caropreso (2004) studied the impact of personality traits on communication type, pattern, and message length and task engagement of students engaging in an online discussion. They reported that students with high extroversion, agreeableness, and openness to experience, engaged with each other more often and on a consistent basis. Further, they noted these students were more likely to use two-way communications indicating a higher level of interactivity. Lee & Lee (2006) further reported students with extroverted traits posting more messages and showing more social and cognitive interactivity during discussions.

Nussbaum et al. (2004) observed extroverted students in an online context to show a higher tendency to engage in argumentative forms of discussions. Quoting findings from

Infante and Rancer (1996), Nussbaum et al. (2004) concluded that the assertive nature more of extroverted students and their willingness to advance ideas led them to engage in more argumentation during online discussions. Nussbaum and Bendixen (2005) further confirmed this through a second study with a larger sample that assertiveness strongly predicted the argumentativeness of students engaged in online discussions.

However, there were other studies that reported different findings. Dewar and Whittington, (2000) and Nussbaum (2002) found that introverted students were more active during online discussions. They were identified to be more reflective thinkers than extroverts (Nussbaum et al., 2004). Quoting Taylor (1998), Lee and Lee (2006) concluded that introverted students took advantage of the time delay provided in asynchronous environments to think through and reflect on posts made by others. In a separate study, Downing and Chim (2004) reported that introverted students displayed extroverted behaviour in an online setting. An inability to cope with social isolation typically experienced in online discussions, was offered as a possible explanation as to why some extroverted students may underperform in an online environment (Verela, Cater & Michael, 2012).

Extroversion and its Influence on Online Speaking Behaviours

This personality factor may affect the quantity of speaking as students engage in online discussions in several ways. Extroverted students may display a higher degree of participation by posting many messages given their desire to express themselves and show initiation. While some studies (Blau & Barak, 2012; Chen & Caropreso, 2004) have confirmed this pattern, others (Dewar & Whittington, 2000; Nussbaum, 2002) have reported active participation by introverted students in comparison to their extroverted counterparts. Thus, prior findings are not conclusive on this point. As for the length of posts, we would expect extroverted students to post shorter messages considering previous findings that suggest these students to be less thoughtful and reflective thinkers (Downing & Chim, 2004)

As for the quality of participation, given the desire to express ideas, Chen and Caropreso, (2004) confirmed that extroverted students are engaging in two-way communications suggesting greater degrees of interactivity. However, these authors did

not report the nature of their interactivity during discussions. While previous studies have reported extroverts showing social interactivity, we may expect these students to show a noteworthy degree of social presence in their posts, since they are reported to spend a significant amount of time socializing with and showing warmth to others (De Raad & Perugini, 2002). Regarding attending to the task, previous research has reported extroverts to engage in argumentative forms of discourse. These findings make sense since these students are considered to be eager to express their ideas. These students may initiate a discussion by taking a position during the beginning of the discussion. They may also use some form of reasoning and evidence to support their positions. However, the reasoning and evidence used may not be exhaustive due to their primary motivation to be engaged due to their higher levels of social consciousness and gregariousness. Due to these same reasons, they may agree more with others during discussions. These students may refer to evidence but may not be motivated to go all the way to apply it to support a point of view. There is a greater tendency for extroverted students to engage in more consensus building speaking behaviours, trying to direct the group towards a final solution, due to their inclination to seek action, excitement and positive emotion (Hurter, 2009). Such tendencies shown by extroverts may motivate others to take direction from these students in leading them towards reaching a final solution. The high levels of gregariousness demonstrated by these students will further provide ample opportunities to barter agreement during difficult negotiations among conflicting ideas presented during the discussion.

Thus in explaining the quality of speaking, extroversion personality trait may influence (a) higher degree of participation during discussions (b) the degree to which a student refers to others' comments.

2.3.2.2 Neuroticism

Neuroticism as a Personality Trait

Neuroticism remains the second most researched trait with over 6,200 citations (De Raad & Perugini, 2002). McCrae and John (1992) relates to this trait as one that "represents differences in the tendency to experience distress" (p. 27). This trait is further

explained by several sub-dimensions such as anxiety, hostility, depression, self-consciousness, impulsiveness, and vulnerability (Hurter, 2009).

Neuroticism and Online Discussion Participation/Learning

Caspi, Chajut, Saporta and Beyth-Marom (2006) reported that students who are high on neuroticism avoided total participation during face-to-face discussions, but did participate in online discussions in limited ways. These students were reluctant to engage in highly argumentative and counter-argumentative measures during discussions, due to concerns that disagreements may affect their social relationships (Stewart, Shields & Sen, 2001). Nussbaum et al. (2004) also reported individuals with high levels of anxiety were afraid to disagree with others during discussions that warranted argumentative thinking. These students worried about negative reactions or feared being perceived as 'foolish', and even losing face among colleagues and friends. Schniederjans and Kim (2005) found neuroticism to predict grade performance of students among those who used web-based educational programs. Piccoli, Ahmad, and Ives (2001) reported the importance of computer self-efficacy as an important criterion for learning success in technology-based environments. These authors reported students high on neuroticism showed signs of low self-confidence and an inability to handle stress. In addition, their low levels of computer self-efficacy contributed towards their poor performance during online discussions.

Neuroticism and its Influence on Online Speaking Behaviours

Students high on neuroticism may not engage in educational activities when they feel threatened or overwhelmed (Nussbaum et al., 2004; Caspi et al., 2006). Thus asynchronous online discussions, which provide ample time for students to read and reflect on the discussion task and other's comments, may reduce the threat of immediacy of action that a student may find threatening. In comparison to a face-to-face medium, it makes sense that a student high on neuroticism would show a relative grater tendency to take part in an online discussion (Caspi et al. (2006). However, in comparison to other students, we may expect a student high on neuroticism to show lower degrees of participation (as in generating speaking behaviours), since hundreds of threads spawned during the discussion can overwhelm such students. Keller and Karau (2013) also

provided evidence of students high on neuroticism possessing low levels of computer self-efficacy thus causing disruptions in their contributions in an online setting.

Schniederjans and Kim (2005) found a student's level of neuroticism to predict their grade performance as they engage in web-based educational programs. Although this does not suggest causation, neurotic students who are academically inclined may take part in online discussions more attentively. This can be a result of perceived fear, thinking they may earn a lower grade, since many online discussions stipulate a minimum number of posts to receive a grade. In this case, such students may attempt to meet at least the minimum number of required posts.

Regarding speaking quality, as reported in many studies, we may expect students high on neuroticism not to challenge others during discussions, for reasons reported earlier. During argumentation, these students may be less inclined to take a firm position of their own that may potentially draw attention towards them. They may provide minimum reasoning and evidence to support their positions due to their non-committal approach towards taking a position. In situations where they may take a position on others' ideas, they may soften them by using a more connected tone. We may further expect these students to agree with others during discussions. These students may also include comments displaying social presence in order not to encounter a confrontation in return.

In general, we would expect students high on neuroticism to engage more passively in online discussions perhaps diluting speaking quantity and quality of a discussion.

2.3.2.3 Openness to Experience

Openness to Experience as a Personality Trait

Costa and McCrea (1992) referred to individuals who score high in this trait to be "original, untraditional, creative, and intellectually curious, proactively seeking out and appreciating new experiences" (p. 28). Taylor (2004) further characterized this trait as one that embraces a "sense of value for originality, novelty, knowledge, and experience, as well as a need for a variety of interests, and ability for liberal and abstract thinking" (p. 28). Costa and McCrea (1992) noted that along with conscientiousness**,** individuals who

displayed higher levels of openness to experiences were more likely to seek educational opportunities. Costa and McCrea refer to six sub-dimensions that represent openness to experience trait. They include active imagination (fantasy), aesthetic sensitivity, attentiveness to inner feelings, preference for variety, and intellectual curiosity (Hurter, 2009).

Openness to Experience and Online Discussion Participation/Learning

Nussbaum et al. (2004) conducted a study to understand the use of scaffolds that encouraged counter-argumentation in an online environment and their interaction with personality characteristics of students. These authors found students with higher levels of openness to experience showed a greater tendency to disagree with others. They also found scaffolds were particularly beneficial to students who displayed low levels of openness to experience, since they prompted them to think deeper and more critically. In a previous study, Nussbaum and Bendixen (2005) found that openness to experiences significantly predicted argumentation during discussions.

Schniederjans and Kim (2005) found a student's level of openness to experience to predict their grade performance as they engage in web-based educational programs. They cited openness to experience as trait that depicted an individual's readiness to learn, leading to a positive attitude that leads to motivation. Highlighting the importance of self-directness in online learning, they quoted examples from the literature how motivation and self-directness led to educational success. Anitsal, Anitsal, Barger, Fidan and Allen (2010) concluded that cognition, agreeableness, openness to experience did result in creative skill development for students in some online and face-to-face course situations. Caspi et al. (2006) found students who frequently participated in online discussions showed higher levels of openness to experiences (and extroversion) than students who avoided participation.

Openness to Experience and its Influence on Online Speaking Behaviours

Given the interest of students with openness to experience to proactively seek out ideas (Costa & McCrea, 1992), we may expect them to be idea generators during a discussion. These students may post many messages and perhaps use more words to

describe and explain their thoughts. Thus, we may expect students who are open to experience to take part in discussions in an active manner.

Further, these students can be expected to enhance the quality of speaking both in attending to others' ideas and the task at hand. These students may look to others' comments frequently due to their persistent quest to uncover new ideas. Thus, they may display a high level of discursiveness during discussions. While appreciating others' ideas (Nussbaum et al., 2004), they may be inclined to disagree with others due to their liberal outlook (Taylor, 2004). Therefore, we may expect these students to take positions against others' ideas during argumentation. Given their interest towards others' ideas, these students may use "yes but" statements, acknowledging others but disagreeing with them the same time. Further, a higher degree of openness to experience may induce these students to appreciate others' ideas in some form with elements of social presence in their posts, although they may end up rebutting them.

Given the appreciation students with this personality trait places on originality, the degree of intellectual curiosity, and quest to seek new experiences, it is not surprising to find previous studies (Nussbaum et al., 2004) concluding the tendency of these students to engage in argumentative discourse. These students may engage in argumentation experimenting with new ideas. They may be inclined to provide reasons and apply evidence to convince others of their novel ideas. During discussions, they may follow a linear message structure in presenting and organizing their thoughts. Their curiosity for new ideas may expose them to a plethora of information; thus, may use hard evidence to inform and situate their arguments.

In explaining the quality of speaking, the openness to experience personality trait may influence (a) the degree of participation during discussions (b) the degree to which a student refers to others' comments (c) the degree to which a student attends to the task.

2.3.2.4 Agreeableness

Agreeableness as a Personality Trait

De Raad and Perugini (2002) stated agreeableness to be a recent construct of personality. These authors characterized those with this trait to be concerned with building

interpersonal relationships between people. McCrae and Dye (1991) quoted in Hurter (2009) view it as a “cluster of attributes, including trust, modesty, and compliance, that blend warmth and submission” (p.29). Trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness are sub-dimensions that represent this trait. (Hurter, 2009).

Agreeableness and Online Discussion Participation/Learning

Chen and Caropreso (2004) reported that students with high levels of agreeableness tend to engage in online discussions more actively. Further, these students showed patterns in both interactive and interpersonal communications with other students as well as engagement with the assigned task consistently. These students demonstrated an ability to talk with others (online) using two-way communication and managed to meet the objectives set for the learning goals. Anitsal et al. (2010) reported students with higher levels of agreeableness to show creative skill development in online discussion settings. Further, Keller and Karau’s (2013) reported high levels of the agreeableness trait as a significant predictor of students’ perceived value in using online courses to enhance their career goals. Schniederjans and Kim (2005) found a student’s level of agreeableness to predict their grade performance as they engage in web-based educational programs.

Agreeableness and its Influence on Online Speaking Behaviours

Agreeableness has been identified to be a personality trait that supports building relationships and interactions (De Raad & Perugini, 2002). Students high on agreeableness showed a tendency to engage in online discussions actively (Chen & Caropreso, 2004). Varela et al. (2012) state that students with high degrees of agreeableness tend to overcome and adapt to situations better. Regarding the quantity of participation, these students may log a substantial degree of participation and use a fair number of words to articulate their ideas.

As for the quality of speaking, it would be safe to assert these students may attend to other’s ideas more scrupulously than others. With a high level of receptiveness, they may refer to others’ comments in their posts. Since these students emphasize building relationships and caring for others, we may expect a higher number of messages with

social presence, acknowledging, thanking, and motivating others in their posts. Regarding message tone, given their empathy towards others, we may find these students use a more relational, connected tone in their messages. As much as they acknowledge others' ideas, this population tends to be more dependent on others for ideas and tend to seek reassurances when making decisions (Costa & McCrea, 1990). Given the inclination to trust others, seek compliance, submit to others and show qualities such as tender-mindedness (Costa & McCrea, 1992), these students may be less inclined to challenge others and lean more towards acknowledging and agreeing with others. Therefore, these students may not take firm positions on their own nor against others during argumentation and may not rely on reasoning to support them. We may find these students use soft forms of evidence to support ideas in their messages.

In explaining the quality of speaking, agreeableness personality trait may influence (a) the degree of participation during discussions (b) the degree to which a student refers to others' comments.

2.3.2.5 Conscientiousness

Conscientiousness as a Personality Trait

Goldberg (1992) quoted in De Raad and Perugini (2002) referred to this trait as "one that represents the drive to accomplish goals and contains characteristics such as pursuit, organization, systematic work ethic, efficient, practical and steady behaviour" (p.8). Schniederjan and Kim (2005) defined conscientiousness as a "tendency to be hardworking, dependable, efficient, and achievement striving" (p. 207). Hurter (2009) relates to individuals with high levels of conscientiousness to be diligent and thorough. Competence, order, dutifulness, achievement striving, self-discipline, and deliberation are facets that explain this trait (Hurter). De Raad and Perugini reported numerous studies that identify conscientiousness in predicting school grades, school performance, and academic achievement. Poropat (2009) in a meta-analysis further provides evidence from studies that confirm conscientiousness as a consistent predictor of academic performance and learning.

Conscientiousness and Online Discussions Participation/Learning

Verela et al. (2012) asserted conscientiousness to be a strong predictor of learning outcomes in an online setting compared to face-to-face situations. They cited freedom, flexibility, and control to be major benefits in learning through asynchronous environments in comparison to taking courses face to face (where learning tasks are completed synchronously). They argued that higher levels of conscientiousness such as self-control and self-discipline play a vital part for individuals to be successful in an online environment.

De Raad and Schouwenburg (1996) reported individuals with high levels of conscientiousness take responsibility for their learning, and tend to develop positive attitudes towards their online learning experiences. Further, these authors reported that students with high levels of conscientiousness use the internet, online tools and social networks for research to complete tasks and gather information to support their ideas. They also reported a positive correlation between conscientiousness and engagement and preference for online courses, but a negative correlation between conscientiousness and anxiety/frustration. Their predictive models showed conscientiousness as the most consistent predictor of students' impressions of online courses.

Schniederjans and Kim (2005) found a student's level of conscientiousness to predict their grade performance as they engage in web-based educational programs. They argued conscientiousness to be a reflection of dependability, thoroughness, and responsibility, which determined success. Given the fewer opportunities students have to engage with instructors, in comparison to face-to-face situations, a high level of conscientiousness was identified as a vital trait that required students to complete assigned tasks on time successfully. Verela et al. (2012) reported achievement (a sub-dimension of conscientiousness) as a strong predictor of learning outcomes in an online discussion setting.

Conscientiousness and its Influence on Online Speaking Behaviours

Students with high levels of conscientiousness can be expected to demonstrate the most promising behaviour in terms of both quantity and quality of speaking during discussions. Regarding the degree of participation, such students may show higher levels of participation, posting a high number of messages. As confirmed in many studies, given

their keen interest to learn (Poropat, 2009), hard work ethic, achievement orientation (De Raad & Perugini, 2002), they may be inclined to spend time reading what others have to say and thinking about their thoughts in a critical manner. This explains why we may expect them to use a fair number of words in their messages to describe their ideas. All these speaking behaviours may contribute towards a higher degree of participation.

These students may also influence the overall speaking quality in discussions in a positive manner. Typically, instructions about online discussions highlight the need for students to engage with other's ideas. Given their work ethic, these students may show the highest level of receptiveness to others' ideas. They may respond to others and, given their lower levels of anxiety (Poropat, 2009), these students will not hesitate to take a firm position against them or disagree with others. In his meta-analysis, Poropat provides further evidence that students with a high conscientiousness showed better academic results. Given their work ethic and cognitive abilities, they may use intensive forms of reasoning and use hard evidence to support their positions. Studies have further revealed students with high levels of conscientiousness use the internet and other tools to gather information systematically (as reported earlier, Piccoli, Ahmad, & Ives, 2001) thus may specifically use of hard evidence to support their ideas.

Given their heavy focus on the task at hand, conscientious students may not be inclined to engage in commentary that reflects social presence. Further, they may maintain a more autonomous tone attempting to parse out their ideas about the task more vigorously. These students may also try to use a more impersonal tone when they flesh out ideas before they interject their thoughts. Further, given these students' obsession in being organized and methodical, they may use a linear approach in their message structures to convey a well thought out and explicit message.

The degree of conscientiousness of a student may influence (a) the overall higher degree of participation during discussions and (b) their level of attainment to the task regarding argumentation in a meticulous and positive manner throughout online discussions.

2.4. Connecting Cultural Values and Personality Traits

In focusing on the person behind the discussion and understanding their differences that may predict online discussion behaviour, the already established relationships between personality traits and cultural values will be extremely useful. Benet-Martínez and Karakitapoglu-Aygun (2003) reported evidence to suggest individualistic values predict all Big Five personality traits except agreeableness. Quoting references from previous studies from a Western perspective, they explained many individualistic values corresponding to extroversion, openness to experience, conscientiousness and low levels of neuroticism amongst students. They further found collectivistic cultural values predicting the agreeableness personality trait of an individual. They argue that people with collectivistic values aspire to cultivate more relational attitudes, and trust thus tends to be high on the agreeableness trait of personality. Smith and Bond (1993) as quoted in Hofstede and McCrea, (2004) speculated conceptual relationships between individualistic values with extroversion, uncertainty avoidance with neuroticism, and power distance with conscientiousness. McCrea (2001, 2002) and Hofstede and McCrea (2004) confirmed these relationships. Similar relationships between cultural values and personality traits are also reported in other studies (Gudykunst, Seung & Nishida, 1987; Tanaka, 2002; Anderson & Kilduff, 2009; Migliore, 2011).

The complementary nature of the relationship between cultural values and personality traits will help explain the individual behind the discussion and their potential influences on the student's online speaking behaviour in many important ways. This study will investigate and report on the potential of how these interdependent factors could predict online speaking behaviours of students who engage in asynchronous online environments.

2.5. Chapter Summary

This chapter reviewed literature in several sections.

It started with a review of the educational potential of online discussions. It examined the contribution made by online discussions towards learning. Highlighting the overemphasis on group processes that account for learning through current studies on

online discussions, the value of emphasizing the individual perspective was discussed. A model of learning based on individual communicative speaking behaviours as reported by Wise and colleagues, was presented as the underlying basis that would inform the current study. Three dimensions (see below) were conceptualized to represent online speaking behaviour in this study.

Summary of Speaking Dimensions

Speaking Quantity	• Degree of Participation
Speaking Quality	• Attending to Others
	• Attending to the Task

Focusing on the individual, cultural values and personality traits that describe personal characteristics of students were reviewed. Several cultural values and personality traits (see below) were identified that can potentially predict online speaking behaviours of students.

Summary of Cultural Values and Personality Traits

Cultural Values	• Individualistic and collectivistic values • High/low power distance-based values • High/low context-based values
Personality Traits	• Extroverted trait • Conscientiousness trait • Open to experience trait • Agreeableness trait • Neuroticism trait

In pursuing the broad research question raised in this study, this chapter further identified how differences between online speaking quantity and quality dimensions can be best explained by cultural and personality factors at a conceptual level. These conceptual relationships will later form the basis of developing specific hypotheses that will be tested after they are operationalized in following chapters.

The next chapter (chapter three) will present questionnaires and scales selected to gather data of cultural and personality characteristics. This chapter will present results from the pilot, and final evaluations carried out to test, validate instruments and scales. Findings related to these cultural and personality factors will be reported later in chapter five.

Chapter 3.

Scale Development and Testing

Earlier in chapter two, several cultural values and personality traits were conceptualized to predict online speaking behaviours of students. This chapter will lay out operational details of those cultural values and personality traits. In achieving this, four specific objectives are pursued. They are

a) To examine and select scale types to measure cultural values and personality traits

b) To examine questionnaires that reliably measure cultural values and personality traits among first-year students in a small-size university in Western Canada.

c) To examine properties of selected scales measuring cultural values and personality traits.

d) To test the internal consistency of the chosen scales.

3.1. Examining Scales and Questionnaires

This section will review scale types commonly used by researchers to measure cultural values and personality traits.

3.1.1. Examining Agreement and Frequency as Scale Types

Agreement (intensity of beliefs) and Frequency (behavioural) are two scale types widely used by researchers to measure cultural values at the individual level.

Agreement scales have been used extensively across 83 studies (a meta-analysis by Oyserman et al., 2002) by researchers to measure cultural values and personality traits of individuals. These scales require a subject to select a response based on the intensity of one's belief for a given statement. For example, one may choose a response that corresponds to their intensity of belief that revolves around "strongly agree," "agree," "disagree," "strongly disagree" etc.

Schwarz and Oyserman (2001) and Shulruf, Alesi et al. (2011) highlight several shortcomings in using agreement scales to measure cultural values. Schwarz and Oyserman argued cultural values to be subtle, implicit and deeply interwoven within a person's everyday life. They argued asking an individual to self-report on one's values, attitudes and beliefs is an oversimplification of a complex process. Further, they stated the meaning assigned to self-response choices using scales such as "very much agree" or "very important" to be vague, leading to different interpretations among people as they respond to statements of their cultural values. Shulruf, Alesi et al. quoting findings from Schwarz and Oyserman (2001) further asserted that requesting a respondent to "indicate their level of agreement with items related to their attitudes, values and beliefs…within a cross-cultural context can be problematic, since people from collectivist and individualist cultures may interpret agreement scales differently" (p.175). They highlighted self-reports on agreement scales not to elicit deep-seated cultural values that are innate within individuals, because a respondent may not be consciously aware of his or her stance of a given cultural value.

Shulruf, Alesi et al. (2011) instead recommended researchers to adopt frequency scales when extracting deep-seated cultural values. Frequency or a behavioural scale requires a respondent to select a reply based on the degree of occurrence of behaviour, relating to a given statement. For example, when using a frequency scale, a respondent may use degrees such as "never", "occasionally" "often", 'frequently" etc.

Shulruf, Alesi et al., (2011) further reinforced their position as follows.

> One possible remedy is to ask the respondents to react to frequency rather than intensity of beliefs. People have a range of beliefs and values, but they may not always exercise them so that one can be intense about a belief in some situations but not in others. Thus, it has been suggested that the use of a frequency scale that relates to a prevalence of behaviour or thought (Brown, 2004) provides a more accurate indication of people's behaviors than reports on intensity of beliefs, that relate to perceived importance of values or beliefs (Shulruf, Alesi et al. 2011, p.175)

Shulruf, Alesi et al. (2011) reported Cronbach's alpha values yielding reliabilities between 0.70 to 0.85 for frequency scales tested across several studies. They concluded frequency scales to be viable option to measure cultural values at the individual level.

Both Schwarz and Oyserman (2001) and Shulruf, Alesi et al. (2011) made a strong conceptual case to support the use of frequency over agreement scales to measure cultural values. In addition, Shulruf, Alesi et al. provided acceptable levels of reliabilities for frequency scales in several empirical studies. However, they did not provide any comparative evidence to confirm their relative advantage over agreement scales. Therefore, both these scales were tested in a pilot study to find empirical evidence to assess which scale type is more reliable for the specific questionnaires and population under study. Sections below will discuss details of this arrangement.

3.1.2. Examining Questionnaires to Measure Cultural Values and Personality Traits

Tables 3-1 and 3-2 summarize questionnaires selected to measure cultural values and personality traits in the pilot study. Section 3.1.3 will provide a detailed rationale for their selection.

Table 3-1 List of Questionnaires to Measure Culture

Questionnaire	Cultural Factors	Original Questionnaire	Scales Tested	
One	Individualistic and Collectivist Cultural Values	Shulruf, Alesi et al. (2011)	Frequency Scale	
Two	Power Distance-based Cultural Values	Richardson & Smith (2007)	Agreement Scale	Frequency Scale
Three	Context-based Cultural Values	Richardson & Smith (2007)	Agreement Scale	Frequency Scale

The first questionnaire is the Auckland Individualism and Collectivism Scale (AICS) developed by Shulruf, Alesi et al. (2011). This questionnaire includes statements of individualistic and collectivistic cultural values measured on a frequency scale. With a minor adaptation to the frequency scale, this questionnaire was used to measure individualistic and collectivistic values in the pilot study. The second questionnaire includes statements developed by Richardson & Smith (2007) on power distance-based cultural values. The original questionnaire measured power distance with agreement scales. The pilot study used an adapted version of both agreement and frequency scales. The third questionnaire developed by Richardson and Smith (2007) measured context-based cultural values with an agreement scale. Again, an adapted version of both agreement and frequency scales were tested in the pilot.

Table 3-2 Questionnaire to Measure Personality Traits

Questionnaire	Personality Factors	Original Instrument Source	Scales Tested
Four	Extraversion Conscientiousness Agreeableness Openness to Experiences Neuroticism	Costa & McCrea (1991)	Agreement Scale

The fourth questionnaire measured personality traits. The condensed version of Costa and McCrea's (1991) personality traits questionnaire measured on an agreement scale was selected for the pilot. This scale has been used reliably in most prior research. An adapted version of the agreement scale was tested in the pilot.

3.1.3. Rationale: For Selecting Questionnaires, Scales for Cultural Values and Personality Traits

3.1.3.1 Questionnaire 01/Scale: Measuring Individualistic and Collectivistic Values

Oyserman et al. (2002) described several approaches used by researchers in measuring individualistic and collectivistic (IND-COL) values. The first approach was termed 'Applying Hofstede'. Here researchers used Hofstede's country level cultural value measurement techniques to capture individual level IND-COL values. As explained in chapter two, researchers who used this approach succumbed to the ecological level fallacy. In addition, Hofstede only measured IND-COL using a bipolar scale that assumed one high on IND was naturally low on COL. This notion challenges the orthogonal nature of individualistic and collectivistic values that may exist at the individual level (Oyserman et al.,2002). The second approach used agreement scales to measure cultural values. As highlighted, agreement scales measured the intensity of beliefs at the individual level to denote individual outcomes, attitudes, and beliefs.

Oyserman et al. (2002) reviewed 83 studies and uncovered 27 types of scales used by researchers to measure IND-COL. According to their analysis, 11 scales measured IND-COL as a single bipolar construct (an individual either being high on one

and low on the other) and the balance measured IND-COL as an orthogonal construct, two independent variables that existed side by side within an individual.

Shulruf, Alesi et al. (2011) identified seven IND and eight COL sub-dimensions across all questionnaires reviewed by Oyserman et al. (2002). In their original assessment, they concluded that the current measurement tools did not assess critical attributes of individualistic and collectivistic values. Shulruf, Hattie & Dixon (2007) offered AICS as an alternative to IND-COL scales that were available at that time.

The AICS was evaluated by Gyorkos, Becker, Massoudi, Antonietti, Pocnet, de Bruin and Rossier (2013) who found adequate goodness-of-fit levels confirmed through a confirmatory factor analysis in five countries: New Zealand, Portugal, People's Republic of China, Romania, and Italy. Ciochina and Faria (2009), quoted in Gyorkos et al. (2013), confirmed the internal consistency and validity of the AICS using Romanian and Portuguese samples. The validity and reliability of the scale were also established in Nepal by Watkins et al. (2011) and Iran by Shakiba, Bahrami and Kave. (2011) quoted in Bernardo, Lising and Shulruf, (2013).

Shulruf, Alesi et al. (2011) highlighted why AICS is a better measure of IND-COL on several fronts.

i) AICS provides more accurate information on people's behaviours.

> We argue that the AICS is superior to other individualism and collectivism measures; in particular, respondents are asked about the frequency of their behavior or thoughts concerning a particular issue, rather than the importance of certain individual values. This difference is important: the answers recorded are the respondents' perception of their own behaviour rather than those they regard as optimal or desired behavior. (Shulruf, Alesi et al., 2011, p. 182)

ii) AICS reflects individualistic and collectivistic tendencies of individuals within a cultural environment**.**

> Since all populations across different cultures comprise the full range from very collectivist to very individualist (Triandis, 1995), we suggest that the mean scores of collectivism and individualism for any given population provide only limited information on the actual ethnic composition of these groups. Hence, the AICS appears to be a highly reliable and valid measure

> of collectivism and individualism not only because of its scale based on frequency rather than agreement, but also because of the way in which results are analyzed (by cluster analysis) and interpreted. Therefore, we suggest that using the AICS for measuring collectivism and individualism and identifying clusters of individuals within each ethnic group is more insightful than simply measuring mean scores. (Shulruf, Alesi et al., 2011, p.185)

In developing the AICS, Shulruf, Alesi et al. (2011) referred to three popular scales that measured IND-COL attributes discussed by Oyserman et al. (2002). First, they focused on the scale developed by Hu in 1998 but dismissed it due low estimates of reliability ($\alpha \sim .60$). Further, this questionnaire has been criticized for not being tested across a wide range of cultures or populations. Second, Shulruf, Alesi et al. referred to the self-construal scale developed by Singelis in 1984. Shulruf, Alesi et al. acknowledged the high reliability of this scale in general but expressed concerns that this scale not been replicated in other major studies as described by Oyserman et al. The third was the 32-item measure of individualistic and collectivistic values, crossed with horizontal and vertical dimensions developed by Singelis, Triandis et al. (1995). Shulruf, Alesi et al. acknowledged that this is a widely-used scale with an acceptable level of reliability but was concerned about its complexity. Shulruf, Alesi et al. therefore developed the AICS as an alternative to these scales. The AICS scale measures individualistic and collectivistic values across major IND-COL sub-dimensions identified by Oyserman et al. (2002). It includes three sub-dimensions (responsibility, uniqueness, and competitiveness) on individualistic values and two (advice and harmony) on collectivistic values. They conceptualized IND and COL to be separate orthogonal constructs. The original version of AICS reported reliabilities between 0.78 and 0.71 for each of the IND-COL sub-dimensions. It consisted of 30 items and the sub-dimension 'closeness' within the COL was later dropped as a consequence of poor factor loadings. Shulruf, Alesi et al. (2011) reported the final version of the AICS repeatedly yielding reliabilities (Cronbach's alpha) between 0.70 and 0.85.

Considering the high reliabilities reported by the AICS in measuring individualistic and collectivistic cultural values (at the individual level) across multiple samples, the most current version of this questionnaire was used in the pilot study with a slight modification. The original AICS used a six-point scale ranging from "Never or almost never" to "Always"

(Shulruf, Alesi et al., 2011). To maintain consistency with other questionnaires used in this pilot study, this scale was converted to a seven-point scale as follows.

1	2	3	4	5	6	7
Never	Almost Never	Occasionally	Sometimes	Often	Very Often	Always

See Appendix A for the full adapted version of the questionnaire used for the pilot study.

3.1.3.2 Questionnaire 02/Scales: Measuring Power Distance-Based Cultural Values

The questionnaire developed by Richardson and Smith (2007) was used to measure power distance values in the pilot study. The rationale and the surrounding context in selecting this questionnaire is explained below.

Hofstede conceptualized power distance as a cultural value at the national level, where less powerful members of a society accept power to be distributed unequally (Hofstede et al., 2010). There are several questionnaires and scales available to measure power distance at the individual level. Yoo and Donthu (2005) used the original cultural dimensions of Hofstede, and developed a questionnaire and a scale to measure power distance at the individual level. Sharma (2010) conceptualized several sub-dimensions; power and social inequality; and developed a questionnaire to measure power distance at the individual level. In the field of management, several studies (e.g. Bochner & Hesketh, 1994; Earley & Erez, 1997; Oetzel et al., 2001; Kirkman, Chen, Farh, Chen, & Lowe, 2009; Hwang & Francesco, 2010) developed questionnaires and scales to measure power distance from an organizational point of view. However, most of them included only a few questions that directly measured power distance, since they were part of a bigger study that included several other cultural factors. Therefore, using a limited number of statements and converting it to a fully-fledged questionnaire, this prior instrument did not warrant the depth and seriousness required to measure this cultural value as it is. Those questionnaires, therefore, were not considered.

Richardson and Smith (2007) developed a questionnaire and a scale to measure power distance-based values on the work done by Oetzel et al. (2001). This study is

worthy of consideration since they translated power distance based statements into an academic setting. They changed the original nine-point scale developed by Oetzel et al. to a five-point agreement scale (strongly disagree to a strongly agree) to be consistent with the rest of the questionnaires used in their study. Unfortunately, these authors reported low-reliability scores (Cronbach's alpha being 0.51 to 0.56). They cited the perception of power between academic and organizational situations might have potentially caused these differences. An adapted version of Richardson and Smith's (2007) questionnaire was used in the current pilot study considering this was developed for an educational environment with many statements that referred to power distance-based values. This questionnaire was tested with both agreement and frequency scales. As for the agreement scales, the original five-point scale developed by Richardson & Smith (2007) was converted into a seven-point scale to be consistent with other questionnaires and scales used in this pilot study. The adjusted agreement scale was as follows.

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

As an alternative to the agreement scale, a questionnaire with a frequency scale was also given to another portion of the pilot study sample. Considering the low reliabilities noted in the original version, and the associated benefits claimed in frequency scales this option was considered important to explore. Small wording changes were made to statements in the questionnaire to match statement responses with frequency scale options. The frequency scale used was as follows.

1	2	3	4	5	6	7
Never	Almost Never	Occasionally	Sometimes	Often	Very Often	Always

See Appendix B1 (Agreement) and B2 (Frequency) for both versions of questionnaires.

3.1.3.3 Questionnaire 03/Scales: Measuring Context-Based Cultural Values

The questionnaire and scale developed by Richardson and Smith (2007) to measure high (HCT) and low context-based (LCT) cultural values was piloted in this study. The surrounding context and the rationale for using this questionnaire is explained below.

Gudykunst, Matsumoto, Ting-Toomey, Nishida, Kim, and Heyman (1996) were the first to assess HCT/LCT context-based cultural values at an individual level. However, Gudykunst et al. (1996) considered HCT and LCT to be orthogonal as opposed to Hall's original conceptualization of HCT and LCT as a bipolar construct. Ohashi (2000) supporting Hall's original claim developed an HCT and LCT scale with a bipolar continuum. However, HCT and LCT statements in this questionnaire were more attuned to a national context rather than to an individual level. Richardson and Smith (2007) revised a few statements from Ohashi's questionnaire and added many new statements to arrive at a seventeen statement questionnaire and a scale that measured HCT and LCT at an individual level. They designed the HCT and LCT scale to be a bipolar construct as originally conceptualized. The confirmatory factor analysis they ran retained fourteen statements with Cronbach's alpha values ranging 0.73 to 0.79. The short nature of this questionnaire and its focus on eliciting responses from an individual's perspective made this instrument an attractive option for this pilot study. Although only fourteen items were retained in the final questionnaire, all of the original nineteen questions were tested in the pilot study.

Once again, both agreement and frequency scales were selected to be tested in the pilot. The original five-point agreement scale developed by Richardson & Smith (2007) was converted into a seven-point agreement scale to be consistent with others in the study. The adjusted agreement scale was as follows.

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

Similarly, small wording changes to match statements with the frequency scale were made. This adjusted version of the questionnaire with the frequency scale was

piloted amongst a portion of the sample. The frequency scale used in the questionnaire was as follows.

1	2	3	4	5	6	7
Never	Almost Never	Rarely	Occasionally	Often	Very Often	Always

Both versions of these questionnaires are found in Appendix C1 (Agreement) and C2 (Frequency).

3.1.3.4 Questionnaire 04/Scale: Measuring Personality Traits

The 60 NEO Five-Factor Inventory (which is also known as NEO-FFI) by Costa and McCrae in 1991 was used to measure personality traits in this pilot study. Costa and McCrea referred to this measure as a concise version of the five basic personality traits. For each trait, twelve items from the original pool of one hundred and eighty NEO Personality Inventory (NEO-PI) items were used to construct the NEO-FFI using correlation and factor scores. Robins, Fraley, Roberts, and Trzesniewski, (2001) found the reliability of the five scales to be between 0.86 to 0.90 (Cronbach Alpha). Zillig, Hemenover, and Dienstbier (2002) highlighted the NEO-FFI as one of the most widely used measures of the five-factor model of personality with documented validity in a number of contexts. Versions of this questionnaire were translated into several different languages. In 2004, McCrea and Costa retested this questionnaire and made modest changes (NEO-FFI-R) to support special populations which had problems with literacy. However, they acknowledge the current NEO-FFI questionnaire would continue to be sufficient to measure personality traits even without those modest changes.

The original questionnaire used agreement scales and produced high reliabilities across multiple contexts. The concerns raised earlier in using agreement scales to measure cultural values are not applicable when measuring personality traits for several reasons. Self-reporting of personality traits through agreement scales has been used across many studies consistently with high reliabilities in the past. This was a primary reason to consider the current agreement scales used in personality measurement questionnaires. Additionally, studies (McCrea, 2001, 2002; Benet-Martínez and Karakitapoglu-Aygun, 2003; Hofstede & McCrea, 2004) have reported personality traits to be similar across cultures. This can reduce potential misinterpretation that were said to

occur when using agreement scales across cultures (Shulruf, Alesi et al., 2011). Unlike cultural values that are generally innate within an individual, personality traits of an individual are more explicit, giving one a better opportunity to relate to their intensity of beliefs (agreement). The brief and the concise nature of this 60 item questionnaire, in comparison to the 180 and 240 item questionnaires of the NEO-PI-R, was a major consideration in selecting this questionnaire. The original scale used by NEO-FFI used a five-point agreement scale. In order to maintain consistency, this was expanded to a seven-point agreement scale as follows.

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

See Appendix D for the questionnaire used to measure personality traits in this study.

3.2. Methods for Testing Questionnaires

This section highlights the methodology followed in running the pilot study and elements of the main study to test types of scales, their properties and internal consistency of scales.

3.2.1. Pilot Study

Table 3-3 Distribution of Questionnaires and Scale Types in the Pilot Study

Course	Sample (*n*)	Scales					
		Frequency			Agreement		
		Ques 1 IND/COL	Ques 2 Power	Ques 3 Context	Ques 2 Power	Ques 3 Context	Ques 4 Personality
#1	22	22	22	22			22
#2	30	30	30	30			30
#3	26	26	26	26			26
#4	24	24			24	24	24
#5	30	30			30	30	30
Total	**132**	**132**	**78**	**78**	**54**	**54**	**132**

A sample of 175 students across five sections of introductory marketing courses taught in a small-size university in Western Canada in the spring of 2014 were invited to take part in the pilot study. This sample was similar to the characteristics of the planned sample of the main study. The four questionnaires with two scale types (reviewed earlier) were handed out in class throughout the semester. One hundred and forty-one students gave consent to access their data. Data from 132 students were finally used to report results due to large incomplete sections within several questionnaires. Details about the distribution of these four questionnaires and versions of scales across sections are reported in Table 3-3. As highlighted above, data from 132 students were available for questionnaire one, measuring individualistic/collectivistic values (frequency scales) and questionnaire four, measuring personality traits (agreement scales). Questionnaire two and three, which measured power distance values and context-based values with either frequency or agreement scales had 78 and 54 students respectively.

3.2.2. Elements of Main Study Methodology Relating to Questionnaire Testing

A sample of 280 students, across eight sections of introductory marketing courses taught in a small-size university in Western Canada, in the summer and fall of 2014 were invited to take part in the main study. Four questionnaires (results of the pilot study will confirm the type and nature of these questionnaires and scales as presented in sections 3.3 onwards) were used to collect data on cultural values and personality traits in the main study. Reliability data is based on data generated by 221 students who gave consent to access their data. Further details about the organization of the main study are reported in chapter four.

3.3. Findings on Scale Types, Properties and Internal Consistency of Scales

This section reports results about scale types, the bipolar or orthogonal nature of the selected scales, and their internal consistency as obtained through the pilot and the main study samples. Nunnaly (1978) suggests a threshold Cronbach alpha value of 0.7 or above when evaluating the reliability pertaining a scale. This threshold is applied in assessing the reliability of scales in this study.

3.3.1. Questionnaire 01 – Individualistic and Collectivistic Values

3.3.1.1 Scale Type

As discussed earlier in the chapter, the AICS was tested on a frequency scale (only) in the pilot study.

3.3.1.2 Properties of the Scale

As revealed in chapter two, researchers who used ecological (national level) measures, described individualistic and collectivistic cultural values to be bipolar (Markus & Kitayama, 1991; Hofstede et al., 2010; Miramontes, 2011). However, those who advocate measuring cultural values at the individual level argue individualistic and collectivistic values to be orthogonal.

Statements that elicit individualistic and collectivistic values were separated as two scales and statistics were run separately. Then, statements with individualistic values were combined with reversed collectivistic statements to arrive at a single combined scale, and statistics were computed accordingly. The following analysis will reveal results from the pilot and the main study about the properties of these scales.

In the pilot study (n = 132), the reported Cronbach alpha coefficients for individualistic and collectivistic values separately were 0.77 and 0.77. The combined scale reported a coefficient of 0.73. In the main study, (n = 221) the Cronbach alpha coefficients for individualistic and collectivistic values were 0.79 and 0.68 respectively. The combined score was 0.73. The alpha value for collectivistic values was very close to the threshold of 0.7 in the main study of .68.

Table 3-4 below reports inter-scale correlations between individualistic and collectivistic values.

Table 3-4 Inter-Scale Correlations between Individualistic and Collectivistic Values

Data Source	*n*	*r*	*p*
Pilot	132	.029	.74
Main	221	-.150	.26

If individualistic and collectivistic values are bipolar (meaning a student high on one should be low on the other), then the inter-scale correlations between them should report a strong negative relationship. Both the pilot ($r_{132} = 0.29$, $p = .74$) and the main study ($r_{221} = -0.150$, $p = .26$) results revealed no correlation between individualistic and collectivistic scales. The lack of correlation between them, and the acceptable threshold of Cronbach alpha for individualistic and collectivistic values, suggests them to be best considered as orthogonal scales. Thus in this study, individualistic and collectivistic values are treated as separate constructs when predicting online discussion behaviours of students.

3.3.1.3 Internal Consistency of Scales

Pilot Study

As reported earlier, Cronbach alpha coefficients for individualistic and collectivistic values in the pilot study was 0.77 and 0.77 respectively. These alpha values highlight the internal consistency of these scales. These findings support results reported by Shulruf, Alesi et al. (2011) ascertaining the capacity of frequency scales to produce reliable data in measuring cultural values at an individual level. Given the acceptable alpha values showed for AICS in the pilot, the same questionnaire was used to collect individualistic and collectivistic cultural data in the main study without any changes. This questionnaire is reported in Appendix A.

Main Study

Cronbach alpha coefficients for individualistic and collectivistic values in the main study was 0.79 and 0.68 respectively. For collectivistic values, though alpha values did not exceed the 0.7 threshold, they are close enough to warrant use.

3.3.2. Questionnaire 02 – Power Distance-Base Cultural Values

3.3.2.1 Scale Type

The second questionnaire tested in the pilot study used both agreement and frequency scales to measure power distance-based values among students. Cronbach alpha values for both these scales are reported in Table 3-5.

Table 3-5 Cronbach Alpha Values for Frequency and Agreement Scales

Scales	Number of Participants	Cronbach Alpha Values
Agreement Scale	54	0.37
Frequency Scale	78	0.60
Frequency Scale	54 of 78 (randomly selected)	0.54

As reported in Table 3-3, questionnaires for 54 students with agreement scales and 78 students with frequency scales were available for analysis. In order to compare like with like, questionnaires for 54 students with frequency scales from a total of 78 were selected at random. The Cronbach alpha values generated from both scales were lower than the 0.7 threshold. However alpha values for the frequency scale (questionnaires for 54 students) were much higher than that (54) found for agreement scales. The alpha value for frequency scales improved further when the full 78 sample was subjected to the analysis.

The assertion made by Shulruf, Alesi et al. (2011) alluding to the strength of frequency scales in measuring cultural values was better supported by the results from this questionnaire, although still lower than the threshold. Moving forward, data generated from frequency scales were used to report results for the pilot and the main study.

3.3.2.2 Properties of the Scale

Similar to what was discusssed earlier, alpha values for power distance were calculated as separate (low power, high power) and as combined scales (low power and reversed high power). Although some studies report power distance-based values both at the national and individual level, the nature of scales for this cultural value has not garnered widespread discussion in literature. In order to maintain consistency with procedures followed for other cultural values discussed in this study and the emphasis placed on the individual, the bipolar or the orthogonal nature of the scales were also investigated.

Cronbach alpha values for low power, high power and combined scales are evaluated below. As per the pilot study (n = 78) data, low power distance, high power distance, and the combined score reported Cronbach alpha values of 0.60, 0.46 and 0.60 respectively. The overall Cronbach alpha values returned for all these factors were lower than the threshold of 0.7. In particular, high power distance reported a very low alpha value. The alpha values for high power and the combined score improved substantially with the main study (n = 221) sample data. The alpha values for low power, high power, and the combined values were 0.65, 0.64 and 0.71 respectively. Only the combined score returned an alpha value that is greater than the required threshold. Based on the results from this sample, power distance when organized as a bipolar scale tends to yield a reliable alpha statistic.

Inter-scale correlations between high and low power distance-based cultural values are presented in Table 3-6. A strong negative correlation between high and low power distance would suggest the bipolar nature of this scale. The pilot study results revealed *(r* 78 = -.186, p = *.110*) no correlation between the two factors. However, the main study (r_{221} = -.271, p < .001) results revealed a statistically significant negative correlation between the two.

Table 3-6 Inter-Scale Correlations between Low and High Power Distance-Based Values

Data Source	*n*	*r*	*p*
Pilot	78	-.186	.110
Main	221	-.271	.000

Although the non-significant inter-scale correlation between high and low power distance values in the pilot study did not suggest a strong bipolar relationship, the statistically significant negative inter-scale correlation between them in the main study and the higher alpha for the combined scale, provided reasonable grounds to consider the bipolar properties of this cultural value. Conceptually, it also makes sense to consider this cultural value to be best considered as a bipolar scale. For example, it would be unlikely for a student who accepts authority to rest with a few (displaying high power distance) to also accept authority to rest with all (displaying low power distance). Thus in this study, power distance-based cultural values are best considered to be a bipolar scale.

3.3.2.3 Internal Consistency of Scales

Pilot Study

Given the lower alpha values reported (0.60 for combined score for high and low power) in the pilot study (*n* = 78), the questionnaire was reviewed closely. Looking through the statistics table generated along the alpha values, removing question 11 would improve the Cronbach alpha to 0.62. A closer look at question 11 revealed the term "standards of performance" to be vague. This term can be interpretated in different ways potentially confusing students. Thus a decision was made to drop this question. For questions 3, 7 and 9, a lower inter-item correlation with other questions was also observed. Changes were made to improve the clarity of these questions (Table 3-7). With the deletion of a question and changes made to others, the updated questionnaire with the frequency scale was distributed to the main study sample. See Appendix B3 for the updated version of this questionnaire.

Table 3-7 Alternations to the Pilot Questionnaire used in the Main Study

Pilot Study Version	Altered Question
Q3. When a student questions a professor's authority, it limits their teaching effectiveness.	Q3. When a student challenges a professor's authority, it limits their teaching effectiveness.
Q7. Compared to professors, students should enjoy equal status in the classroom	Q7. Students and professors should enjoy equal status in the classroom.
Q9. Even after the semester has begun, professors have the right to change course requirements set forth on the syllabus.	Q9. Even after the semester has begun, professors have the right to change course requirements set in the syllabus without consultations with students
Q11. Professors have the right to decide standards of performance expected from students.	Deleted

Main Study

Main study (n=221) results returned a 0.71 Cronbach alpha coefficient for the combined scale. This suggested reasonable internal consistency above the threshold for this bipolar scale.

3.3.3. Questionnaire 03 – Context-Based Cultural Values

3.3.3.1 Scale Type

The third questionnaire measured context-based cultural values with agreement and frequency scales in the pilot study. Cronbach alpha values for these scales are reported in Table 3-8. The reliabilities reported with the frequency scales improved substantially in comparison to agreement scales. The alpha for the frequency scale with n = 54 was at the threshold (0.70), and for n = 78, was even higher (0.74). This remarkable improvement (0.49 for agreement scales and 0.70 for frequency scales) in the internal consistency affirms the usefulness of frequency scales in measuring this cultural value in a reliable manner. Moving forward, data generated from frequency scales were used to report results for the pilot and the main study.

Table 3-8 Cronbach Alpha Values between Frequency and Agreement Scales

Scales	Number of Participants	Cronbach Alpha Values
Agreement Scale	54	0.49
Frequency Scale	78	0.74
Frequency Scale	54 of 78 (randomly selected)	0.70

3.3.3.2 Properties of the Scale

As discussed previously, Hall conceptualized context-based cultural values to be bipolar (Hall & Hall, 1990). Although an individual can possess both high and low context-based cultural values, Hall's argument was that one cannot be both high and low context at a given point in time. Richardson and Smith's (2007) context-based cultural value questionnaire selected for this study was designed to capture cultural data as a bipolar construct. Results from the pilot and the main study are reported below to identify properties of this scale.

Cronbach alpha values for low context, high context and combined scales are evaluated below. In the pilot study (n = 78), Cronbach alpha coefficients reported for low context and high context separately 0.61 and 0.74. The combined scale reported a coefficient of 0.75. In the main study (n = 221) the Cronbach alpha coefficients for low context and high context were 0.67 and 0.72 respectively. The combined score was 0.74.

Alpha coefficients from both the pilot and the main study for combined scales consistently reported coefficients well above the threshold of 0.7 and higher than the high context and low context scales separately.

Table 3-9 Inter-Scale Correlations between Low and High Context-Based Values

Data Source	*n*	*r*	*p*
Pilot	78	-.027	.813
Main	221	-.327	.000

Table 3-9 reports inter-scale correlations between high and low context-based values. A strong negative correlation between them would suggest the bipolar nature of this scale. The pilot study results revealed *(r* 78 = -.027, *p = .813*) no inter-scale correlation between them. However, the main study (r_{221} = -.327, $p < .001$) results revealed a statistically significant negative inter-scale correlation between the two factors.

Although the non-significant inter-scale correlation between high and low context values in the pilot did not suggest a bipolar relationship, the statistically significant negative inter-scale correlation between them in the main study and the higher alpha for the combined scale, provided reasonable grounds to consider this cultural value as bipolar. Additionally, as stated earlier this scale was originally designed to be bipolar. Thus in this study, context-based cultural values will be best considered as a bipolar scale.

3.3.3.3 Internal Consistency of Scales

Pilot Study

The Pilot study (n = 78) reported a Cronbach alpha coefficient of 0.75 for the combined scale. This highlights the internal consistency for this bipolar scale. Given the acceptable alpha values reported for the frequency scale in the pilot, the same questionnaire (without any revisions) was used to collect cultural context data in the main study. This questionnaire is reported in Appendix C2.

Main Study

Cronbach alpha values (n = 221) for the combined scale returned a coefficient of 0.74. This again highlighted the internal consistency of this scale.

3.3.4. Questionnaire 04 – Personality Traits

3.3.4.1 Scale Type

This questionnaire used an agreement scale that had previously reported reliable alpha scores across many studies.

3.3.4.2 Internal Consistency of Scales

Pilot Study

Table 3-10 reports Cronbach alpha values of the five personality factors.

Table 3-10 Cronbach Alpha Values of Personality Traits: Pilot Study

Sample (n)	Neuroticism	Extraversion	Openness to Experience	Agreeableness	Conscientiousness
132	0.81	0.82	0.67	0.77	0.78

The reported alpha values for all personality traits, except openness to experience, were above the threshold alpha value of .70. The review of alpha values for questions on 'openness to experience' personality trait revealed that deleting question 8 or 38 would improve the alpha value marginally to 0.68. After carefully reviewing these questions and not noticing any obvious problems with the wording; after considering the reported alpha values to be around the threshold, and acknowledging the widespread use of this questionnaire, it was decided to proceed without making any changes. This questionnaire is reported in Appendix D of this study.

Main Study

Table 3-11 includes Cronbach alpha values for the five personality traits from data generated from the main study.

Table 3-11 Cronbach Alpha Values of Personality Traits: Main Study

Sample (n)	Neuroticism	Extraversion	Openness to Experience	Agreeableness	Conscientiousness
221	0.83	0.82	0.68	0.73	0.83

With the exception of the ‘openness to experience’ personality trait, the reported Cronbach alpha values for all other personality traits were well above the threshold indicating a reliable level of internal consistency. The reported alpha value for openness to experience was very close to the threshold range of 0.7, asserting a good enough reliable level of internal consistency.

3.4. Chapter Summary

This chapter presented operational details for the scales used to measure cultural values and personality traits measured in this study. It started by examining types of scales in general and then looked at specific questionnaires to measure these values and traits. Four objectives were set for this purpose.

The first was to decide on scale types (agreement and frequency) that measured cultural values and personality traits in a reliable manner. Choosing between frequency and agreement scales, reliability statistics revealed frequency scales yielded better internal consistency when measuring cultural values. Frequency scales thus were adopted to measure all cultural values. For personality traits only the original tried and tested agreement scales were tested and alpha levels were acceptable. The second objective was to examine specific questionnaires earmarked to measure cultural values and personality traits with the target population. Four questionnaires (three cultural and one personality) were selected to be tested in the pilot study. The third objective was to investigate the properties of scales used to measure cultural values identified in the study. Context-based cultural values were best considered to be a bipolar scale through study results. Cronbach alpha values and inter-scale correlation coefficients revealed individualistic and collectivistic values to be best considered as orthogonal, and power distance to be best considered as bipolar scale. The final objective was to examine and report the internal consistency of scales referred in earlier sections. With slight adjustments to the power distance questionnaire based on pilot study results and with no changes to others, the final set of questionnaires were compiled for the main study. Cronbach alpha values produced acceptable thresholds for these scales in the main study sample. Chapter four will now unfold the methodology set for the main study.

Chapter 4.

Methodology

This chapter will lay out the research design of the main study. Section 4.1 will review the operational details of the independent variables decided on in chapter three.

4.1. Review of Independent Variables

Table 4-1 Summary of Independent Variables

Independent Variables	Description
Individualistic Cultural Values	Values that reflect an individual's desire for self-expression focusing on inwardly projecting a unique identity for an individual.
Collectivistic Cultural Values	Values that reflect an individual's energy to situate themselves within a group, identifying themselves with a group. Their prime motivation is to promote the group cause, at times sacrificing their self-interest.
High/Low Power Distance Cultural Values	The degree to which one is willing to accept or reject the differences of equality and authority within a group.
High/Low Context-based Cultural Values	The degree to which one uses context to create and communicate meaning.
Neuroticism Personality Trait	A trait characterized by anxiety, hostility, depression, self-consciousness, impulsiveness, and vulnerability.
Extraverted Personality Trait	The tendency of an individual to express ideas and initiate action.
Openness to Experience Personality Trait	A trait that embraces a sense of value for originality, novelty, knowledge, and experience.
Agreeableness Personality Trait	A trait that is mostly concerned in building interpersonal relationships between people.
Conscientiousness Personality Trait	A trait that represents the drive to accomplish something, and contains characteristics such as pursuit, being organized, systematic, efficient, practical and steady.

Cultural and personality characteristics of students were operationalized earlier in chapter three. Specific questionnaires and scales to measure these characteristics were identified and tested. During this process, individualistic and collectivistic cultural values were identified to be best considered as orthogonal, meaning a student can be high (or low) or both on these values at a given time. Power distance and context-based cultural

values were identified to be best considered as bipolar, meaning a student can only be high or low on that value at a given time. Further, the Big Five personality traits were identified and tested earlier. Altogether, four cultural values and five personality traits were shortlisted as independent (predictor) variables in this study. Table 4-1 briefly summarizes these variables. The following section will now present the operationalization of the dependent variables related to speaking in online discussions.

4.2. Operationalizing Dependent Variables

Speaking dimensions listed in Table 4-2 were conceptualized in chapter two. This section will now operationalize them in detail.

Table 4-2 Summary of Speaking Dimensions

Nature of Speaking	Speaking Dimensions
Quantity of Speaking	Degree of Participation
Quality of Speaking	Attending to Others, Attending to the Task

Several dependent/outcome variables that defined each of the speaking dimensions are detailed below. Log activities recorded by the discussion tool were extracted at the post level. A content analysis coding scheme was designed to translate post content into measurable speaking quality variables. This can be found in Appendix E of this study. This scheme coded each speaking quality outcome variable at the post level since all discussion data were captured as log activities by the discussion tool. When developing predictive models, these post-level data (for both speaking quantity and quality) were converted and reported per student. More details about the unit of analysis of this study is presented in section 4.6.1.

4.2.1. Degree of Participation

This dimension captured the quantity of speaking. The average length of a message and the total number of messages were two specific variables that measured the quantity of speaking in this study. These measures allowed the investigation of the degree of thoroughness displayed by students during the online discussion. A student who posts many messages during a discussion has the potential to refer to many others during the discussion. The average number of words used in a message can highlight the

potential depth to which a student could address the discussion task or others' ideas. The degree of participation can also be influenced by a student's cultural and personality characteristics.

4.2.2. Attending to Others

This was the first dimension that conceptualized the quality of speaking. The three variables used to assess how students attend to others in their posts during discussions were: the degree of discursiveness, the level of social presence and the nature of message tones in posts. The following paragraphs will provide the rationale for the choice of these variables.

4.2.2.1 Discursiveness

In chapter two, discursiveness was introduced to conceptualize how students link comments to others during discussions. This was operationalized in the study in two ways. The first way distinguished messages that referred to others' comments (coded as 'one') from those that did not (coded as 'zero'). The second way focused on how students agreed or disagreed with others in their messages. Indicators used to assess each of these elements are presented below.

Wise and Hausknecht et al. (2014) used how students acknowledged others, how they responded to a single idea or multiple ideas as indicators to code referred to others. Clark and Sampson (2008) used 'query about meaning' as an indicator for reference to others when students seek clarification during discussions. Pena-Shaff and Nicholls (2004) portrayed questions raised by students or replies to questions as indicators. A review of discussion posts often reveals students referring to others by name or using direct quotes verbatim in their messages. Statements that signal some form of agreement or disagreement in general were also considered as indicators of referring to others. Together, all of the above indicators were used to code 'referring to others' in the current scheme.

Earlier in chapter two, evidence from past studies (Price et al., 2002; Paulus, 2006; Clark et al., 2007; Dennen and Wieland, 2008) showed how the degree of agreement or disagreement displayed by students in their posts could potentially influence the overall

quality of online discussions. Besides, signs of full or partial agreement/disagreement is another aspect of discursiveness that can be influenced by a student's cultural and personality characteristics. Therefore, four codes were assigned to assess this: code 'one' was assigned to identify neutral content-based comments (where participants do not agree or disagree with others) and when students engaged in non-task/content related comments; code 'two' was assigned to posts that indicated full agreement with other's' ideas; code 'three' was assigned for partial agreement/disagreement and code 'four' for full disagreement with other's ideas. The indicator 'support of a comment' (Clark & Sampson, 2008) was used to code posts that suggested agreement. This indicator included several well thought-out statements that reflected agreement with others. To code full disagreement, two indicators identified by Clark and Sampson; namely, rebuttal against grounds and rebuttal against thesis, were combined. These indicators framed disagreement with others in a clear manner. Indicators that resonated with partial agreement or disagreement were rarely found in previous studies. Therefore, several indicators that reflected on partial agreement/disagreement were suggested for the current coding scheme. All these codes merely categorized posts into groups thus were considered as nominal measures in the coding process. Please see Appendix E for a full list of indicators used to operationalize this speaking variable.

4.2.2.2 Social Presence

As highlighted in chapter two, social presence refers to how students relate to each other socially within a community of inquiry (Rourke, Anderson, Garrison, & Archer, 2007). These authors referred to greetings, compliments and making humorous comments as indicators of social presence in messages. Rourke, et al. (2007) coded expression of emotions, risk-free expression, and encouragement of collaboration as social presence. Wise, Chang et al. (2004) coded humor, playful asides, emotions, self-disclosure, greeting, complimenting others' ideas, allusions to physical presence, addressing people by name etc. as social presence. Pena-Shaff and Nicholls (2004) regarded recognizing others' contributions and showing of empathy as indicators of social presence. Weltzer-Ward (2011) identified multiple codes to capture social interactions across many studies reviewed. They included comments pertaining to asking for help, supporting others, and making friendly or humorous remarks. Considering all the above, indicators such as emotions and feelings, empathizing with others, greeting others, thanking others,

recognizing contributions, encouraging and motivating others, asking for help, alluding to physical presence, making humor/playful asides and addressing people by name were used in this coding scheme to identify social presence.

Two codes were assigned to highlight degrees of social presence in messages. Code 'zero' for "no social presence" and code 'one' for "'some degree of social presence"'. Please see Appendix E for a full list of indicators used to characterize this speaking variable.

4.2.2.3 Message Tone

Message tone was conceptualized as referring to an autonomous versus a connected voice when relating to others during discussions. As explained in chapter two, the tone used by a student in a message, helps us understand the quality of speaking as to how they relate to other's ideas. Various studies (Belenky et al., 1986; Ting-Toomey, 1999; Blum, 1999; Rovai, 2001) have referred to the use of autonomous and connected tones in messages. In operationalizing autonomous and connected tones, Ting-Toomey's (1999) "I" and "we" variations (singular and plural) of the first person when addressing others were used. A third variable was further introduced. That was the 'impersonal tone'; using the third person to address others during the discussion. This tone is very different to the autonomous or the connected tone that used some form of personal reference interjected when referring to others. The impersonal message tone distanced oneself from others in the group, and may depict a different connotation otherwise not captured by autonomous or connected tones.

Therefore, in total three types of pronouns were counted in messages. The number of times the first person singular pronouns such as "I, me, my or mine", first person plural pronouns such as "we, us, our or ours" and third person singular or plural pronouns such as "he, him, his, she, her, hers, it, its, they, them, their, theirs" used in messages were counted. First person singular pronouns highlighted an autonomous tone, first person plural pronouns a connected tone, and third person pronouns indicated impersonal message tones during discussions. Since the above pronouns were counted with an identifiable number of occurrences, they were categorized as ratio measures. Appendix E will list all indicators used to characterize this speaking action.

4.2.3. Attending to the Task

Attending to the task at hand was the second speaking quality dimension conceptualized in this study. Variables that highlighted how students attend to the task include, argumentative actions engaged during discussions and ways students structure messages to convey meaning. The following paragraphs will operationalize these variables further.

4.2.3.1 Message Structure

As explained earlier, message structure refers to how students organize their thoughts in relation to the task within a message as they externalize ideas during discussions. When students are assigned many tasks in a discussion, some may choose to focus on one task at a time while others may address all of them together in a single post. Veldhuis-Diermanse (2002) differentiated between uni-structural approaches, where a student addressed one aspect of the task in messages, versus multi-structural approaches where several aspects of the task were taken up in a post. Another way to look at message structure is how they organize their ideas in the message. Students can either follow a linear structure where they organize thoughts in a logical order, clearly connecting each thought with another, or they can follow a circular/contextual structure. In the latter, ideas and arguments are presented organically at will, going back and forth between various topics without a clear organizational plan (Bennett, 1998; Ting-Toomey, 1999).

How students organized their thoughts in messages as described by Bennett, (1998) and Ting-Toomey (1999) was selected to code posts in this study as opposed to the uni-structure versus multi-structure approach suggested by Veldhuis-Diermanse (2002). The discussion task provided to students in this study included multiple tasks. Thus we may expect students to address many tasks (multi-structured approach) within one post. This would potentially reduce the variability of this speaking action if measured that way, minimizing its usefulness. Therefore, the uni-structured versus multi-structured approach to organize messages was not considered. Context-based cultural values described earlier in chapter two related to how students referred to the “content” versus the “context” in a message. This can potentially explain how students organize their ideas

in messages and may be more useful for this study. Therefore, three codes were used to operationalize how students structured their ideas in messages. Code 'one' related to "contextual-circular/implicit organization of thoughts". In these messages, ideas were presented in a fluid manner, expressing thoughts along the way. In most cases these messages referred to thoughts in an implicit, roundabout way. They did not refer to a thesis explicitly in the post. They used tentative forms of language and narrative expressions that allowed the reader to interpret the meaning on their own. These messages did not necessarily refer to tasks clearly. Code 'two' denoted "linear/explicit organization of thoughts" within a post. These messages included explicit statements. Thoughts within the post were organized logically from point a, to point b to point c. There were signs of a deliberate attempt to link each point to the other. Often these messages included a thesis at the beginning or the end of the message. They frequently included direct, pointed short statements that articulated ideas. Responses were clearly referred to the task that was being addressed in the post. Code 'zero' was used to categorize messages that were too short to be assigned to any of the earlier codes. All codes were organized as nominal measures since they categorized differences in type, not level. Appendix E will list all indicators used to characterize this speaking action.

4.2.3.2 Argumentative Actions

In chapter two, argumentation was identified as a major component that led to learning through asynchronous online discussions (Weinberger & Fischer, 2006). Various elements and their impact on the overall quality of argumentation was also reviewed. Elements that constitute an argument are operationalized below.

Position of an Argument

This was identified to be the first step in the argumentative process (Weinberger & Fischer, 2006). As discussed, a position taken on an issue can help a student to examine their thinking more carefully, and eventually lead them to formulate an argument to support a point of view. During a discussion, students are required to engage with others. This inadvertently can lead them to take positions on others' ideas. In this study, a position was counted in several ways. A stance taken by a student on a case issue, or suggestion to resolve an issue, independent of others' ideas were considered as a position. Further, a

positive or a negative stance taken on another student's idea was also considered as a position. These positions as articulated above were coded as 'one'. A 'zero' position would mean a student not taking a stance in relation to others' ideas/solutions or case issues (Hsiao, 2012). Since the above codes used a dichotomous categorization, they were organized as nominal codes.

Reasoning of an Argument

Weinberger and Fischer (2006) referred to reasons as statements that advance a position taken by students. Reasoning during argumentation provides details to support why a particular position may be a potential solution to the task at hand. Further, it provides weight to the position taken by the author. The assigned discussion case included several issues. If a student addressed multiple issues within a post, the message could easily end up with multiple reasons. The examination of a sample number of posts confirmed this. Counting reasons one-by-one was a complex task that could potentially take numerous hours that were limited by the resources allocated for this study. To explore this, a training session with 100 posts was carried out. The poor inter-rater reliabilities noted when counting reasons one-by-one led to the development of a binning system. The number of reasons counted for this trial coding was subjected to a frequency distribution. The distribution of data generated for these bins were used to design the following binning system. Code 'zero' was assigned to indicate no reasons, code 'one' for a single reason and code 'two' for 2 or 3 reasons, code 'three' for 4 or 5 reasons and code 'four' for 6 or 7 reasons and code 'five' for 8 or more reasons. Codes for reasons indicate degrees of reasoning and when students use more reasoning; it is indicative of stronger forms of argumentation. Thus, they were organized as ordinal measures.

Evidence to Ground a Position in an Argument

Evidence refers to various forms of internal or external resources used by students to support their reasons and positions. As explained in chapter two, evidence used to back a position(s) is a manifestation of a stronger argument presented during a discussion. Toulmin's argumentation model described evidence as examples or factual data used to support ideas. Weinberger and Fischer (2006) referred to evidence as 'grounds', categorizing them into observations, experiences and evidence (meaning facts). Weltzer-Ward (2011) provided a comprehensive list of resources as evidence reported in many

previous studies. These are direct quotes, citations, generalized referrals, experiences, theories, examples, generalizations and data. Considering all types of evidence reported in studies, the following list of resources were considered as indicators in this study: anecdotes, observations, generalizations, personal experiences, examples, references to theory, direct quotes, citations, and data.

Application of evidence in argumentation was operationalized based on a coding scheme similar to what was presented by Clark and Sampson (2008). It included three codes. Code ‘zero’ referred to no presence of any evidence in posts. Code ‘one - reference to evidence’ when a student only referred to evidence but did not apply it to support their claims. Code ‘two - applying evidence’, denoted when a student applied evidence directly linked it to support their claims. Application of evidence indicated a strong form of argumentation when used to ground a position or a reason (as opposed to merely referring to evidence). The latter is often seen in a weak form of argumentation. These codes were organized as ordinal measures.

Type of Evidence in Posts

The earlier coding scheme related to the use of evidence in general when it was referred to or applied in messages. However, these indicators may not help us understand the types of evidence used by students during discussions. Therefore, a separate coding category termed “types of evidence” was used. As revealed earlier, students with different cultural and personality backgrounds may use different forms of resources as evidence to support their claims. For example, students with high context-based values may use personal forms of evidence such as anecdotes, observations, experiences, examples etc. These types of light, personal forms of evidence generated by students were identified as “soft evidence” in this study. In turn, students with low context-based values, who rely on logical, precise and direct notations of conversations, may show a higher tendency to use factual data, direct quotes and citations found in published sources or referenced in theory. These are termed as “hard evidence” in this study. Hard evidence is mostly by third parties and can generally be verified independently. The number of times soft and hard forms of evidence used in posts were counted separately. Since the number of occurrences can be identified with a definite zero, they were organized as ratio measures.

Please refer Appendix E for a full list of indicators used to charcaterize types of argumentation.

Speaking quantity and quality variables discussed above, constituted the dependent/outcome variables in this study. Table 4-3 provides a brief summary of these variables.

Table 4-3 Summary of Dependent/Outcome Variables

Speaking Dimension	Speaking Variables		Description
Degree of Participation	Number of Posts		Total number of posts made by a student during the discussion.
	Average Length of Posts		The average number of words used by a student to post a message
Attending to Others	Discursiveness	Reference to Others	The extent to which students refers to others' comments
		Degree of Agreement/ Disagreement	The extent to which a student fully/partially agrees, disagrees or remains neutral to others' ideas during the discussion.
	Social Presence		The extent to which students use greetings, compliments, humorous comments, empathy etc. to relate to others socially in their posts.
	Message Tone		The use of autonomous, connected or impersonal tones with the use of first person singular, first person plural or third person pronouns in messages
Attending to the Task	Message Structure		The manner in which students structure their ideas, thoughts, feelings or arguments in externalizing them through messages
	Argumentative Actions	Taking a position	The extent to which a student takes a stand on issues or possible recommendations made by others.
		Reasoning	The extent to which reasons provided to support the position are taken as valid.
		Refer/Apply Evidence to Ground a Position	The extent to which supporting proof/resources used/applied to validate why the supporting position may hold ground.
		Types of Evidence	The nature of proof used. They can be based on previously published information, verified by third parties (hard) or ideas, generalizations, experiences (soft) that provides a further context to a position.

4.3. Specific Research Questions

The broad research question proposed in this study was to investigate "How and to what extent are online discussion-based behaviours of students predicted by their cultural values and personality traits." Figure 4.1 highlights this visually.

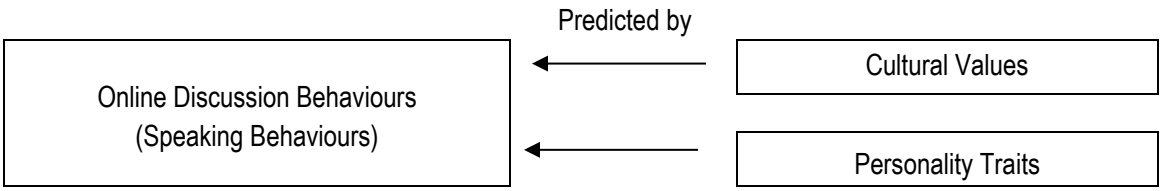

Figure 4-1 Online Discussion Behaviours Predicted by Cultural and Personality Characteristics

Having operationalized both outcome and predictor variables, the broad research question is now dissected into the following specific questions to investigate predictive relationships between online speaking variables and cultural values and personality traits.

1 How is the number of messages posted by a student …….

2 How is the average number of words used per message by a student …….

3 How is the extent to which a student refers to others' posts…….

4 How is the extent to which a student disagrees with others …….

5 How is the extent to which a student fully agrees with others …….

6 How is the extent to which social presence displayed by a student …….

7 How is the tone of message used by a student …….

8 How is the structure of message used by a student …….

9 How is a position taken by a student in argumentation …….

10 How is the level of reasoning made by a student in argumentation…….

11 How is the manner in which evidence is used by a student in argumentation …

12 How is the nature of evidence used by a student in argumentation …….

…….. during an online discussion predicted by their cultural values and personality traits?

4.4. Hypothesized Predictive Relationships

The hypothesized relationships between speaking dimensions (now operationalized as specific outcome variables) and cultural/personality characteristics (now operationalized as specific predictor variables) that were reviewed in chapter two are summarized in Table 4-4 below.

Table 4-4 Hypothesized Relationships between Outcome Variables and Predictors

Research Questions	Outcome Variables	Hypotheses	Predictor Variables								
			IND	COL	LPR	LCT	NEU	EXT	OPN	AGR	CON
1	Number of Posts	H01	+		+	+	-	+	+	+	+
2	Average Words	H02	+		+	+	-	-	+	+	+
3	Reference	H03	-	+	+		-	+	+	+	+
4	Some Disagreement	H04	+	-	+		-		+	-	+
5	Full Agreement	H05		+				+		+	
6	Social Presence	H06		+		-	+	+	+	+	-
7	Autonomous Tones	H07a	+			+					+
	Connected Tones	H07b		+			+			+	
	Impersonal Tones	H07c	+			+					+
8	Contextual Structure	H08	-			-			-		-
9	Position	H09	+	+	+	+	-	+	+	-	+
10	Reasoning	H10	+	-	+	+	-	-	+	-	+
11	Refer Evidence	H11a		+			-	+			
	Apply Evidence	H11b	+		+	+		-	+		+
12	Hard Evidence	H12a	+		+	+			+		+
	Soft Evidence	H12b		+		-		+		+	

4.5. Study Design

4.5.1. Study Context and Participants

Permission to access data was requested from students across eight sections of an introductory-level marketing course. These courses covered various topics of marketing that taught students how to profile consumer characteristics and their behaviours. Students were often required learn marketing research techniques that taught them to investigate and profile consumer behaviours. These courses were taught in a small-sized university in Western Canada in the summer and fall of 2014. The same instructor taught all course sections. Seven sections were delivered as blended modules across three geographical campus locations. The other course was offered as a fully online course. The data used for this study were naturally generated as a part of regular course work carried out by students. 221 out of 280 students gave consent to access data generated during this period. Coursework included both online discussions and surveys completed throughout the semester.

4.5.2. Design of Online Discussions

Students were required to take part in three asynchronous online discussions as a part of their course work. Discussion topics corresponded to course topics that students studied throughout the semester. Students were required to apply learnings from their course work to inform their discussions. The asynchronous online discussion tasks were carried using a forum based software called ‘Phorum.' The weight of the overall online discussions accounted for 21% of their total course grade. Each discussion session lasted up to 10 days.

Students engaged in the discussions in groups of 11-12. In week two of the semester, the instructor divided approximately 35 students per section into three discussion groups. In total, there were 24 discussion groups across eight sections. All groups were provided two tasks per discussion. For each task, students were given a scenario that included an authentic business controversy which had multiple solution options. These business controversies were based on topics related to ethics, privacy and business decision making in line with their natural course topics. Two discussion task examples can be found in Appendix F and G. These discussion tasks were designed to

ignite a discussion among group members and arrive at collective consensuses based on social constructivist learning principles. Hsiao (2012) reported in certain contexts, the task type assigned to students may have a potential effect on discussion outcomes. According to this author, the discussion task type had stimulated learners to respond to learning tasks differently in certain context than others. In the current study, students were required to come up with solutions to solve the controversy presented in each case and to debate merits and demerits of possible solutions and ideas suggested by others during the discussion. This controversial task was assigned to naturally generate as many competing points as possible, with the hope that students would disagree with each other. Past studies (e.g. Paulus, 2006, Clark et al., 2007) had shown the overall quality of an online discussion to improve when students disagree with each other. At the end of the discussion period, students were required to reach a collectively agreed-upon position with justifications. Detailed instructions regarding expectations; for example, the number of posts required, criteria to explain what constitued an effective discussion were provided.

4.5.3. Generation of Survey Data

As a part of their coursework, students were required to complete several questionnaires to learn about their own personal characteristics (lifestyles, cultural values, personality traits, product adoption styles, decision making styles etc.) so that they could use these as examples to learn how to profile consumers and their behaviours. These same questionnaires were used to teach students how to design and carry out surveys (and other research techniques) when gathering data about consumer characteristics and their behaviours. These questionnaires were distributed throughout the semester in class and students completed them as they discussed relevant course topics. For this study, permission was requested to access the surveys related to students' cultural and personality characteristics only. Students had ample time to complete these questionnaires and were asked to check for any incomplete responses. As a result, all surveys that students completed did not have any missing responses.

4.5.4. Discussion (Speaking) Data Collection and Processing

The 72 (3 discussions x 24 groups) discussions carried out amongst 221 consenting students generated 4694 posts. The sheer volume of posts and hand coding procedures forced a limit of the data corpus to a manageable level. Thus, posts from the

second online discussion were selected for this study for two reasons. First, it gave students the opportunity to get used to online discussions and possibly learn from any mistakes made at the first discussion. Second, the tasks assigned for all groups and courses for this discussion were the same. This assured the consistency of content and task rigour. 211 of the original 221 consented students took part in the second online discussion. Therefore, survey and online discussion data from 211 students were used for data analysis in this study. Speaking actions from 1565 posts across 24 groups in discussion 2 were extracted via mySQL queries from the database. Log file data that related to the number of messages posted and number of words per message were extracted to calculate quantity of speaking variables. Further, the textual content of messages was extracted using this same tool. These messages were coded based on the content analysis scheme discussed earlier to measure speaking quality.

4.5.4.1 Procedures Followed for Coding of Posts

The unit of analysis in coding content is an important consideration. Schellens and Valcke (2006) and Wise and Paulus (2014) have suggested researchers use the entire message or a portion as the unit of analysis in coding for content of online discussion behaviours of individuals. Wise, Hausknecht et al. (2014) further argued that using the whole post was an explicit, clear-cut way to segment a unit of student ideas and interaction with others during a discussion. In this study, using this same rationale the entire message was considered as the unit of analysis for coding. The coding scheme included several speaking quality variables that corresponded to nominal, ordinal and ratio measures as described in sections 4.2.1 to 4.2.3. Statistical measures to calculate inter-rater reliabilities are reviewed below. Table 4-5 provides a brief description of these details.

Percent agreement, Cohen's Kappa and Krippendorff's Alpha are popular measures used to report reliabilities. The latter is a more robust measure of inter-rater reliability (Freelon, 2013; Antoine, Villaneau & Lefeuvre, 2014; Krippendorff, 2004). A Krippendorff's Alpha value of 0.667 is reported as an acceptable threshold (Krippendorff, 2004) to assert inter-rater reliability. This threshold was used in this study. Freelon (2010) introduced 'Recal2', a free web-based online calculator to measure inter-rater reliabilities for nominal data and 'Recal OIR' for ordinal, interval and ratio data. These tools have been used over 66,000 times (Freelon, 2013) around the world to calculate inter-rater reliabilities. These calculators were used in this study to calculate inter-rater reliabilities.

Table 4-5 Online Calculators, Statistics, Data Type to Measure Reliability

Speaking Quality Variables	Data Type	Statistical Measures	Type of Online Calculator Used
Discursiveness – Reference to Others Discursiveness – Degree of Agreement Message Structure Argumentation – Position	Nominal	Krippendorff's Alpha	ReCal2 Inter-rater calculator for nominal data developed by Freelon (2010).
Social Presence Argumentation – Reasons, Application of Evidence	Ordinal	Krippendorff's Alpha	ReCal OIR – Inter-rater calculator for ordinal, interval and ratio data developed by Freelon, (2013).
Tone - First Person Singular (Autonomous) Tone - First Person Plural (Connected) Tone – Third Person Singular and Plural (Impersonal) Type of Evidence Used	Ratio	Krippendorff's Alpha	ReCal OIR – Inter-rater calculator for ordinal, interval and ratio data developed by Freelon, (2013).

4.5.4.2 Inter-Rater Reliabilities for Content Analysis Posts

1565 posts generated from the second online discussion were coded using two coders. 150 messages generated from the first online discussion were used as training data. This was done to refine the coding scheme and train the two coders. The coders engaged in several rounds of training and used the results of inter-rater reliabilities to guide their coding efforts. In coding the final posts, a rigorous method was followed. The first 50 posts were coded by both coders separately and then checked for inter-rater reliabilities. Upon noting reliabilities well above the threshold, 100 posts each, were coded separately. The next 50 posts were coded by both coders again separately and checked for reliabilities. The first column in Table 4-6 will highlight the sequence followed for the entire 1565 posts. Whenever there were disagreements between the coders, they were reconciled to achieve agreement in the end. Krippendorff's Alpha values for all variables for the joint sessions are reported in Table 4-6 below.

Table 4-6 Krippendorff's Alpha Values

Coding Sessions		Discursiveness		Argumentation					Social Presence	Tone			Message Structure
		Reference	Agreement	Position	Reasons	Apply Evidence	Soft Evidence	Hard Evidence		Autonomous Tone	Connected Tone	Impersonal Tone	
Joint 1 (50)		0.96	0.97	1.00	0.98	0.98	0.95	1.00	0.89	1.00	0.94	0.81	0.82
Separate(100)	Separate(100)												
Joint 2 (50)		0.96	1.00	1.00	0.91	0.90	1.00	1.00	0.93	0.85	0.99	0.92	0.88
Separate(100)	Separate(100)												
Joint 3 (50)		1.00	1.00	1.00	1.00	0.95	0.85	1.00	0.96	0.95	0.99	0.84	1.00
Separate(100)	Separate(100)												
Joint 4 (50)		0.91	0.94	1.00	0.99	0.94	0.86	0.99	0.95	0.95	1.00	1.00	0.91
Separate(100)	Separate(100)												
Joint 5 (50)		1.00	0.95	1.00	0.97	0.97	1.00	1.00	0.95	0.92	0.81	1.00	0.90
Separate(100)	Separate(100)												
Joint 6 (65)		0.94	0.96	1.00	0.98	0.97	0.91	1.00	0.95	0.99	0.86	1.00	0.80
Separate(125)	Separate(125)												
Total 1565 Posts		0.96	0.97	1.00	0.97	0.95	0.93	1.00	0.94	0.94	0.93	0.93	0.89

4.6. Considerations in Setting Up Predictive Models

The stipulated hypotheses required setting up of predictive models in order to test the asserted relationships. This section will review details about the setup of these models.

4.6.1. Unit of Analysis for Modeling

Predictive models were set up and run at the student level in this study. The specific research questions and hypotheses were all articulated at the student level. Cultural and personality (predictor) data was collected for each student. However, speaking quantity data was based on log activity at the post level. Coding of posts across several speaking quality variables were also carried out at the post level. Therefore, both speaking quantity and quality data at post level were converted to the student level.

Table 4-7 Converting Posts Level to Student Level Data for Speaking Quality Variables

	Outcome Variables	Posts Level Data Coding			Conversion to Student Level Data
Nominal	Reference	0 No		1 Yes	[Total # of 1 (reference) /Total posts by that student] %
	Position	0 No		1 Yes	[Total # of 1 (position) /Total posts by that student] %
	Social Presence	0 No		1 Yes	[Total # of 1 (social presence) /Total posts by that student] %
	Contextual Structure	0 No Structure	1 Context	2 Linear	[Total # of 1 (contextual structure) /Total posts by that student] %
	Some Disagreement	3 Partial Agree/Disagreement		4 Full Disagreement	[Total # of 3 + 4/ Total posts by that student] %
	Full Agreement	1 Neutral Comments		2 Full Agreement	[Total # of 2/ Total posts by that student] %

Outcome Variables		Posts Level Data Coding			Conversion to Student Level Data
Ordinal	Refer to Evidence	0 No Evidence	1 Refer Evidence	2 Apply Evidence	[Total # of 1/ Total posts by that student] %
	Apply Evidence				[Total # of 2/ Total posts by that student] %
	Reasoning	Bins 0 (0 reasons) 1 (1 reason) 2 (2 to 3 reasons) 3(4 to 5 reasons) 4 (6 to 7 reasons) 5 (8 & above reasons)			Total reasoning score based on bins//total posts by that student = Average reasons based on bins
Ratio	Soft Evidence	No of times soft evidence used in posts			Total # of soft evidence/ Total posts by that student = Average soft evidence posts
	Hard Evidence	No of times hard evidence used in posts			Total # of hard evidence/ Total posts by that student = Average hard evidence posts
	Autonomous Tone (First Person Singular)	No of times first person singular pronouns used in posts			Total # of first singular/ Total posts by that student = Average first person singular posts
	Connected Tone (First Person Plural)	No of times first person plural pronouns used in posts			Total # of first plural/ Total posts by that student = Average first person plural posts
	Impersonal Tone (Third Person)	No of times third person pronouns used in posts			Total # of third person/ Total posts by that student = Average third person posts

As for quantity of speaking, the number of messages posted were counted per student. The average number of words was measured by dividing the total number of words by the number of messages posted by a student during the discussion. As for speaking quality, in converting post level data to student level, Table 4-7 reports the formulae used for each variable.

4.6.2. Single Level versus Multi-Level Predictive Models

Cress (2008) drew attention to specific problems CSCL (Computer Supported Collaborative Learners) researchers face in handling data when individuals are nested within groups. Design effects in online discussion experiments are said to violate some

underlying assumptions that prevent the use of single level predictive models (Cress, 2008). According to this author, common fate and reciprocal influence are two design level effects that violate the assumption of independence. She argued when group members are assigned a task which requires deliberation in a collaborative manner, common fate sets in among members within a group, resulting in similarities in discourse. Cress also highlighted reciprocal influence as the inherited consequence of small groups where one or few members have the ability to influence the entire group towards one direction or another. These two design effects are said to create dependence of observations among students. When the assumption of independence is violated, traditional single-level linear models such as ordinary least squares regression analysis cannot be used (Garson, 2013). Garson argued if single level linear models are used for data sets with nested group effects, they fail to model the correct correlated errors and standard errors of prediction parameters, distorting the final interpretation of the model. In such circumstances, these authors call for the use of multilevel/hierarchical linear models (HLM) which are capable of handling observations that are not independent, as they take into account clustering effects of data by one or more grouping factors (Cress, 2008; Garson, 2013).

4.6.3. Intra Class Correlation (ICC)

Although the use of single level predictive techniques may distort findings nested within hierarchical data structures, if there is no influence by these nested groups on individuals, then both multilevel (HLM) and single level predictive models will yield similar results (Garson, 2013, Field, 2009, Tabachnick & Fidell, 2013). To assess the impact of groups on individual data, the intraclass correlation (ICC) coefficient is calculated.

ICC measures

> The proportion of the total variability in the outcome variable that is attributable to a contextual variable [defined as individual, group or course level] (Field, 2009, p. 729)

> The proportion of variance explained by the grouping structure in the population (Heck et al., 2013, p.8).

ICC is calculated by dividing the proportion of variance between groups (for a given level) by the total variation in the population (Garson, 2013). If the ICC is substantial and significant, “it suggests that groups are relatively homogeneous and likely to be quite different from each other” (Heck et al., 2013, p.8). The relatively homogeneous nature of groups can be explained by common fate and reciprocal influence as explained earlier. In this situation, there will be a significant group effect on the individual subject level, and results obtained through single and multi-level models will differ substantially.

As a precursor to running multilevel models, the ICC coefficient needs to be calculated first. The size and the significance of the coefficient can be used to determine whether running multilevel models are required. The value of the ICC coefficient ranges from 0 to 1. An ICC closer to 1 depicts a higher impact from group effects on individual behaviour and vice versa. There is no consensus in the literature of a clear threshold value to make this determination. Lee (2000), Scherbaum and Ferrerter (2009) determined that any ICC value over 0.10 (or 10%) or higher represents a sizable group effect on individual behaviour. Heck et al. (2013) were more conservative and suggested a 0.05 (5%) as a threshold. Others have suggested even more stringent thresholds of 0.01 (1%) to indicate group effects (Heck et al., 2013). Cress (2008) and Garson (2013) acknowledged this lack of consensus, emphasizing the need to check the significance of the ICC coefficient first as a means of determining this effect. They suggested to consider the value of the coefficient to determine the degree of the impact. The ICC needs to be calculated for each level depending on the nested structure of the data. In this study, the individual subject is defined as level 1. Discussion groups and courses are defined as level 2 and level 3 (even higher levels are possible if schools and districts are relevant) respectively. The following is an example of a three-level model of online discussions as organized this study.

Level 1 – Proportion of variance from individual effects
Level 2 – Proportion of variance from group effects
Level 3 – Proportion of variance from course effects

The following are formulae for calculating ICC at these levels.

$$\text{ICC at Level 2} = \frac{\text{Proportion of Variance from Group Level}}{\text{Proportion of Variance from Group Level + Individual Residual Variance}}$$

$$\text{ICC at Level 3} = \frac{\text{Proportion of Variance from Course Level}}{\text{Proportion of Variance from Group Level + Proportion of Variance from Course Level + Individual Residual Variance}}$$

Table 4-8 Preliminary Intra-Class Correlation Coefficients at Discussion Group Level

Variables (n=211)	INTRCPT1, u0 (Group)	Sig p=.05	Level-1, r (residual)	ICC	Prop of Variance Group	Prop of Variance Individual
Number of Posts	4.11146	<0.001	23.01135	0.15	15%	85%
Average Words	1688.59038	<0.001	4694.06553	0.26	26%	74%
Reference	0.00746	0.002	0.06052	0.11	11%	89%
Some Disagreement	0.00001	0.455	0.04136	0.00	0%	100%
Full Agreement	0.00255	0.063	0.04793	0.05	5%	95%
Social Presence	0.01323	<0.001	0.05488	0.19	19%	81%
Contextual Structure	0.00899	<0.001	0.05509	0.14	14%	86%
Autonomous Tone	0.53077	<0.001	1.47772	0.26	26%	74%
Connected Tone	0.08354	0.018	1.05757	0.07	7%	93%
Impersonal Tone	1.70218	<0.001	7.37426	0.19	19%	81%
Position	0.00001	>0.500	0.01037	0.00	0%	100%
Reasoning	0.16611	<0.001	0.44566	0.27	27%	73%
Refer Evidence	0.00876	<0.001	0.0544	0.14	14%	86%
Apply Evidence	0.02019	<0.001	0.05512	0.27	27%	73%
Hard Evidence	0.45921	<0.001	1.80991	0.20	20%	80%
Soft Evidence	0.01481	<0.001	0.06844	0.18	18%	82%

In order to determine whether multilevel models are required Table 4-8 reports the preliminary ICC coefficients and their significance levels for each outcome variable. These coefficients are calculated only for discussion group (level 2) at this time. In chapter five, a more thorough analysis of ICC both at discussion group and course level will be presented, after potential outliers in the data set are identified and addressed. Based on the preliminary results highlighted in Table 4-8, it is evident that the ICC coefficients for 13 out of 16 outcome variables are sizable and significant. In other words, significant group effects on individuals are noted for 13 outcome variables. The use of multilevel modeling, therefore, is required in order to account for such nested group effects. As for the balance

variables where the ICC coefficient was not significant nor sizable, multilevel modelling will still be instituted for consistency. Results between multilevel and single level models are said not to be different when the ICC coefficient is not significant nor substantial (Heck et al., 2013).

4.6.4. Sample Size and Power in Multi-Level Models

There are references in the literature (e.g. Scherbaum & Ferrerter, 2009) that refer to the relatively large size samples and groups required to run multilevel/HLM with adequate power. There are several rules of thumb that are often very conservative. Kreft (2008) quoted in Garson (2013) offered a 30/30 rule that advocated the use of 30 groups with 30 students resulting in a total of 900 observations to run multilevel models with adequate power. Maintaining the same number of total observations, alternative heuristics such as 60/15 (60 groups of 15 observations) and 150/6 (150 groups of 6 observations) were also suggested in a similar vein. Scherbaum and Ferrerter explained "increasing the sample size at the highest level (groups) will do more to increase power than increasing the number of individuals in groups" (p.352). Maas and Hox (2005) offered an even more stringent rule of 50/20 (50 groups with 20 students in each group). They reported when the number of groups is less than 100, the standard errors at the second level (meaning discussion groups in this case) can be estimated up to 15% too small. However, Scherbaum and Ferrerter cautioned researchers not to rely on these principles solely since they are still debatable. There are several software tools now available to calculate the power of a sample for multilevel analysis. The Optimal Design program developed by Spybrook, Raudenbush, Liu, Congdon and Martínez (2006) is one popular tool. This software estimates power using intra-class correlation, expected effect size and significance levels for clustered randomized measures. Using this calculator, results of a power analysis for the common data set are reported below.

- **Type of Power Analysis** – A two-level randomized trial was carried out through the Optimal Design Software. This trial is run when individuals are nested within groups with continuous data.
- **Power Outcome** - In this trial, number of groups required to obtain 0.80 power was assessed. The option "power vs number of clusters" was thus used.

- **Assumptions** – This software trial is based on experiments run using a treatment and a control variable. Thus, the number of groups computed by the calculator are assumed to be distributed equally between the experiment and the control group. For non- experiment based studies, the number of groups suggested by the calculator is therefore divided by half.

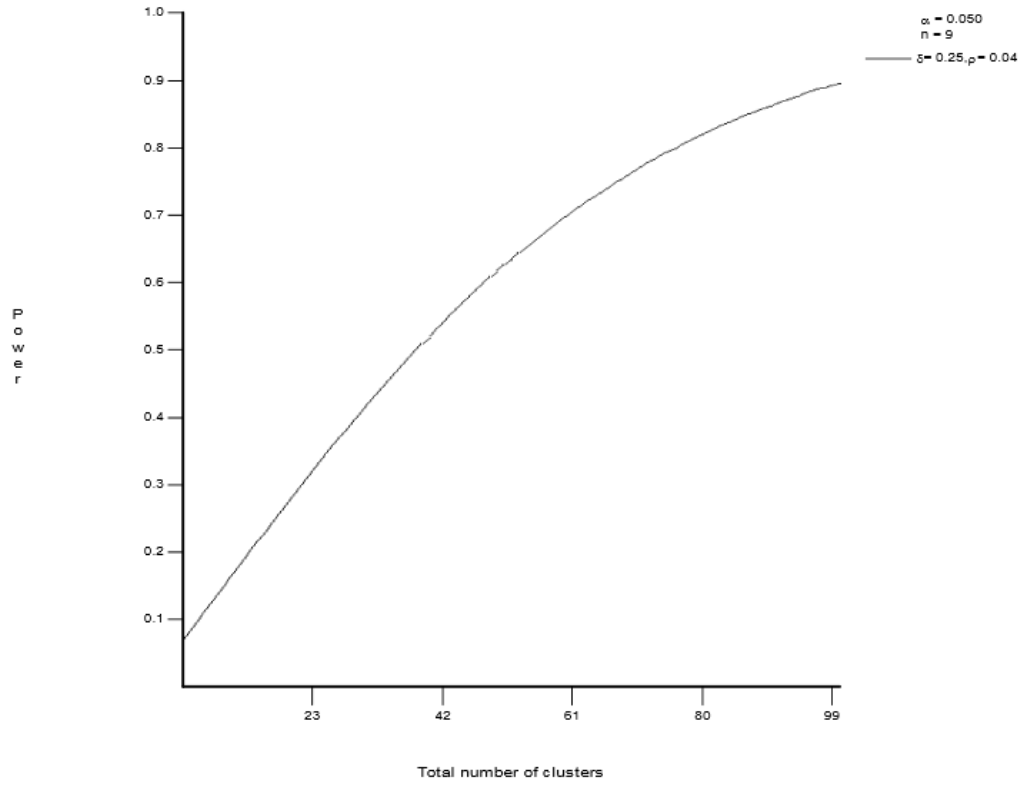

Figure 4-2 Number of Groups Required to Run Multilevel Models with Adequate Power

- **Input Parameters**
  - The expected power for the suggested group sizes is estimated at 0.80
  - Input values in the test
    - Alpha level – is set at 0.05
    - The number of subjects per group – is set at 9. Although the study had an imbalance number of cases per each group, the average cases per group were 9.
    - The authors suggest to set an effect size of at least 0.25.

- **The intra-class correlation** - Was set at .04 based on the average ICC calculated for all outcome variables.
- **Outcome** - The output (see figure 4.2) suggests 76 groups. Therefore, 38 (half since the study was not an experiment) groups are required to attain 0.80 power. The implication of this is discussed in section 5.1.11 in chapter five.

4.6.5. Model Specifications

Garson (2013) highlighted three broad classes of multilevel models. They included fixed effects, random effects and mixed effects models. Pure fixed effects models are similar to ordinary regression models that are run as typical single- level models. This is when researchers predict a dependent variable (at the individual subject /level 1) from one or more independent variables. In doing so, they consider effects across the entire sample. Random effects models use a multilevel approach to estimate the outcome variable across multiple groups (group subject /level 2) of observations. Mixed models use both fixed and random effects and are commonly used in multilevel/HLM models. Both fixed and random effects are useful for this study because fixed effects will test predictive relationships across all students in the sample, while random effects will highlight potential group effects on these predictive relationships. There are several types of multilevel mixed models. These include the null model, random intercept only model and the random intercept and slopes models and they are discussed below.

4.6.5.1 Null Model

The null model is a base line that is used to calculate the intra-class correlation (ICC) and to compare best-fit statistics across more complex models. It predicts the level 1 intercept of the dependent variable as a random effect of the level 2 group variable (Garson, 2013). It is also called the unconditional model and does not include any predictors. Earlier (see Table 4-8), preliminary results obtained through the null model revealed the need to carry out multilevel models in this study, given the substantial and significant and large ICC coefficients noted. Further, when predictors are used in more complex conditional models, researchers can compare the log likelihood ratio (known as the deviance statistic) between the null and those models to assess model fit criteria.

4.6.5.2 Random Intercept and Slope Model (RIRS)

Table 4-9 below will highlight the arrangement of fixed and random effects of the random intercept only, and the random intercept and slopes models. Fixed effects remain the same in both the random intercept only and random intercept slope models. The difference between these two models lies in the slopes of random effects. The random intercept and slopes model allows both the intercept and the slope to vary randomly while in the random intercept only model, the slope is held constant. In this study, the random intercept and slope model was used to set up multilevel predictive models. The following paragraphs will lay out reasons for selecting this model type. Further, the meaning of fixed and random effect intercepts and slopes in the context of this study will also be discussed.

Table 4-9 Fixed and Random Effects: Random Intercept Only/Random Intercept and Slopes Model

Effects	Random Intercept Only Model		Random Intercept Slope Model	
	Intercept	Slope	Intercept	Slope
Fixed Effects	Included	Included	Included	Included
Random Effects	Included		Included	Included

The selected random intercept and slope model includes both fixed and random effects. The fixed effect component comprises both an intercept and a slope which are estimated across all students within the sample. The intercept estimate will represent the mean of the dependent variable when the value of the predictor(s) is zero. The slope estimate describes the direction and the strength of the relationship between each predictor and the outcome variable, which are asserted at the individual subject (level 1) of the model. In this study, all hypothesized relationships are asserted at the fixed effect slope level since the primary interest of the study is to understand the direct effects of cultural and personality characteristics of students (subject level 1) on their online speaking behaviour. Significant fixed effect slope estimates will highlight the overall direction and the strength of these relationships, between the predictors and the outcome variable that exist at individual subject level.

The discussion set up of this study also warrants the investigation of random effects since the individuals were nested within groups. The random intercept will highlight the overall group effect for each outcome variable. It reports the absolute level of

differences in activity across groups for each outcome variable. The random slope will suggest if there is an interaction between the predictors and the local group context of students. The RIRS model therefore will afford the testing of the set hypothesis at the fixed level and explore random effects (both the intercept and slopes) that highlight possible group variations and group/individual subject level interactions.

4.7. Model Set Up and Testing

One of the important assumptions in multilevel modelling is the setup of proper model specifications to ensure convergence and best fit of models. Researchers often are encouraged to run several iterations of multilevel modeling (Heck at al., 2013) before setting up the final model specifications. The following section will highlight this process.

4.7.1. Arrangement of Outcome Variables

When multilevel/HLM models are pursued, an initial consideration is to decide whether outcome variables should be organized as univariate or multivariate measures. When outcome variables are organized as univariate measures, effects for each outcome variable are considered one at a time. In contrast, a multivariate outcome variable arrangement considers the effect of multiple outcome variables organized as a cluster at a given time. The latter arrangement is capable of identifying and accounting for relationships between outcome variables. Tate and Pituch (2007) suggested several advantages in considering multivariate arrangement of outcome variables. According to these authors, multivariate models make sense when outcome variables are related to each other conceptually and when there are significant and notable correlations between them. Further, potential associations between outcome variables are said make multivariate arrangements to provide more accurate standard errors and give more power to the analysis. In chapter two, conceptual relationships between outcome within each speaking dimension were explained. Moderate correlations between the outcome variables were noted (see Table 4-10 and will be discussed later). In order to determine the final model, set up process, several multivariate and univariate model arrangements were tested. Details pertaining to these tests are presented in the proceeding section.

4.7.2. Running Test Models and the Final Arrangement of Models

A number of potential models that include several multivariate and univariate outcome variable options were run. Details of these models are as follows.

The list of outcome variables and their conceptual groups (Table 4-3) that were selected to be modeled were presented earlier. Table 4-10 reports correlations noted across outcome variables. Three multivariate groups that made conceptual sense with significant but moderate correlations were arranged to be tested. Further, all the fifteen outcome variables were also modeled separately as univariate outcome variables. Interested readers can see Appendix H for details pertaining to this arrangement. Several critical issues were noted when multilevel models were run as multivariate outcome variables. They are as follows.

a) Complexity in models leading to convergence issues

In running multivariate multilevel models, predictors that were not originally hypothesized for some outcome variables had to be included. This is because when several outcome variables are grouped together cumulatively, all predictors invariably must be included into the multivariate model. As a consequence, there were more predictors than hypothesized for each outcome variable. This made models more complex leading to convergence issues. Two out of the three multivariate groups failed to produce improved best-fit statistics between the null and the final models when all predictors were included. This was not the case in models with univariate outcome variables. All models converged and for the vast majority, best-fit statistics improved between models. The ability to include the hypothesized predictors for each outcome variable and the fewer number of variables in the model made them less complicated and more precise.

b) Unable to obtain random effect estimates

Due to the complexity of models (several outcome variables and multiple predictors) results failed to produce estimates for random effects in multivariate models. This prevented the examination of random effects.

Two software options were available to run multilevel models in this study. When running multivariate models with IBM SPSS software, it produced separate fixed estimates for each outcome variable and predictors within the multivariate group. This afforded the ability to test hypotheses at fixed effects one by one. However, these same models failed to produce random effects due to convergence issues.

HLM7; an alternative software that has a reputation to be robust in running multilevel models; was able to produce fully converged solutions for all multivariate models. But this software only produces a cumulative output for fixed effects combining all outcome variables in the cluster, preventing the testing of hypothesis of fixed effects one by one.

As highlighted earlier, the main advantage of running multivariate models was to identify interactive relationships between outcome variables. While correlations reported between some outcome variables were significant, they were weak or moderate in almost all cases. Further, multivariate models can help to account for the inflation of Type I error. However, in this study, the suggested hypotheses do not assert a claim of significance at the model level, but attempt to evaluate model fit in terms the information criteria (the amount of predictive power obtained for the amount of information put in) and how useful the overall model is (or isn't) in terms of the reduction in unexplained variance. Thus the issue of family-wise error in significance testing in running multiple outcome variables does not arise.

Table 4-10 Pearson Correlation Coefficients between Speaking Variables (n=205 after removing outliers)

		Outcome Variables		Correlation Matrix													
				A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Degree of Participation		A	Average Words	1	-.056	.485**	.360**	.108	.228**	.171*	.186**	-.101	-.149*	-.042	-.181**	.048	-.050	-.032
		B	Number of Posts		1	-.031	.122	-.076	.103	.390**	.319**	.683**	-.457**	.759**	-.256**	.616**	.604**	.218**
Attending to Others	Discursiveness	C	Refer to Others			1	.470**	.593**	.514**	.449**	.304**	-.106	-.087	-.011	-.125	.003	-.112	.040
		D	Some Disagreement				1	-.252**	.256**	.272**	.150*	-.052	-.128	.154*	-.050	.120	.129	-.022
		E	Full Agreement					1	.150*	.253**	.091	.013	.087	-.021	-.080	-.070	-.203**	.114
	Social Presence	F	Social Presence						1	.414**	.324**	.071	-.221**	.092	-.056	.093	.040	-.016
	Message Tone	G	Autonomous Tone							1	.430**	.144*	-.273**	.251**	-.074	.237**	.197**	.204**
		H	Connected Tone								1	.157*	-.143*	.274**	-.077	.170*	.103	.188**
		I	Impersonal Tone									1	-.231**	.618**	-.349**	.455**	.313**	.048
Attending to the Task	Message Structure	J	Context Structure										1	-.364**	.102	-.345**	-.375**	-.084
	Argumentation	K	Reasoning											1	-.228**	.548**	.552**	.185**
		L	Refer to Evidence												1	-.515**	-.101	.093
		M	Apply Evidence													1	.730**	.116
		N	Hard Evidence														1	-.059
		O	Soft Evidence															1

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Therefore, in this study, all models were run as univariate multilevel models. This will

i) Reduce model complexity, which will lead to better model convergence since hypothesized predictors can now be included into the model for each outcome variable.

ii) Keep the analysis simple by using one software; HLM7, without having to toggle between two software platforms.

iii) Obtain model fit results that highlight the change in the percentage of unexplained variance to understand whether the predictors are making any impact (and also the information criteria which indicates the information cost of the prediction).

iv) Allow interpretation the results as appropriate.

Table 4-11 below will highlight the final arrangement of predictors and outcome variables modeled through a univariate arrangement in this study.

Table 4-11 Arrangement of Univariate Outcome Variable Models

Univariate Outcome Variables	Hypo	Predictors (Hypothesized Relationships with Outcome Variables)								
		IND	COL	LPR	LCT	NEU	EXT	OPN	AGR	CON
Number of Post	H01	+		+	+	-	+	+	+	+
Average Words	H02	+		+	+	-	-	+	+	+
Reference	H03	-	+	+		-	+	+	+	+
Some Disagreement	H04	+	-	+		-		+	-	+
Full Agreement	H05		+				+		+	
Social Presence	H06		+		-	+	+	+	+	-
Autonomous Tone	H07a	+			+					+
Connected Tone	H07b		+			+			+	
Impersonal Tone	H07c	+			+					+
Contextual Structure	H08	-			-			-		-
Reasoning	H10	+	-	+	+	-	-	+	-	+
Refer Evidence	H11a		+			-	+			
Apply Evidence	H11b	+		+	+		-	+		+
Hard Evidence	H12a	+		+	+			+		+
Soft Evidence	H12b		+		-		+		+	

4.7.3. Stages of Potential Results Analysis

The next chapter will report findings of the study. It will start by checking the assumptions required to run multilevel models successfully. Upon completion, results will be subjected to two stages of model interpretation. The first stage will produce results from the hypothesis testing of fixed effects. Both the intercept and slope of the fixed effects at the individual subject level will be reported along with test statistics required to run hypothesis tests. Given the interest in this study to pursue effects at individual subject level, there were no predictors tested at the group level. However, due to potential group effects that can influence individual students nested in discussion groups, random effects will be investigated as well.

4.8. Chapter Summary

In this chapter, the research design of the study was presented. Having revisited the broad research question and further operationalized both the independent and dependent variables, several specific research questions were articulated. Based on the conceptualized predictive relationships identified between cultural values and personality traits in chapter two, several hypotheses were explicated to test these relationships at the individual subject level. Further, details pertaining to the study design, the study context, participants, data collection methods and content analysis procedures were discussed. The final section of this chapter discussed the setup of predictive models for data analysis purposes. The significant and substantial ICC coefficients reported through the preliminary analysis of data revealed the need to set up multilevel models to test the hypothesized predictive relationships. Other considerations such as the unit of analysis for modeling, power implications from sample size and types of models to be used in setting up predictive models were discussed. Upon running several iterations of test models, it was concluded to arrange all outcome variables as univariate models. The next chapter will describe the final models used and present findings of the study.

Chapter 5.

Findings

This chapter presents the results of the study. The preliminary analysis presented in section one below will assess the tenability of statistical assumptions of data to run successful multilevel models. Having verified these assumptions, results pertaining to online speaking behaviours predicted by a student's cultural and personality characteristics will be presented.

5.1. Preliminary Analysis of Data

5.1.1. Outliers

5.1.1.1 Univariate Outliers

Detecting Univariate Outliers

Data outside 99% of scores (+/- 3.29 standardized score) was used as a benchmark to detect univariate outliers (Tabachnick & Fidell, 2013). Table 5-1 reports the spread of flagged univariate outliers across variables and cases. For outliers identified across cases, (last column in Table 5-1) results revealed four outliers for case one. Several other cases showed two outliers while the vast majority accounted for one. As for potential outliers across variables (last row in Table 5-1), each outcome variable accounted for only a few outliers. The visual inspection of the histogram clearly indicated the discontinuous nature of these flagged outliers, from the remaining data spread confirming that they were outliers.

Reducing the Impact of Univariate Outliers

The next step was to identify ways to reduce potential adverse impacts from these outliers. Given that case one accounted for four outliers, it was deleted from the data set. Deleting other cases was not considered as the first option for several reasons. As discussed earlier, most cases had only one outlier while some had two (Table 5-1). Deleting cases without an attempt to reduce their impact wastes the data pool with

potential adverse impact on the power of analysis. In addition, if multivariate outliers are identified further down the analysis and additional cases needed to be deleted, this will further reduce the data pool deteriorating the power of the analysis.

Table 5-1 Spread of Scores Across Variables and Cases Flagged as Univariate Outliers

Case ID (n=211)	Low Context	Extroversion	No of Posts	Average Words	Some Disagree	Autonomous	Connected	Impersonal	Position	Hard Evidence	Soft Evidence	**Outliers Across Cases**
1					1.0	8.00	6.00				2.0	**4**
7											1.5	**1**
10	2.1											**1**
17										8.00		**1**
31					1.0						2.0	**2**
34							4.83					**1**
36					1.0					8.00		**2**
46	2.0											**1**
50	2.0											**1**
57			31.0									**1**
61				516								**1**
77									0.60			**1**
88		1.7									1.17	**2**
96			53.0									**1**
108								18.00		10.00		**2**
124									0.00			**1**
134	2.2											**1**
139										10.00		**1**
142			26.0					15.65				**2**
166		1.9										**1**
192							10.67					**1**
211									0.50			**1**
Outliers Across Variables	**4**	**2**	**3**	**1**	**3**	**1**	**3**	**2**	**3**	**4**	**4**	**30**

Therefore, a transformation technique called “winsorizing” was adopted. Winsorizing (Shete et al., 2004) assigns each outlier the next highest or lowest value found in the sample that is not an outlier. This process pulls extreme values towards the centre of the distribution and removes extreme cases that are at the upper and lower bounds of the sample. It is justified only when performed to less than 5% of the sample. This was the case here. Having adjusted for univariate outliers through deleting one case and winsorizing the rest, 210 student cases were subjected to detect multivariate outliers.

5.1.1.2 Multivariate Outliers

Detecting Multivariate Outliers

A multivariate outlier is a combination of unusual cases that are seen across variables that can influence the outcome of a statistical analysis (Field, 2009). Following the procedure adopted by Tabachnick and Fidell (2013) the Mahalanobis distance (MD) was calculated to detect multivariate outliers. 25 variables (9 predictors and 16 outcome variables) were bundled together to calculate MD. The critical chi-square value for *df* = 25 is 52.620 ($p < .001$). Cases that showed MD values above this critical value was marked as multivariate outliers. See Table 5-2 below.

Table 5-2 Mahalanobis Distance (*n* = 210)

Cases	Mahalanobis Distance (df=25)
31	61.57
36	87.17
118	79.55
124	78.62
144	63.64

Making Sense of Multivariate Outliers and Reducing their Impact.

Several post hoc analyses were carried out to understand the impact of the above multivariate outliers. As a first step, a regression was run for each multivariate outlier (cases 31, 36, 118, 124 & 144) separately to identify raw scores that were significantly different ($p < .05$) from the rest of the scores across all variables. Five dummy variables were used to identify each multivariate outlier when running the regressions. Table 5-3

reports the raw score values for the variables on which each multivariate outlier differed from the rest of the sample.

Table 5-3 Post Hoc Analysis of Multivariate Outliers

	Raw Scores of the Five Multivariate Outlier Cases for Variables in Which They Differed from the Sample Mean					**Sample Mean (n=205)
	#31	#36	#118	#124	#144	
Openness					3.30*	**4.39**
Average Words			228.00*			**203.31**
Reference	1.00*	1.00*	1.00*	0.12*		**0.59**
Some Disagree		0.71*	0.00*	0.29*		**0.17**
Full Agreement	0.00*	1.00*	0.00*	0.29*		**0.34**
Social Presence	0.00*			0.93*	0.67*	**0.23**
Contextual	1.00*	1.00*				**4.39**
Autonomous Tone	5.00*		6.00*			**1.91**
Connected Tone			0.00*			**0.63**
Impersonal Tone			9.00*			**5.11**
Position		1.00*		0.72*		**0.97**
Reasoning				0.36*		**2.55**
Refer Evidence				0.43*	0.67*	**0.27**
Apply Evidence					0.00*	**0.30**
Hard Evidence		5.86*	4.00*		5.67*	**1.44**
Soft Evidence	1.00*					**0.16**

* Reported a significance value less than .05

** Mean values of variables after deleting the identified multivariate outliers

When comparing, raw scores for some variables for cases 31, 36, 118, 124, and 144 were substantially different to the mean scores of the remaining cases. This could potentially distort the findings of the study. Therefore, these five cases were deleted from the dataset.

5.1.1.3 Post Outlier Scale Reliabilities of Cultural Values and Personality Traits

Post outlier (*n* =205) Cronbach alpha coefficients were run. Minimum changes to the coefficients were noted for scales that measured cultural and personality factors. Cronbach alpha for individualistic, collectivistic and combined scales reported values of 0.79, 0.68 and 0.74 respectively. Low power, high power and combined scales reported

Cronbach alpha values of 0.64, 0.69 and 0.70. Cronbach alpha for low context, high context, and combined scales reported values of 0.67, 0.68 and 0.72 respectively. As for personality traits, Cronbach alpha coefficients for neuroticism was 0.84, extroversion 0.81, openness to experience 0.69, agreeableness 0.72 and conscientiousness was 0.83.

Having identified and adjusted for both univariate and multivariate outliers, the following section will present variability and normality of data with the remaining 205 cases.

5.1.2. Variability and Normality of Data

Descriptive statistics (Table 5-4) are reported to examine the variability and normality of data within the sample. Results are presented for predictors and outcome variables separately.

For predictors, results for two variables are slightly different from the rest. The mean for Neuroticism (one of the predictors) reported a value below the scale midpoint (4 in a scale 1 to 7). This is noteworthy since this is the only predictor that showed an overall lower mean, suggesting an overall low degree of Neuroticism in the sample. In addition, a higher standard deviation along with the highest range for this variable indicated a higher variability amongst its data. Low Context (the other predictor) recorded a lower standard deviation and the lowest range. The slightly elevated kurtosis for this variable suggested a lower variability amongst its data in comparison to others. As for the rest, the maximum scores for most were closer to the higher end of the scale of 7. The minimum scores recorded for others were closer to the lower end of the scale with the exception for Individualism, Low Power Distance, and Agreeableness. Standard deviations of these variables were reasonable, and their kurtosis values were well below the conservative +/- 1. This suggested a reasonable level of variation of data for these variables. As for normality of data, the skewness values reported for all variables were well below the conservative +/- 1 estimate. Although the kurtosis for the Low Context variable was slightly higher, the visual inspection of the frequency distribution for this variable and others confirmed only a slight deviation from normality. This suggests the above variables having properties to act as reasonable predictors.

Table 5-4 Variability and Normality of Data (*n* = 205)

Variables	Mean	Std. Deviation	Range	Min	Max	Skewness	Kurtosis
Predictor Variables							
Individualism	5.10	.655	3.60	3.30	6.90	-.243	-.046
Collectivism	4.44	.676	3.70	2.50	6.20	-.133	.124
Low Power	4.94	.754	3.90	3.00	6.90	-.296	.243
Low Context	4.19	.533	2.90	2.60	5.50	-.585	1.299
Neuroticism	3.69	1.012	5.50	1.00	6.50	-.010	-.061
Extraversion	4.77	.783	4.00	2.60	6.60	-.153	-.144
Openness	4.39	.717	3.60	2.70	6.30	-.060	-.554
Agreeableness	4.75	.715	3.50	3.10	6.60	.021	-.191
Conscientiousness	4.94	.791	4.40	2.40	6.80	-.106	-.240
Outcome Variables							
Number of Posts	7.30	3.869	20.00	1.00	21.00	1.370	2.695
Average Words	203.31	78.002	384.00	62.00	446.00	1.046	.878
Reference	0.59	.254	1.00	0.00	1.00	-.829	.242
Some Disagreement	0.17	.179	0.71	0.00	.71	.683	-.606
Full Agreement	0.34	.219	1.00	0.00	1.00	.151	-.479
Social Presence	0.23	.244	1.00	0.00	1.00	.961	.189
Autonomous Tone	1.91	1.298	6.33	0.00	6.33	1.031	1.097
Connected Tone	0.63	.709	3.43	0.00	3.43	1.733	3.348
Impersonal Tone	5.11	2.899	14.25	0.00	14.25	.855	.636
Contextual	0.28	.244	1.00	0.00	1.00	.701	-.173
Position	0.97	.071	0.30	.70	1.00	-2.324	4.330
Reasoning	2.55	.757	4.00	1.00	5.00	.590	.431
Refer Evidence	0.27	.236	1.00	0.00	1.00	.940	.644
Apply Evidence	0.30	.267	1.00	0.00	1.00	.836	-.054
Hard Evidence	1.44	1.152	5.86	0.00	5.86	1.610	3.296
Soft Evidence	0.16	.212	1.00	0.00	1.00	1.785	3.721

For the outcome variables that represented speaking quantity, Number of Posts recorded a substantially high range with a minimum of 1 and a maximum of 21 posts not on the same scale as other variables. However, the standard deviation of 3.89 within 68% of the data was dispersed between 3.4 and 11.2 posts. This suggested a slightly low yet reasonable level of variability amongst its data. The elevated kurtosis confirmed this. The

second variable within this category, Average Number of Words, depicted a good degree of variability amongst its data. It recorded a low level of kurtosis. Further, 68% of its data were dispersed between 125 to 281 average words per posts, although its range was high (minimum of 62 and a maximum of 446 average words per post). As for the normality of data, the skewness and kurtosis for number of posts were higher than the conservative estimate of +/- 1. The visual inspection of the normal distribution of the histogram confirmed a departure from normality for this variable. Procedures adopted by multilevel modeling is robust to deviations from normality (Garson, 2013) thus this departure poses no major concerns. As for Average Words, skewness and kurtosis were slightly above and below 1 respectively. The visual inspection of the histogram confirmed only minor deviations for normality of its distribution.

The rest of the outcome variables represented speaking quality. In terms of variability, two specific variables displayed results that were noteworthy.

The variable, Position, showed very little variability. On average, a student took a position in 97% of their posts during the discussion. The range represented a minimum of 70% and the maximum of 100% of student posts with positions. The standard deviation of 0.07 suggested 68% of students that took a position in their posts were between 90% to 100%. The very high kurtosis (4.372) further documented this lack of variability. Considering this, the variable, Position, was removed from modeling in this study.

The second variable was Soft Evidence. It showed a lower variability in comparison to the rest. On average, a student used soft evidence in 16% of their posts. Although the range was between 0 to 100%, the standard deviation indicates 68% of cases using Soft Evidence in between 0 to 37% of their posts. However, this variability was not low enough for this variable to be discounted from modeling. Thus, it will be retained for further analysis. As for the rest, the variability of data was reasonable considering the standard deviations and the range recorded between minimum and maximum values. The kurtosis for Reference, Some Disagreement, Full Agreement, Social Presence, Contextual Structure, Reasoning, Refer Evidence and Apply Evidence were close to zero suggesting no problems. For Hard Evidence, Autonomous, Connected and Impersonal Message Tones, kurtosis was slightly elevated. Although this can potentially reduce their variability,

the reported values were reasonable enough for these variables to be considered for modeling. As for normality, Soft Evidence, Hard Evidence, Autonomous Message Tone, Connected Message Tone and Impersonal Message Tone variables did depart from normality with high skew and kurtosis values. The visual inspection of their histograms confirmed this. As highlighted earlier, this was not a concern since procedures adopted by multilevel modeling were robust to deviations from normality. As for the rest of the speaking quality variables, both skewness and kurtosis values were all within the conservative estimates of +/- 1, and the visual inspection of the histograms confirmed their normality.

5.1.3. Linearity of Data amongst Variables

Bivariate linear relationships between each independent variable and all dependent variables were checked with the use of scatter plots. The visual inspection of plots suggested linear bivariate relationships between them; even for those four outcome variables that slightly departed from normality.

5.1.4. Multicollinearity between Predictors

Table 5-5 Pearson Correlation Coefficients Between Independent Variables (*n* = 205)

	1	2	3	4	5	6	7	8	9
1. Individualism	1	-.179*	.161*	.117	-.260**	.284**	.098	-.152*	.386**
2. Collectivism		1	.123	-.228**	.277**	-.074	-.146*	.150*	.005
3. Low Power Distance			1	.034	-.002	.031	.016	.004	-.024
4. Low Context				1	-.047	-.110	.139*	.003	.040
5. Neuroticism					1	-.497**	-.090	-.300**	-.325**
6. Extraversion						1	.127	.286**	.204**
7. Openness							1	.044	.018
8. Agreeableness								1	.197**
9. Conscientiousness									1

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Bivariate correlations were run between all predictor variables (see Table 5-5). All predictors reported correlation coefficients below 0.5. Predictors marked with asterisks

reported significant correlations. The associations noted between predictors were small enough to not raise any concerns of multicollinearity

5.1.5. Independence of Blocks

The group level variables set in this study were discussion groups (level 2) and courses (level 3) with individual subjects set as level one. During the discussions, students within the group were required to collaborate with each other, but there was no opportunity to interact with other groups. Thus at level two, discussion groups operated as independent blocks within a course. Although this study was carried out amongst students across eight courses, there was no opportunity or need for them to interact across courses during the discussions. Therefore, courses operated as independent blocks.

5.1.6. Independence of Student Outcome Observations

Table 5-6 Intra Class Correlation (Three Levels – Course, Group and Individual) *p* = 0.05

Variables (n=205)	(GROUP) INTRCPT1	*Sig*	(COURSE) INTRCPT1/ INTRCPT2	*Sig*	ICC Level 2	ICC Level 3	Group	Course	Individual
No of Posts	2.85547	<0.001	0.01348	*0.402*	0.19	0.00	**19%**	**0%**	**81%**
Avg Words	1328.37842	<0.001	246.93597	*0.134*	0.22	0.04	**22%**	**4%**	**74%**
Reference	0.00891	<0.001	0.00000	*>.500*	0.14	0.00	**14%**	**0%**	**86%**
Some Disag	0.00089	*0.051*	0.00000	*>.500*	0.03	0.00	**3%**	**0%**	**97%**
Full Agree	0.00252	*0.048*	0.00061	*0.194*	0.05	0.01	**5%**	**1%**	**94%**
Social Pres	0.00769	0.002	0.00280	*0.067*	0.13	0.05	**13%**	**5%**	**82%**
Autonomous	0.36878	<0.001	0.08925	*0.100*	0.22	0.05	**22%**	**5%**	**73%**
Connected	0.03871	0.006	0.00007	*>.500*	0.08	0.00	**8%**	**0%**	**92%**
Impersonal	1.05629	0.002	0.73415	*0.140*	0.13	0.09	**13%**	**9%**	**78%**
Context Struct	0.00413	0.039	0.00188	*0.088*	0.07	0.03	**7%**	**3%**	**90%**
Reasoning	0.16092	<0.001	0.00236	*0.299*	0.28	0.00	**28%**	**0%**	**72%**
Refer Evid	0.00299	0.003	0.00481	*0.074*	0.05	0.09	**5%**	**9%**	**86%**
Apply Evid	0.01890	<0.001	0.00374	*0.113*	0.26	0.05	**26%**	**5%**	**69%**
Hard Evid	0.32602	<0.001	0.04488	*0.163*	0.25	0.03	**25%**	**3%**	**72%**
Soft Evid	0.00745	<0.001	0.00003	*0.849*	0.17	0.00	**17%**	**0%**	**83%**

The nested structure of data due to design effects in online discussions and their potential impact in violating the assumption of independence amongst individual student observation was discussed in chapter four. In section 4.6.3 (chapter four), a preliminary analysis of significant and substantial ICC coefficients calculated for level two revealed significant group effects on individual subject level. This was a reason to run multilevel predictive models in this study. Table 5-6 reports ICC coefficients for both level 2 (Discussion groups) and level 3 (Courses) after accounting for outliers.

In the current analysis, all outcome variables reported significant ICC coefficient for level 2 (Discussion groups). Except for Some Disagreement, Full Agreement and Refer to Evidence the ICC coefficients were also substantial. At the course level, the ICC coefficients were not significant nor substantial. Therefore, multilevel models at discussion group (level 2) level only were run in this study to report predictive relationships.

5.1.7. Continuous Outcome Variables

Multilevel models assume dependent variables to be continuous. As highlighted in chapter four, student level data was used as the unit of analysis in setting up predictive models in this study. At the posts coding level, there were several variables with nominal, ordinal and ratio data. Variables with nominal data mostly included two possible values only, and ordinal data was arranged with several possible outcomes. When converted to student level data this nominal and ordinal data became continuous in nature since aggregated scores for each student could take any value from a 0 to a 100. Therefore, outcome variables used in this study at the student subject level, were all continuous.

5.1.8. Dropped Cases with Missing Values or Outliers

Multilevel models also require limiting dropped cases to less than 5% of the sample due to missing values or outliers. In this study, students had an opportunity to check for missing data immediately after completing the surveys to analyze their cultural values and personality traits as a part of their course content. Thus, there were no missing data among predictor variables. As for dropped cases through outliers, altogether five cases were deleted. This represents 2% of the sample.

5.1.9. Sampling

All participants in the study were invited based on a sample of convenience. These students were mainly first-year business students who took marketing courses in a small-sized university in Western Canada. Other characteristics of the sample will be reported in section 5.2 in this study. When forming groups for online discussions, students for each group were assigned randomly. All groups in the sample were selected for data analysis.

5.1.10. Group Size

Table 5-7 Number of Courses, Groups and Cases

Course ID	Group ID	Cases	Course ID	Group ID	Cases
1	1	8	5	13	9
	2	10		14	7
	3	11		15	11
2	4	7	6	16	9
	5	7		17	10
	6	7		18	7
3	7	7	7	19	11
	8	8		20	10
	9	7		21	9
4	10	9	8	22	7
	11	12		23	6
	12	10		24	6
Total Groups		24	Average Cases Per Group		9
Total Cases - 205					

When forming groups, 11 to 12 students were allocated to each group at random. Due to non-participation and attrition, final group sizes of participants were not equal. Table 5-7 highlights the number of groups and their membership in the sample. Model results for certain outcome variables with multiple predictors reported insufficient data for some groups to calculate the chi-square statistic in reporting random effects. In this situation, HLM7 software calculated the chi-square statistic for the random effects portion only based on groups that had the required number of students.

5.1.11. Sample Size for Multilevel Modeling

Results of the power analysis tool (Section 4.6.4 in chapter four) revealed the sample to include 38 groups to attain 0.80 power. As discussed, the number of groups in this sample was 24. This represented 60% of the suggested number of groups. The consequence of running a multilevel analysis with a smaller sample/group size is the occurrence of type II errors. That is, retaining a false null hypothesis. After running the multilevel models, if significant results are not reported, the sample will be subjected to bootstrapping as a possible rectifying mechanism.

5.1.12. Centered Data

Garson (2013) highlighted that it is customary to center predictor variables before running multilevel models. Grand mean centering of predictors is said to be the most commonly used method in multilevel modeling (Garson). This centering method is said to improve the interpretability of coefficients and reduce multicollinearity. Thus, grand mean centering of predictors was carried out before running models.

5.1.13. Final Model Set Up and Specification

A detailed explanation about the final model set up was explained in sections 4.6 and 4.7 in chapter four. As explained earlier, all outcome variables identified in this study were arranged as univariate multilevel models. For each univariate outcome variable, the null model without any predictors was run first. Then the random intercept and slope models (RIRS) with the hypothesised predictors was run. The deviance statistic obtained through the null model was compared with RIRS models to assert model fit. Improvement in the unexplained variance between the null and the final model and model fit statistics for each variable will be presented in section 5.1.15. In addition to models with the hypothesized predictors, full models with all predictors were also run. Reasons for running these models are explained further in section 5.1.15.

5.1.14. Types of Estimation and Covariance Structures

Multilevel modeling software uses different estimation algorithms to calculate parameter estimates. In this study, all models were run through HLM7 software using the default 'restricted maximum likelihood estimation' (REML). REML estimation is favoured over other estimation techniques since it takes into account the loss of degrees of freedom to obtain an unbiased estimation of the variance components (Snijders & Bosker, 1999 quoted in Heck et al., 2013). Further, REML estimation is said to lead to better estimates when models are run with a smaller number of groups (Heck et al., 2013, p.19) and smaller sample sizes (Garson, 2013). The alternate estimation technique, maximum likelihood (ML) when modelled with a smaller sample size, is expected to produce small variance estimates possibly leading to liberal hypotheses tests (Raudenbush & Bryk, 2002). When using the REML estimations in modeling, the covariance structure of the model needs to be specified (Garson). Covariance refers to how two random variables will change together and the covariance structure will specify their organization. Random effects were specified using the default unrestricted covariance structure in HLM7. This covariance structure does not place any form of restriction in the organization of the covariance structure since none was hypothesized in this study.

5.1.15. Model Convergence and Fit Statistics

Table 5-8 reports model fit statistics (deviance) for the null and the final random intercept and slopes model (RIRS). The smaller the information criteria displayed, the better the model fit. Further, the table shows the change in the unexplained variance from the null to the RIRS model as hypothesized predictors are added to the latter. Deviance statistic for the final RIRS model is higher than the null model for Some Disagreement and Apply Evidence outcome variables. This suggests that when the hypothesized predictors are included, the RIRS model is not predicting the outcome variables any better than the null model. The change in unexplained variance between the null and RIRS models for many variables seem to be reasonable with the exception of Referring to Evidence, Autonomous and Impersonal Message Tones. This measure is yet another indicator to look for model fit in understanding how much the hypothesized predictors explain the unexplained variance of the outcome variable. Ideally, there should be a reasonable reduction in the unexplained variation between the null and the RIRS model.

Table 5-8 Model Fit Statistics and Change in Unexplained Variance for Models based on Hypothesized Predictors

Outcome Variables	No of Predictors	Deviance Statistic*		Change in Unexplained Variance level-1, r (residual)		
		NULL Model	RIRS Model	Null	RIRS	Change
Number of Posts	8	1116.294953	1091.193442	11.92542	8.97099	-0.25
Average Words	8	2335.787783	2293.599491	4566.8646	2639.913	-0.42
Reference	8	16.640693	16.555371	0.05592	0.03274	-0.41
Some Disagreement	8	-117.269735	-101.193986	0.03115	0.01931	-0.38
Full Agreement	3	-37.361954	-49.412227	0.04528	0.03492	-0.23
Social Presence	7	-4.767154	-7.976157	0.04945	0.02948	-0.40
Autonomous Tone	3	663.144369	656.624949	1.24763	1.14035	-0.09
Connected Tone	3	440.604114	428.754992	0.46277	0.39249	-0.15
Impersonal Tone	3	998.110741	990.855945	6.60448	6.36313	-0.04
Contextual Structure	4	2.322888	-55.306732	0.05321	0.03350	-0.37
Reasoning	9	441.800945	418.282265	0.42028	0.19157	-0.54
Refer Evidence	3	16.349649	-3.151152	0.04743	0.04613	-0.03
Apply Evidence	6	8.482277	22.669823	0.04951	0.04147	-0.16
Hard Evidence	6	610.065175	593.869388	0.95918	0.75623	-0.21
Soft Evidence	4	-61.747096	-74.429457	0.03754	0.02681	-0.29

*The information criteria are displayed in smaller-is-better form.

In addition to running models based on hypothesized predictors, a decision was made to run models with the full set of predictors (full models). Both fixed and random effect results obtained from this full model will be presented as an exploratory analysis in section three of this chapter. The following paragraphs will provide reasons to support this decision.

a) The fixed estimate results obtained by including all predictors (full models) into the model may lead to the discovery of potential predictors that were not hypothesized earlier, but may explain the unexplained variance of the outcome variables. These potential predictors can be used for in future studies when designing models.

b) The random effects estimates obtained through all predictors (full models) that are not currently captured through the hypothesized predictors may inform and design future studies that may explore group effects during online discussions.

Table 5-9 Model Best Fit Statistics and Change in Unexplained Variance for Models based on All Predictors

Outcome Variables	No of Predictors	Deviance Statistic*		Change in Unexplained Variance level-1, r (residual)		
		NULL Model	RIRS Model	Null	RIRS	Change
Number of Posts	9	1116.294953	1084.94201	11.92542	8.82965	-0.26
Average Words	9	2335.787783	2221.628564	4566.86455	2289.60477	-0.50
Reference	9	16.640693	11.046892	0.05592	0.02845	-0.49
Some Disagreement	9	-117.269735	-90.524645	0.03115	0.01869	-0.40
Full Agreement	9	-37.361954	-25.132731	0.04528	0.02971	-0.34
Social Presence	9	-4.767154	-25.697391	0.04945	0.01901	-0.62
Autonomous Tone	9	663.144369	645.638249	1.24763	0.72635	-0.42
Connected Tone	9	440.604114	398.363386	0.46277	0.17714	-0.62
Impersonal Tone	9	998.110741	966.388885	6.60448	4.16703	-0.37
Contextual Structure	9	2.322888	-67.03004	0.05321	0.01849	-0.65
Reasoning	9	441.800945	418.282265	0.42028	0.19157	-0.54
Refer Evidence	9	16.349649	6.465948	0.04743	0.03423	-0.28
Apply Evidence	9	8.482277	20.721289	0.04951	0.03305	-0.33
Hard Evidence	9	610.065175	572.760658	0.95918	0.47294	-0.51
Soft Evidence	9	-61.747096	-82.225112	0.03754	0.01602	-0.57

*The information criteria are displayed in smaller-is-better form.

Table 5-9 reports model fit statistics and change in the unexplained variance for outcome variables for the full models. In section three of this chapter, the deviance statistic and the change in unexplained variance reported in Table 5-8 and 5-9 will be discussed one by one when model results are reported.

5.1.16. Residual Analysis

The final assumption in running multilevel models is the interpretation of residuals to assess model fit. This includes testing the normal distribution and the homogeneity of variance of residuals. Table 5-10 reports residual results for all univariate outcome models for the respective hypothesized predictors. The skewness and kurtosis for residuals of Average Words, Reference, Some Disagreement, Full Agreement, Social Presence, Autonomus Tone, Impersonal Message Tone, Contextual Structure, Reasoning, Refer Evidence and Apply Evidence were between conservative +/- 1 range. The inspection of the histogram of these variables confirmed the normal distribution of their residuals.

Table 5-10 Residual Analysis for Models with Predicted Hypothesis

Outcome Variable	Distribution of Residuals			Homogeneity of Variance of Residuals
	Skew	Kurtosis	Inspection of Histogram	Test of homogeneity of level-1 variance
Number of Posts	.613	1.777	Slightly Kurtotic	χ^2 statistic = 11.25364, df=7, p = 0.127
Average Words	.965	1.088	Normal	χ^2 statistic = 16.16727, df=7, p = 0.023
Reference	-0.299	0.941	Normal	χ^2 statistic = 1.02093, df = 7 p = >.500
Some Disagree	.567	.044	Normal	χ^2 statistic = 2.20434, df = 11, p = >.500
Full Agreement	.275	.168	Normal	χ^2 statistic = 6.76682, df = 23, p = >.500
Social Presence	.392	-0.057	Normal	χ^2 statistic = 2.50208, df = 11, p = >.500
Autonomous Tone	.539	.448	Normal	χ^2 statistic = 15.18819, df = 23, p = >.500
Connected Tone	1.341	2.562	Slightly Kurtotic	χ^2 statistic = 14.55174, df=23, p = >.500
Impersonal Tone	.870	.685	Normal	χ^2 statistic = 41.58733, df=23, p = 0.010
Context Structure	.212	-0.073	Normal	χ^2 statistic = 7.66429, df=23, p = >.500
Reasoning	.159	.097	Normal	χ^2 statistic = 0.33791, df=7, p = >.500
Refer Evidence	.878	.875	Normal	χ^2 statistic = 7.01616, df=23, p = >.500
Apply Evidence	.336	-0.074	Normal	χ^2 statistic = 3.31171, df=13, p = >.500
Hard Evidence	1.045	2.588	Slightly Kurtotic	χ^2 statistic = 15.42260, df=2, p = >.500
Soft Evidence	1.120	1.986	Slightly Kurtotic	χ^2 statistic = 8.90253, df=23, p = >.500

As for Number of Posts, Connected Message Tone, Hard Evidence and Soft Evidence variables, the skewness reported were closer to the conservative +1 value. The kurtosis values for these variables were elevated. However, they were not high enough to be removed from the analysis. In checking for homogeneity of variance of residuals, the test of homogeneity of level-1 variance statistic was used to determine whether this assumption was violated. A statistic that is not significant suggests residual variances are not different across groups in a noteworthy manner. This suggested meeting the assumption of homogeneity of variance of residuals. For Average Words and Impersonal Message Tone variables, the test statistic for homogeneity of level-1 variance was significant. Violation of this assumption in multilevel modeling suggests an improper model specification (Garson, 2013), thus these two models were not taken forward for interpretation.

Table 5-11 Residual Analysis for Models with All Predictors

Outcome Variable	Distribution of Residuals			Homogeneity of Variance of Residuals
	Skew	Kurtosis	Inspection of Histogram	Test of homogeneity of level-1 variance
Average Words	.262	.009	Normal	$\chi 2$ statistic = 3.32443, df=3, p= 0.344
Impersonal Tone	.325	-0.099	Normal	$\chi 2$ statistic = 0.74532, df=3, p= >.500

However, when all predictors were included into the model (Table 5-11), the homogeneity of variance test statistic for both Average Words and Impersonal Message Tones was not significant, meeting the assumption of homogeneity of variance. Thus, results for these two variables were reported as exploratory data in this study.

5.1.17. Review of Multilevel Assumptions

Earlier sections asserted the tenability of multilevel assumptions in setting up and running predictive models successfully. The following section (Table 5-12) summarizes those findings.

Table 5-12 Summary of Multilevel Assumptions

Multilevel Assumptions	Summary
Presence of Outliers	Presence of outliers makes parameter estimates in multilevel models biased. Several univariate outliers were identified. One case was deleted. Other outliers were winsorized to reduce their impact. Further analysis revealed five multivariate outliers. All these cases were deleted. The remaining sample of 205 cases were subjected to analysis in reporting results of this study.
Normality of Distribution	Section 5.1.2 in this chapter, reported one independent and four dependent variables slightly departing from normality. Procedures adopted by multilevel modeling is robust to deviations from normality (Garson, 2013) thus this departure poses no major concerns.
Linearity of Data amongst Variables	Bivariate correlations between independent and dependent variables were examined. The visual inspection of plots suggested linear bivariate relationships between them.
Multicollinearity between Predictors	The overall correlation coefficients reported between predictor variables were insufficient to raise any concerns of multicollinearity
Independence of blocks	Discussion groups and courses were identified as separate blocks in this study. They were all independent from each other.
Independence of Observations	The significant and substantial ICC coefficients for all outcome variables at level 2 (Discussion groups) suggested the violation of the independence of observations. This indicates a significant group effect on individuals. However, there were no course level effects on individuals given non-significant and small ICC coefficients reported at level 3 (Courses) for all variables. Given this finding, all multilevel models were set up to account for group effects (level 2) only on individual student discussion behaviours in this study.

Multilevel Assumptions	Summary
Continuous Outcome Variables	All data reported at student level (unit of analysis) were established to be continuous in nature for all outcome variables in this study.
Dropped Cases with Missing Values/Outliers	There was no missing data. Dropped cases due to outliers were limited to 2% of the sample.
Sampling	All students in the study were based on a sample of convenience limited to first-year business students who took marketing courses in a small-sized university in Western Canada. Students for each discussion group were selected randomly. All groups in the sample were used for the study.
Group Sizes	At group formation stage, 11-12 students were allocated to groups at random. Due to non-participation and attrition, the groups did not have an equal number of cases. They varied between 6-12 per group. The average number of cases per group was 9.
Sample Size for Multilevel Modeling	Power analysis revealed 38 groups were required at level 2 for adequate power. The number of available groups for analysis was 24. This represents 60% of the required groups. If multilevel models failed to produce modest significant results, bootstrapping methods were planned for adoption.
Centered Data	All predictors were centered around the grand mean.
Final Model Set Up and Specification	Sections 4.6 and 4.7 in chapter four presented details pertaining to the final model set up in this study. All outcome variables were arranged as univariate outcome models. Model fit statistics, estimates from the random intercept and slopes model, was used to report results of this study. In a separate analysis, full models with all predictors were also run for exploratory purposes.
Types of Estimation and Covariance Structures	The default restricted maximum likelihood estimation (REML) algorithm was used to run parameter estimates.

Multilevel Assumptions		Summary
Model Convergence and Best-Fit Statistics		All models run in this study were univariate multilevel mixed models. The final RIRS models with the specified estimations methods and covariance structures did convergence and produced complete estimates. Except for two cases, the vast majority of models produced improved best-fit statistics for the final model. Mixed models reported both fixed and random effects.
Residual Analysis of Outcome Variables	Normal distribution of residuals	Except for two outcome variables, residuals of remaining outcome variables were all distributed normally. For the two variables, the reported kurtosis was slightly outside the normal range. However, they were not high enough to be removed from the analysis.
	Homogeneity of Variance	All outcome variables met the assumption of homogeneity of variance of the residuals but two. Residual results run through the Full models only for these two variables will be reported for exploratory purposes.

5.2. Demographic Characteristics of Students Across the Sample

Self-reports on key demographic characteristics (gender, age, citizenship and ethnic origin) of students across the sample are detailed in Table 5-13.

The majority of students in the sample were female. Over 70% of students were university-aged (17-22 years). Almost two-thirds of students in the sample were Canadian citizens. Students of East Asian origin were the largest ethnic group followed up by Caucasians and South Asians. However, the ethnic composition within the category of Canadian citizens was slightly different. Students of Caucasian origin (41%) were the largest group followed up by East Asians (27%) and the South Asians (21%).

Table 5-13 Demographic Characteristics of Students

Demographic Groups		Self-Reports	%
Gender	Female		58%
	Male		42%
Age	University Age	17 – 22 years	74%
	Mature Students	23 – 49 years	26%
Citizenship	Canadians	Canadian	72%
	Chinese	Chinese, Hong Kong Chinese, Taiwanese	11%
	Other Citizenships	American, French, German, Ukrainian, Brazilian, Panamanian, Egyptian, Palestinian, Saudi Arabian, Indonesian, Korean, Malaysian, Vietnamese, Filipino, Nigerian, Pakistani, Indian	17%
Ethnic Origin	East Asian	Chinese, Vietnamese, Fujian, Filipino, Hong Kong Chinese, Taiwanese	36%
	Caucasians	Caucasian - American, Canadian, Western and Eastern European Origin	35%
	South Asian	Punjabi, Sikh, Indian, South Asian	21%
	Other Ethnic Groups	Hispanic, Jewish, Native American, Middle Eastern & Sub-Saharan African	8%

5.3. Model Results

Section 5.1.11 of this chapter made references to bootstrapping. This was to be initiated if modest significant results were not reported, considering current models were run with only 60% of the required sample size. Test results for both fixed and random effects produced modest significant results, thus bootstrapping was not initiated for any of the models.

To recap, multilevel mixed models were run in this study. Each mixed model included estimates of fixed and random effects.

a) Fixed estimates report relationships between predictors and outcome variables across the sample irrespective of the group membership of a student.

b) Random effects report the influence of group memberships on absolute levels of participation for each outcome variable, and interactions between predictors and the student's local group context.

Two models were run for each outcome variable in this study. They included

a) Confirmatory tests with the originally hypothesized predictors. Fixed effect estimates (Fixed Slope) obtained through these models showed evidence to support or reject hypotheses asserted in this study. Random effects obtained through these models described both overall levels of group activity (Random intercept) and interaction effects (Random slope).

b) Exploratory tests with the full set of predictors. Test results from these models produced fixed effects that could verify / contest results from the confirmatory tests and suggest variables to be modeled in future studies. Random effect results (Random intercept and slope) were also reported for the full models.

The following section will report model results for each outcome variable.

5.3.1. Number of Messages

5.3.1.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H01	IND	LPR	LCT	NEU	EXT	OPN	AGR	CON
Number of messages posted by a student is predicted by	+	+	+	-	+	+	+	+

The deviance statistic (Table 5-8) between the null (without any predictors) and the RIRS (random intercept and slopes) model decreased from 1116.29 to 1091.19 (smaller is better). The unexplained variance between these models decreased by 25%, suggesting a modest explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

The hypothesis test results are reported in Table 5-14. The confirmatory test results for fixed effects showed a student's level of Conscientiousness to be a significant positive predictor of the Number of Messages they posted during the online discussion. There were no significant fixed effects for any other hypothesized predictors on the Number of Messages posted by students.

Table 5-14 Estimates for Fixed Effects: NUMBER OF POSTS (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	7.167917	0.434309	16.504	23	<0.001		
INDIVIDU slope, β_1	0.323301	0.529804	0.610	23	0.548	(+)	No
LOWPOWER slope, β_2	-0.307899	0.279808	-1.100	23	0.283	(+)	No
LOWCONTE slope, β_3	0.150291	0.315478	0.476	23	0.638	(+)	No
NEUROTIC slope, β_4	0.057980	0.297572	0.195	23	0.847	(-)	No
EXTROVER slope, β_5	-0.138218	0.269029	-0.514	23	0.612	(+)	No
OPENNESS slope, β_6	-0.384468	0.432596	-0.889	23	0.383	(+)	No
AGREEABL slope, β_7	-0.121308	0.287341	-0.422	23	0.677	(+)	No
CONSCIEN slope, β_8	**0.887805**	**0.319354**	**2.780**	**23**	**0.011**	**(+)**	**Yes (+)**

Exploratory Test Results for Random Effects

Results of random effects for the Number of Messages obtained through the hypothesized predictors are reported in Table 5-15. Results showed a significant random effect for the intercept. This meant that some groups posted a higher Number of Messages during the discussion than others.

Table 5-15 Estimates for Variance Components: NUMBER OF POSTS (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**1.88605**	**3.55717**	**11**	**48.43095**	**<0.001**	**16%**
INDIVIDU slope, u_1	**1.94247**	**3.77318**	**11**	**36.30343**	**<0.001**	**17%**
LOWPOWER slope, u_2	**0.85890**	**0.73771**	**11**	**21.22478**	**0.031**	**3%**
LOWCONTE slope, u_3	**0.67758**	**0.45912**	**11**	**29.17792**	**0.002**	**2%**
NEUROTIC slope, u_4	**0.96640**	**0.93392**	**11**	**34.36805**	**<0.001**	**4%**
EXTROVER slope, u_5	0.68918	0.47497	11	16.20119	0.133	2%
OPENNESS slope, u_6	**1.48035**	**2.19144**	**11**	**26.71285**	**0.005**	**10%**
AGREEABL slope, u_7	0.70076	0.49106	11	19.23586	0.057	2%
CONSCIEN slope, u_8	**0.89886**	**0.80795**	**11**	**24.23154**	**0.012**	**4%**
level-1, *r*	2.99516	8.97099				40%

Note: The chi-square statistics reported above are based on only 12 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Further, results displayed six predictors with significant random effects for slopes. Individualistic Values and Openness to Experience showed a large interaction effect. This meant the group membership of a student had a significant and a substantial effect on the relationship between Individualism, Openness to Experience and Number of Messages. There were significant random effects for Low Power Distance, Low Context, Neuroticism, and Conscientiousness. However, they showed small interaction effects.

5.3.1.2. All Predictors

Deviance statistic (Table 5-9) between the null and the RIRS model decreased from 1116.29 to 1084.94. The unexplained variance between these models decreased by 26%, suggesting a modest explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Table 5-16 Estimates for Fixed Effects: NUMBER OF POSTS (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	7.141627	0.430605	16.585	23	<0.001		
INDIVIDU slope, β_1	0.152561	0.492079	0.310	23	0.759	(+)	No
COLLECTI slope, β_2	-0.253975	0.386118	-0.658	23	0.517		
LOWPOWER slope, β_3	-0.256160	0.240012	-1.067	23	0.297	(+)	No
LOWCONTE slope, β_4	0.148586	0.308010	0.482	23	0.634	(+)	No
NEUROTIC slope, β_5	0.081899	0.332079	0.247	23	0.807	(-)	No
EXTROVER slope, β_6	-0.049466	0.271899	-0.182	23	0.857	(+)	No
OPENNESS slope, β_7	-0.427194	0.432980	-0.987	23	0.334	(+)	No
AGREEABL slope, β_8	-0.106400	0.336998	-0.316	23	0.755	(+)	No
CONSCIEN slope, β_9	**1.027770**	**0.257172**	**3.996**	**23**	**<0.001**	**(+)**	**Yes (+)**

Exploratory test results for fixed effects (Table 5-16) confirmed the findings of the hypothesized model, where a student's level of Conscientiousness was a significant positive predictor of the Number of Messages they posted during the online discussion.

Exploratory Test Results for Random Effects

Exploratory random effects of the full model are reported in Table 5-17. The random effect for the intercept was again significant. In the full model, only three predictors

displayed significant random effects for slopes. Individualistic Values and Openness to Experience showed large interaction effects. Neuroticism showed a small interaction effect.

Table 5-17 Estimates for Variance Components: NUMBER OF POSTS (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**1.86522**	**3.47906**	**7**	**19.02978**	**0.008**	**16%**
INDIVIDU slope, u_1	**1.78103**	**3.17207**	**7**	**16.92741**	**0.018**	**14%**
COLLECTI slope, u_2	1.09798	1.20556	7	4.67963	>0.500	5%
LOWPOWER slope, u_3	0.62319	0.38837	7	3.25811	>0.500	2%
LOWCONTE slope, u_4	0.52740	0.27815	7	4.54223	>0.500	1%
NEUROTIC slope, u_5	**1.11042**	**1.23304**	**7**	**16.70183**	**0.019**	**6%**
EXTROVER slope, u_6	0.63394	0.40188	7	8.13192	0.320	2%
OPENNESS slope, u_7	**1.46378**	**2.14265**	**7**	**9.97918**	**0.189**	**12%**
AGREEABL slope, u_8	0.93633	0.87672	7	13.04245	0.070	4%
CONSCIEN slope, u_9	0.42263	0.17862	7	9.24832	0.234	1%
level-1, *r*	2.97147	8.82965				40%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

5.3.2. Average Words

5.3.2.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H02	IND	LPR	LCT	NEU	EXT	OPN	AGR	CON
Average number of words in a message is predicted by	+	+	+	-	-	+	+	+

The deviance statistic (Table 5-8) between the null and the RIRS model decreased from 2335.79 to 2293.60 (smaller is better). The unexplained variance between these models was decreased by 42%, suggesting a notable explanation of the variance by the hypothesized predictors. However, results of the residual analysis revealed the violation of the homogeneity of variance of residuals assumption (Table 5-10). Therefore, results obtained for the hypothesized model were not reported. Exploratory test results obtained through the full model are reported below.

5.3.2.2 All Predictors

The deviance statistic (Table 5-9) between the null and the RIRS model decreased from 2335.79 to 2221.63 (smaller is better). The unexplained variance between these models decreased by 50%, suggesting a notable explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Table 5-18 Estimates for Fixed Effects: AVERAGE WORDS (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	199.38038	8.091259	24.641	23	<0.001		
INDIVIDU slope, β_1	4.803611	9.058276	0.530	23	0.601	(+)	No
COLLECTI slope, β_2	-3.356711	10.64840	-0.315	23	0.755		
LOWPOWER slope, β_3	-13.132518	8.067077	-1.628	23	0.117	(+)	No
LOWCONTE slope, β_4	**22.334531**	**8.643432**	**2.584**	**23**	**0.017**	**(+)**	**Yes (+)**
NEUROTIC slope, β_5	13.065382	7.210899	1.812	23	0.083	(-)	No
EXTROVER slope, β_6	2.580534	6.406234	0.403	23	0.691	(-)	No
OPENNESS slope, β_7	10.345437	8.575361	1.206	23	0.240	(+)	No
AGREEABL slope, β_8	2.476824	7.908029	0.313	23	0.757	(+)	No
CONSCIEN slope, β_9	11.559794	6.614538	1.748	23	0.094	(+)	No

Exploratory test results for fixed effects (Table 5-18) showed a student's level of Low Context-Based Values to be a significant positive predictor of the Average Number of Words used in a message.

Exploratory Test Results for Random Effects

Exploratory random effects of the full model are reported in Table 5-19. Results showed a significant random effect for the intercept, meaning that the Average Number of Words used messages in some groups was higher than in others. In the full model, Openness to Experience displayed significant random effects for slopes. However, it showed a small interaction effect.

Table 5-19 Estimates for Variance Components: AVERAGE WORDS (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**35.74843**	**1277.95034**	**7**	**33.92791**	**<0.001**	**11%**
INDIVIDU slope, u_1	28.91243	835.92870	7	4.82285	>0.500	7%
COLLECTI slope, u_2	41.16325	1694.41337	7	10.86063	0.144	15%
LOWPOWER slope, u_3	31.13638	969.47428	7	7.36586	0.392	9%
LOWCONTE slope, u_4	30.10091	906.06452	7	7.70779	0.359	8%
NEUROTIC slope, u_5	26.91094	724.19843	7	8.80367	0.266	6%
EXTROVER slope, u_6	19.76507	390.65783	7	7.80153	0.350	4%
OPENNESS slope, u_7	**31.60218**	**998.69794**	**7**	**18.37050**	**0.011**	**9%**
AGREEABL slope, u_8	26.11945	682.22562	7	6.18566	>0.500	6%
CONSCIEN slope, u_9	19.68944	387.67401	7	8.19806	0.315	3%
level-1, *r*	47.84981	2289.60477				21%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

5.3.3. Reference to Others

5.3.3.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H03	IND	COL	LPR	NEU	EXT	OPN	AGR	CON
The extent to which a student refer to others' ideas is predicted by	**-**	**+**	**+**	**-**	**+**	**+**	**+**	**+**

Deviance statistic (Table 5-8) between the null and the RIRS model decreased from 16.64 to 16.56 (smaller is better). The unexplained variance between these models decreased by 41%, suggesting a notable explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects (Table 5-20) showed a student's level of Conscientiousness and Agreeableness to be significant positive predictors of how they Referred to Others in messages. There were no significant fixed effects for any other hypothesized predictors as to how students Referred to Others in messages.

Table 5-20 Estimates for Fixed Effects: REFERENCE to OTHERS (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.593286	0.022145	26.791	23	<0.001		
INDIVIDU slope, β_1	0.041210	0.022674	1.818	23	0.082	(-)	No
COLLECTI slope, β_2	-0.028436	0.042295	-0.672	23	0.508	(+)	No
LOWPOWER slope, β_3	0.032925	0.023739	1.387	23	0.179	(+)	No
NEUROTIC slope, β_4	0.031223	0.018163	1.719	23	0.099	(-)	No
EXTROVER slope, β_5	-0.037586	0.023323	-1.612	23	0.121	(+)	No
OPENNESS slope, β_6	0.022695	0.027422	0.828	23	0.416	(+)	No
AGREEABL slope, β_7	**0.067279**	**0.026571**	**2.532**	**23**	**0.019**	**(+)**	**Yes (+)**
CONSCIEN slope, β_8	**0.058204**	**0.020719**	**2.809**	**23**	**0.010**	**(+)**	**Yes (+)**

Exploratory Test Results for Random Effects

Results for random effects for reference to others obtained through the hypothesized predictors are reported in Table 5-21.

Table 5-21 Estimates for Variance Components: REFERENCE to OTHERS (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.08864	0.00786	11	13.4128	0.267	7%
INDIVIDU slope, u_1	0.05897	0.00348	11	13.50886	0.261	3%
COLLECTI slope, u_2	**0.17223**	**0.02966**	**11**	**32.83297**	**<0.001**	**27%**
LOWPOWER slope, u_3	0.08411	0.00707	11	10.56713	>0.500	6%
NEUROTIC slope, u_4	0.04341	0.00188	11	13.67979	0.251	2%
EXTROVER slope, u_5	0.08700	0.00757	11	17.56156	0.092	7%
OPENNESS slope, u_6	**0.09797**	**0.00960**	**11**	**28.58320**	**0.003**	**9%**
AGREEABL slope, u_7	0.09051	0.00819	11	15.34516	0.167	7%
CONSCIEN slope, u_8	0.06217	0.00386	11	18.02257	0.081	3%
level-1, *r*	0.18095	0.03274				29%

Note: The chi-square statistics reported above are based on only 12 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

There was no significant difference in the way groups Referred to Others in their messages (non-significant random effect intercept). Two predictors showed significant random effects for slopes. Collectivistic Values displayed a large interaction effect. This

meant the group membership of a student had a significant and a substantial effect on the relationship between Collectivistic Values and Reference to Others in messages. Openness to Experience was the other predictor that displayed a significant random effect. However, it showed a small interaction effect.

5.3.3.2 All Predictors

The deviance statistic (Table 5-9) between the null and the RIRS model decreased from 16.64 to 11.05 (smaller is better). The unexplained variance between these models decreased by 49%, suggesting a notable explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Table 5-22 Estimates for Fixed Effects: REFERENCE to OTHERS (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.593063	0.022296	26.599	23	<0.001		
INDIVIDU slope, β_1	0.051626	0.023243	2.221	23	0.036	(-)	No
COLLECTI slope, β_2	-0.037025	0.042994	-0.861	23	0.398	(+)	No
LOWPOWER slope, β_3	0.027989	0.026309	1.064	23	0.298	(+)	No
LOWCONTE slope, β_4	-0.053867	0.027547	-1.955	23	0.063		
NEUROTIC slope, β_5	0.021671	0.017162	1.263	23	0.219	(-)	No
EXTROVER slope, β_6	-0.041471	0.022585	-1.836	23	0.079	(+)	No
OPENNESS slope, β_7	0.012929	0.025499	0.507	23	0.617	(+)	No
AGREEABL slope, β_8	**0.074312**	**0.028750**	**2.585**	**23**	**0.017**	**(+)**	**Yes (+)**
CONSCIEN slope, β_9	**0.055179**	**0.021490**	**2.568**	**23**	**0.017**	**(+)**	**Yes (+)**

Exploratory test results for fixed effects (Table 5-22) confirmed the findings of the hypothesized model where a student's level of Agreeableness and Conscientiousness to be significant positive predictors of how they Referred to Others in messages.

Exploratory Test Results for Random Effects

Exploratory random effects are reported in Table 5-23. The random effect for the intercept was again not significant.

Table 5-23 Estimates for Variance Components: REFERENCE to OTHERS (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.09262	0.00858	7	11.42708	0.120	7%
INDIVIDU slope, u_1	0.07260	0.00527	7	11.49387	0.118	4%
COLLECTI slope, u_2	**0.17999**	**0.03240**	**7**	**28.16389**	**<0.001**	**25%**
LOWPOWER slope, u_3	0.10774	0.01161	7	11.57622	0.115	9%
LOWCONTE slope, u_4	**0.09491**	**0.00901**	**7**	**13.62837**	**0.048**	**7%**
NEUROTIC slope, u_5	0.04752	0.00226	7	12.46192	0.086	2%
EXTROVER slope, u_6	0.08342	0.00696	7	11.91805	0.103	5%
OPENNESS slope, u_7	**0.09773**	**0.00955**	**7**	**27.11308**	**<0.001**	**7%**
AGREEABL slope, u_8	**0.10735**	**0.01152**	**7**	**20.38029**	**0.005**	**9%**
CONSCIEN slope, u_9	**0.06747**	**0.00455**	**7**	**15.78039**	**0.027**	**3%**
level-1, *r*	0.16867	0.02845				22%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

In the full model, five predictors displayed significant random effects for slopes. Confirming the results reported in the hypothesized model, Collectivistic Values showed a large interaction effect again. In other words, in both modeling situations, the group membership of a student seemed to have a significant and a substantial effect on the relationship between Collectivistic Values and Reference to Others in their messages. Low Context-Based Values, Openness to Experience, Agreeableness and Conscientiousness traits also displayed significant random effects, but they showed small interaction effects.

5.3.4. Some Disagreement

5.3.4.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H04	IND	COL	LPR	NEU	OPN	AGR	CON
The extent to which a student disagree with others is predicted by	+	-	+	-	+	-	+

The deviance statistic (Table 5-8) between the null and the RIRS model marginally increased from -117.27 to -101.19 (smaller is better). However, the unexplained variance between these models decreased by 38%, suggesting a notable explanation of the variance by the hypothesized predictors. An increase in the deviance statistic suggests hypothesized predictors did not predict the outcome variable as expected. However, considering the notable reduction in the unexplained variance, results of this model were interpreted, but cautiously.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects (Table 5-24) showed a student's level of Conscientiousness to be a significant positive predictor of how they Disagree with others in messages. There were no significant fixed effects for any other hypothesized predictors on how students Disagreed with others in messages.

Table 5-24 Estimates for Fixed Effects: SOME DISAGREEMENT (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.164660	0.012909	12.756	23	<0.001		
INDIVIDU slope, β_1	0.031955	0.022344	1.430	23	0.166	(+)	No
COLLECTI slope, β_2	-0.005255	0.020072	-0.262	23	0.796	(-)	No
LOWPOWER slope, β_3	0.028799	0.017987	1.601	23	0.123	(+)	No
NEUROTIC slope, β_4	0.026207	0.011918	2.199	23	0.038	(-)	No
OPENNESS slope, β_5	0.025228	0.020063	1.257	23	0.221	(+)	No
AGREEABL slope, β_6	0.001533	0.017364	0.088	23	0.930	(-)	No
CONSCIEN slope, β_7	**0.039374**	**0.017043**	**2.310**	**23**	**0.030**	**(+)**	**Yes (+)**

Exploratory Test Results for Random Effects

Results for random effects for Some Disagreement obtained through the hypothesized predictors are reported in Table 5-25. Results showed a significant random effect for the intercept. This meant the number of messages with disagreements where higher in some groups than in others.

Table 5-25 Estimates for Variance Components: SOME DISAGREEMENT (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.03823**	**0.00146**	**13**	**22.68434**	**0.045**	3%
INDIVIDU slope, u_1	**0.05769**	**0.00333**	**13**	**31.09552**	**0.004**	**7%**
COLLECTI slope, u_2	**0.05745**	**0.00330**	**13**	**23.83688**	**0.032**	**7%**
LOWPOWER slope, u_3	0.05655	0.00320	13	21.43674	0.064	7%
NEUROTIC slope, u_4	**0.03022**	**0.00091**	**13**	**25.43673**	**0.020**	**2%**
OPENNESS slope, u_5	0.07577	0.00574	13	18.85928	0.127	13%
AGREEABL slope, u_6	0.03277	0.00107	13	13.48564	0.411	2%
CONSCIEN slope, u_7	0.05753	0.00331	13	17.27619	0.187	7%
level-1, *r*	0.14988	0.02246				50%

Note: The chi-square statistics reported above are based on only 14 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Individualistic Values, Collectivistic Values and Neuroticism displayed significant random effects for slopes. However, they showed small interaction effects.

5.3.4.2 All Predictors

The deviance statistic (Table 5-9) between the null and the RIRS model marginally increased from -117.27 to -90.52 (smaller is better). However, the unexplained variance between these models decreased by 40%, suggesting a notable explanation of the variance by all predictors. Thus results of this model were interpreted, but cautiously.

Exploratory Test Results for Fixed Effects

Exploratory test results for fixed effects (Table 5-26) confirmed findings of the hypothesized model, where a student's level of Conscientiousness to be a significant positive predictor of how they Disagreed with others in messages

Table 5-26 Estimates for Fixed Effects: SOME DISAGREEMENT (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.165660	0.01369	12.101	23	<0.001		
INDIVIDU slope, β_1	0.037766	0.023528	1.605	23	0.122	(+)	No
COLLECTI slope, β_2	-0.004296	0.019724	-0.218	23	0.830	(-)	No
LOWPOWER slope, β_3	0.029106	0.017117	1.700	23	0.103	(+)	No
LOWCONTE slope, β_4	-0.014364	0.017222	-0.834	23	0.413		
NEUROTIC slope, β_5	0.024637	0.011304	2.179	23	0.040	(-)	No
EXTROVER slope, β_6	-0.002125	0.01265	-0.168	23	0.868		
OPENNESS slope, β_7	0.023245	0.020597	1.129	23	0.271	(+)	No
AGREEABL slope, β_8	0.000361	0.017061	0.021	23	0.983	(-)	No
CONSCIEN slope, β_9	**0.036287**	**0.017551**	**2.068**	**23**	**0.050**	**(+)**	**Yes (+)**

Exploratory Test Results for Random Effects

Table 5-27 Estimates for Variance Components: SOME DISAGREEMENT (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.04462	0.00199	7	13.42481	0.062	4%
INDIVIDU slope, u_1	0.06397	0.00409	7	9.45549	0.221	9%
COLLECTI slope, u_2	0.05636	0.00318	7	13.42809	0.062	7%
LOWPOWER slope, u_3	0.05440	0.00296	7	12.97206	0.072	6%
LOWCONTE slope, u_4	0.02767	0.00077	7	13.30972	0.064	2%
NEUROTIC slope, u_5	0.02594	0.00067	7	9.99632	0.188	1%
EXTROVER slope, u_6	0.02052	0.00042	7	12.95937	0.073	1%
OPENNESS slope, u_7	0.07842	0.00615	7	11.91157	0.103	13%
AGREEABL slope, u_8	0.03770	0.00142	7	11.55672	0.115	3%
CONSCIEN slope, u_9	0.06002	0.00360	7	8.00224	0.332	8%
level-1, r	0.14750	0.02176				46%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Results of exploratory random effects obtained through full models are reported in Table 5-27. There were no significant random effects for the intercept nor any of the slopes in this model. This meant that there were no group effects on how students disagreed with others in their messages.

5.3.5. Full Agreement

5.3.5.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H05	COL	EXT	AGR
The extent to which a student fully agree with others is predicted by	+	+	+

The deviance statistic (Table 5-8) between the null and the RIRS model decreased from -37.36 to -49.41. The unexplained variance between these models decreased by 23% suggesting a modest explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects (Table 5-28) showed a student's level of Agreeableness to be a significant positive predictor as to how they Fully Agree with others in messages. There were no significant fixed effects for any other hypothesized predictors on how students Fully Agreed with others in messages.

Table 5-28 Estimates for Fixed Effects: FULL AGREEMENT (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.342247	0.015644	21.877	23	<0.001		
COLLECTI slope, β_1	0.010658	0.029392	0.363	23	0.720	(+)	No
EXTROVER slope, β_2	-0.026604	0.023437	-1.135	23	0.268	(+)	No
AGREEABL slope, β_3	**0.068849**	**0.021461**	**3.208**	**23**	**0.004**	**(+)**	**Yes (+)**

Exploratory Test Results for Random Effects

Results for random effects for Full Agreement obtained through hypothesised models are reported in Table 5-29. There was no significant difference in the way groups Fully Agreed with others in their messages (non-significant random effects intercept).

Table 5-29 Estimates for Variance Components: FULL AGREEMENT (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.04522	0.00205	23	31.78576	0.105	4%
COLLECTI slope, u_1	**0.10496**	**0.01102**	**23**	**35.82774**	**0.043**	**20%**
EXTROVER slope, u_2	**0.07110**	**0.00506**	**23**	**42.16922**	**0.009**	**9%**
AGREEABL slope, u_3	**0.05806**	**0.00337**	**23**	**34.59213**	**0.057**	**6%**
level-1, *r*	0.18688	0.03492				62%

Three predictors showed significant random effects for slopes. Collectivism showed a large effect. This meant the group membership of a student has a significant and a substantial effect on the relationship between Collectivistic Values and Full Agreement. Extroversion and Agreeableness also displayed significant random effects. But they showed small interaction effects.

5.3.5.2 All Predictors

The deviance statistic (Table 5-9) between the null and the RIRS model increased from -37.36 to -25.13 (smaller is better). However, the unexplained variance between these models decreased by 34%, suggesting a modest explanation of the variance by all predictors. Thus results of this model were interpreted, but cautiously.

Exploratory Test Results for Fixed Effects

Table 5-30 Estimates for Fixed Effects: FULL AGREEMENT (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.341053	0.015342	22.229	23	<0.001		
INDIVIDU slope, β_1	-0.005613	0.024421	-0.230	23	0.820		
COLLECTI slope, β_2	-0.006753	0.035377	-0.191	23	0.850	(+)	No
LOWPOWER slope, β_3	-0.003206	0.016678	-0.192	23	0.849		
LOWCONTE slope, β_4	-0.006436	0.026317	-0.245	23	0.809		
NEUROTIC slope, β_5	0.006217	0.015006	0.414	23	0.682		
EXTROVER slope, β_6	-0.022080	0.022510	-0.981	23	0.337	(+)	No
OPENNESS slope, β_7	0.011741	0.014980	0.784	23	0.441		
AGREEABL slope, β_8	**0.078276**	**0.020951**	**3.736**	**23**	**0.001**	**(+)**	**Yes (+)**
CONSCIEN slope, β_9	-0.013659	0.020499	-0.666	23	0.512		

Exploratory test results for fixed effects (Table 5-30) showed a student's level of Agreeableness to be a significant positive predictor as to how they Fully Agreed with others in messages.

Exploratory Test Results for Random Effects

Table 5-31 Estimates for Variance Components: FULL AGREEMENT (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.05083	0.00258	7	7.63113	0.366	4%
INDIVIDU slope, u_1	0.06099	0.00372	7	9.06772	0.247	5%
COLLECTI slope, u_2	**0.13875**	**0.01925**	**7**	**14.64584**	**0.040**	**27%**
LOWPOWER slope, u_3	0.03335	0.00111	7	7.97087	0.335	2%
LOWCONTE slope, u_4	**0.05992**	**0.00359**	**7**	**16.21143**	**0.023**	**5%**
NEUROTIC slope, u_5	0.02354	0.00055	7	11.8165	0.106	1%
EXTROVER slope, u_6	0.06507	0.00423	7	6.28622	>0.500	6%
OPENNESS slope, u_7	0.03936	0.00155	7	10.59624	0.157	2%
AGREEABL slope, u_8	0.05508	0.00303	7	10.60814	0.156	4%
CONSCIEN slope, u_9	**0.05236**	**0.00274**	**7**	**13.96031**	**0.050**	**4%**
level-1, *r*	0.17238	0.02971				41%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Exploratory random effects obtained through the full model are reported in Table 5-31. The random effects for the intercept was again not significant.

Three predictors showed significant random effects for slopes. Confirming results reported in the hypothesized model, Collectivistic Values showed a large effect again. Low Context and Conscientiousness also displayed significant random effects. But they showed small interaction effects.

5.3.6. Social Presence

5.3.6.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H06	COL	LCT	NEU	EXT	OPN	AGR	CON
The extent to which a student display social presence in messages is predicted by	+	-	+	+	+	+	-

The deviance statistic (Table 5-8) between the null model and the RIRS model decreased from -4.77 to -7.98 (smaller is better). The unexplained variance between these models decreased by 40%, suggesting a notable explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Test results of the hypothesized model are reported in Table 5-32. Confirmatory test results for fixed effects showed a student's level of Agreeableness and Conscientiousness were significant positive predictors of Social Presence displayed in messages. Although Conscientiousness showed a significant effect, the direction of the relationship hypothesized and the result was different.

Table 5-32 Estimates for Fixed Effects: SOCIAL PRESENCE (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.235446	0.029173	8.071	23	<0.001		
COLLECTI slope, β_1	-0.026527	0.033983	-0.781	23	0.443	(+)	No
LOWCONTE slope, β_2	0.036757	0.031765	1.157	23	0.259	(-)	No
NEUROTIC slope, β_3	0.040036	0.020982	1.908	23	0.069	(+)	No
EXTROVER slope, β_4	0.014791	0.018437	0.802	23	0.431	(+)	No
OPENNESS slope, β_5	0.018945	0.024861	0.762	23	0.454	(+)	No
AGREEABL slope, β_6	**0.073656**	**0.023152**	**3.181**	**23**	**0.004**	**(+)**	**Yes (+)**
CONSCIEN slope, β_7	**0.053428**	**0.022736**	**2.350**	**23**	**0.028**	**(-)**	**Yes (+)**

Exploratory Test Results for Random Effects

Results for random effects reported for Social Presence obtained through hypothesized predictors are reported in Table 5-33. Results reported a significant random effect for the intercept. This meant that some groups displayed more comments with Social Presence in messages than others.

Table 5-33 Estimates for Variance Components: SOCIAL PRESENCE (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.13161**	**0.01732**	**13**	**39.18154**	**<0.001**	**16%**
COLLECTI slope, u_1	**0.13675**	**0.01870**	**13**	**31.00587**	**0.004**	**18%**
LOWCONTE slope, u_2	**0.10411**	**0.01084**	**13**	**25.48662**	**0.020**	**10%**
NEUROTIC slope, u_3	0.08132	0.00661	13	20.89728	0.075	6%
EXTROVER slope, u_4	0.05134	0.00264	13	18.17829	0.151	2%
OPENNESS slope, u_5	**0.07889**	**0.00622**	**13**	**48.65544**	**<0.001**	**6%**
AGREEABL slope, u_6	0.08829	0.00780	13	19.17536	0.117	7%
CONSCIEN slope, u_7	**0.07857**	**0.00617**	**13**	**43.17342**	**<0.001**	**6%**
level-1, *r*	0.17171	0.02948				28%

Note: The chi-square statistics reported above are based on only 14 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

There were four predictors with significant random effects for slopes. Collectivistic Values and Low Context-Based Values showed a large interaction effect. This meant that the group membership of a student had a significant and substantial effect on the relationship between Collectivistic Values and Low Context Values with Social Presence. Openness to Experience and Conscientiousness also displayed significant random effects. However, they showed small interaction effects.

5.3.6.2 All Predictors

The deviance statistic (Table 5-9) between the null and the RIRS model decreased from -4.77 to -25.70 (smaller is better). The unexplained variance between these models decreased by 62%, suggesting a substantial explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Exploratory test results for fixed effects (Table 5-34) confirmed results of the hypothesized model where a student's level of Agreeableness was a significant positive predictor of Social Presence displayed in messages. However, Conscientiousness was no longer significant. Instead, a student's level of Individualistic Values was now a significant positive predictor of Social Presence displayed in messages.

Table 5-34 Estimates for Fixed Effects: SOCIAL PRESENCE (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.223118	0.024623	9.061	23	<0.001		
INDIVIDU slope, β_1	**0.093910**	**0.025365**	**3.702**	**23**	**0.001**		**Yes (+)**
COLLECTI slope, β_2	-0.044632	0.036809	-1.213	23	0.238	(+)	No
LOWPOWER slope, β_3	-0.001323	0.024588	-0.054	23	0.958		
LOWCONTE slope, β_4	0.008602	0.039019	0.220	23	0.827	(-)	No
NEUROTIC slope, β_5	0.043267	0.022622	1.913	23	0.068	(+)	No
EXTROVER slope, β_6	-0.005423	0.025441	-0.213	23	0.833	(+)	No
OPENNESS slope, β_7	0.004052	0.026088	0.155	23	0.878	(+)	No
AGREEABL slope, β_8	**0.106116**	**0.021453**	**4.946**	**23**	**<0.001**	**(+)**	**Yes (+)**
CONSCIEN slope, β_9	0.019041	0.026585	0.716	23	0.481	(-)	No

Exploratory Test Results for Random Effects

Random effects obtained through the full model are reported in Table 5-35. The random effect for the intercept was again significant.

In the full model, several predictors showed significant random effects for slopes. As noted earlier in the hypothesized model, a large interaction effect was noted for Collectivistic Values and Low Context-Based Values. Although Low Power Distance, Extroversion, Openness, Agreeableness and Conscientiousness showed significant random effects, their interaction effects were small.

Table 5-35 Estimates for Variance Components: SOCIAL PRESENCE (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.11013**	**0.01213**	**7**	**23.68808**	**0.002**	**9%**
INDIVIDU slope, u_1	0.08433	0.00711	7	9.44480	0.221	5%
COLLECTI slope, u_2	**0.15719**	**0.02471**	**7**	**23.48587**	**0.002**	**18%**
LOWPOWER slope, u_3	**0.09686**	**0.00938**	**7**	**13.68423**	**0.057**	**7%**
LOWCONTE slope, u_4	**0.15425**	**0.02379**	**7**	**36.40143**	**<0.001**	**17%**
NEUROTIC slope, u_5	0.09360	0.00876	7	10.70799	0.151	6%
EXTROVER slope, u_6	**0.09720**	**0.00945**	**7**	**19.50242**	**0.007**	**7%**
OPENNESS slope, u_7	**0.10069**	**0.01014**	**7**	**34.13223**	**<0.001**	**7%**
AGREEABL slope, u_8	**0.07770**	**0.00604**	**7**	**21.81575**	**0.003**	**4%**
CONSCIEN slope, u_9	**0.09766**	**0.00954**	**7**	**24.19362**	**0.001**	**7%**
level-1, *r*	0.13787	0.01901				14%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

5.3.7. Autonomous Message Tone (First Person Singular)

5.3.7.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H07a	IND	LCT	CON
The extent to which a student use autonomous tones in messages is predicted by	+	+	+

The deviance statistic (Table 5-8) between the null model and RIRS model decreased reasonably from 663.14 to 656.62 (smaller is better). The unexplained variance between these models decreased by 9%, suggesting a marginal explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Test results of the hypothesized model are reported in Table 5-36.

Table 5-36 Estimates for Fixed Effects: AUTONOMOUS TONES (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	1.883638	0.157808	11.936	23	<0.001		
INDIVIDU slope, β_1	0.063346	0.117678	0.538	23	0.596	(+)	No
LOWCONTE slope, β_2	**0.327364**	**0.100627**	**3.253**	**23**	**0.004**	**(+)**	**Yes (+)**
CONSCIEN slope, β_3	0.188471	0.117644	1.602	23	0.123	(+)	No

Confirmatory test results for fixed effects showed a student's level of Low Context-Based Values was a significant positive predictor of how they used Autonomous Tones in messages. There were no significant fixed effects for any other hypothesized predictors as to how students used Autonomous Tones in messages.

Exploratory Test Results for Random Effects

Table 5-37 Estimates for Variance Components: AUTONOMOUS TONES (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.69659**	**0.48523**	**23**	**67.54673**	**<0.001**	**27%**
INDIVIDU slope, u_1	0.22716	0.05160	23	24.93531	0.353	3%
LOWCONTE slope, u_2	0.15076	0.02273	23	10.73042	>0.500	1%
CONSCIEN slope, u_3	**0.28689**	**0.08231**	**23**	**33.6466**	**0.007**	**5%**
level-1, *r*	1.06787	1.14035				64%

Results for random-effects for Autonomous Message Tone obtained through hypothesized predictors are reported in Table 5-37. Results reported a significant random effect for the intercept. This suggests that some groups used a higher number of autonomous tones in their messages than others.

Conscientiousness was the only predictor that showed significant random effects for slopes. However, it showed a smaller interaction effect.

5.3.7.2 All Predictors

The deviance statistic (Table 5-9) between the null and the RIRS model decreased from 663.14 to 645.64 (Smaller is better). The unexplained variance between these

models decreased by 42%, suggesting a notable explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Exploratory test results for fixed effects (Table 5-38) were different from those of the hypothesized model. Low Context-based Values no longer showed a significant effect. Instead, a student's level of Extroversion was now a significant negative predictor as to how they used Autonomous Tones in messages.

Table 5-38 Estimates for Fixed Effects: AUTONOMOUS TONES (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	1.740191	0.114440	15.206	23	<0.001		
INDIVIDU slope, β_1	0.011803	0.155830	0.076	23	0.940	(+)	No
COLLECTI slope, β_2	-0.039845	0.121334	-0.328	23	0.746		
LOWPOWER slope, β_3	-0.008933	0.133673	-0.067	23	0.947		
LOWCONTE slope, β_4	0.198406	0.121030	1.639	23	0.115	(+)	No
NEUROTIC slope, β_5	-0.030961	0.091110	-0.340	23	0.737		
EXTROVER slope, β_6	**-0.162285**	**0.070376**	**-2.306**	**23**	**0.030**		**Yes (-)**
OPENNESS slope, β_7	0.081951	0.165534	0.495	23	0.625		
AGREEABL slope, β_8	0.238976	0.124736	1.916	23	0.068		
CONSCIEN slope, β_9	0.218212	0.136571	1.598	23	0.124	(+)	No

Exploratory Test Results for Random Effects

Results for random effects obtained through the full model are reported in Table 5-39. Results between the hypothesized and the full predictor models were different. The random effect of the intercept was no longer significant. Conscientiousness no longer showed a significant random effect for slopes. Instead Agreeableness now displayed a significant random effect. However, it showed a small iinteraction effect.

Table 5-39 Estimates for Variance Components: AUTONOMOUS TONES (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.47392	0.22460	7	8.95643	0.255	8%
INDIVIDU slope, u_1	0.58890	0.34680	7	12.55854	0.083	12%
COLLECTI slope, u_2	0.37428	0.14009	7	12.55251	0.083	5%
LOWPOWER slope, u_3	0.51341	0.26359	7	8.51044	0.289	9%
LOWCONTE slope, u_4	0.32300	0.10433	7	8.16431	0.318	4%
NEUROTIC slope, u_5	0.29924	0.08954	7	6.84574	>0.500	3%
EXTROVER slope, u_6	0.14847	0.02204	7	10.42983	0.165	1%
OPENNESS slope, u_7	0.67176	0.45127	7	6.35194	>0.500	16%
AGREEABL slope, u_8	**0.46685**	**0.21795**	**7**	**15.46542**	**0.030**	**8%**
CONSCIEN slope, u_9	0.52565	0.27630	7	9.99608	0.188	10%
level-1, *r*	0.85226	0.72635				25%

Note: The chi-square statistics reported above are based on only 8 of 24 group that had sufficient data for computation. Fixed effects and variance components are based on all the data.

5.3.8. Connected Message Tone (First Person Plural)

5.3.8.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H07b	COL	NEU	AGR
The extent to which a student use connected tones in messages is predicted by	+	+	+

The deviance statistic (Table 5-8) between the null and the RIRS model decreased reasonably from 440.60 to 428.75 (Smaller is better). The unexplained variance between these models decreased by 15%, suggesting a reasonable explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects are reported in Table 5-40. There was no evidence to suggest any of the hypothesized cultural/personality factors predicted how students used Connected Tones in messages.

Table 5-40 Estimates for Fixed Effects: CONNECTED TONE (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.623095	0.053588	11.627	23	<0.001		
COLLECTI slope, β_1	0.064786	0.079869	0.811	23	0.426	(+)	No
NEUROTIC slope, β_2	0.014585	0.050466	0.289	23	0.775	(+)	No
AGREEABL slope, β_3	0.096574	0.093491	1.033	23	0.312	(+)	No

Exploratory Test Results for Random Effects

Results of random effects obtained through the hypothesized model are reported in Table 5-41.

Table 5-41 Estimates for Variance Components: CONNECTED TONE (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.18823	0.03543	23	17.56022	>0.500	6%
COLLECTI slope, u_1	0.20025	0.04010	23	23.12147	0.454	7%
NEUROTIC slope, u_2	0.12881	0.01659	23	24.71855	0.365	3%
AGREEABL slope, u_3	**0.34808**	**0.12116**	**23**	**44.64853**	**0.005**	**20%**
level-1, *r*	0.62649	0.39249				65%

There was no significant difference in the way groups used Connected Tones in their messages (non-significant random effects intercept).

Agreeableness showed a significant random effect on slopes. The interaction effect was also large. This meant that the group membership of a student had a significant and a substantial effect on the relationship between Agreeableness and Connected Message Tones.

5.3.8.2 All Predictors

The deviance statistic (Table 5-9) between the null and the RIRS model decreased from 440.60 to 398.36 (smaller is better). The unexplained variance between these models decreased by 62%, suggesting a substantial explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Table 5-42 Estimates for Fixed Effects: CONNECTED TONE (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.591895	0.051854	11.415	23	<0.001		
INDIVIDU slope, β_1	-0.001848	0.097569	-0.019	23	0.985		
COLLECTI slope, β_2	-0.036898	0.089066	-0.414	23	0.683	(+)	No
LOWPOWER slope, β_3	-0.008659	0.080838	-0.107	23	0.916		
LOWCONTE slope, β_4	0.053143	0.084339	0.630	23	0.535		
NEUROTIC slope, β_5	0.071800	0.066737	1.076	23	0.293	(+)	No
EXTROVER slope, β_6	**0.139981**	**0.059292**	**2.361**	**23**	**0.027**		**Yes (+)**
OPENNESS slope, β_7	-0.042068	0.064934	-0.648	23	0.523		
AGREEABL slope, β_8	0.120949	0.088041	1.374	23	0.183	(+)	No
CONSCIEN slope, β_9	0.131603	0.111667	1.179	23	0.251		

Exploratory test results for fixed effects (Table 5-42) showed a student's level of Extroversion to be a significant positive predictor of how they use Connected Tones in messages.

Exploratory Test Results for Random Effects

Table 5-43 Estimates for Variance Components: CONNECTED TONE (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.21924	0.04806	7	7.30334	0.398	4%
INDIVIDU slope, u_1	**0.38706**	**0.14982**	**7**	**15.42219**	**0.031**	**12%**
COLLECTI slope, u_2	**0.35551**	**0.12638**	**7**	**17.79495**	**0.013**	**10%**
LOWPOWER slope, u_3	0.32829	0.10778	7	12.75236	0.078	9%
LOWCONTE slope, u_4	0.29611	0.08768	7	13.64702	0.057	7%
NEUROTIC slope, u_5	0.25599	0.06553	7	10.26072	0.174	5%
EXTROVER slope, u_6	0.21670	0.04696	7	12.03935	0.099	4%
OPENNESS slope, u_7	0.20011	0.04005	7	10.92445	0.141	3%
AGREEABL slope, u_8	0.35392	0.12526	7	10.38249	0.167	10%
CONSCIEN slope, u_9	**0.48396**	**0.23422**	**7**	**15.79783**	**0.027**	**19%**
level-1, *r*	0.42088	0.17714				15%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Results for random effects obtained through the full model are reported in Table 5-43. The random effect for the intercept was again not significant.

In the full model, Individualistic Values, Collectivistic Values, and Conscientiousness displayed significant random effects for slopes. The interaction effects were also large. Agreeableness no longer showed a significant random effect.

5.3.9. Impersonal Message Tone (Third Person)

5.3.9.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H07c	IND	LCT	CON
The extent to which a student use impersonal tones in messages is predicted by	+	+	+

The deviance statistic (Table 5-8) between the null and the RIRS model decreased from 998.11 to 990.86 (smaller is better). The unexplained variance between these models decreased by 4%, suggesting a hardly any explanation of the variance by the hypothesized predictors. Results of the residual analysis revealed a violation of the homogeneity of variance (Table 5-10) of residual assumption for this model. Therefore, results obtained from this model will not be reported. Exploratory test results obtained through the full model are presented below.

5.3.9.2 All Predictors

The deviance statistic (Table 5-9) between the null and the RIRS model decreased from 998.11 to 966.39 (smaller is better). The unexplained variance between these models decreased by 37%, suggesting a modest explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Exploratory test results for fixed effects (Table 5-44) showed a student's level of Low Power Distance to be a significant negative predictor of their use of Impersonal Tones in messages.

Table 5-44 Estimates for Fixed Effects: IMPERSONAL TONE (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	5.041533	0.329491	15.301	23	<0.001		
INDIVIDU slope, β_1	-0.104067	0.370646	-0.281	23	0.781	(+)	No
COLLECTI slope, β_2	-0.633544	0.362775	-1.746	23	0.094		
LOWPOWER slope, β_3	**-0.572291**	**0.275056**	**-2.081**	**23**	**0.049**		**(-) Yes**
LOWCONTE slope, β_4	0.496516	0.414351	1.198	23	0.243	(+)	No
NEUROTIC slope, β_5	0.490562	0.294662	1.665	23	0.110		
EXTROVER slope, β_6	0.431144	0.288969	1.492	23	0.149		
OPENNESS slope, β_7	-0.044312	0.334817	-0.132	23	0.896		
AGREEABL slope, β_8	0.098939	0.320857	0.308	23	0.761		
CONSCIEN slope, β_9	0.379420	0.316992	1.197	23	0.244	(+)	No

Exploratory Test Results for Random Effects

Table 5-45 Estimates for Variance Components: IMPERSONAL TONE (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**1.39823**	**1.95505**	**7**	**30.13806**	**<0.001**	**14%**
INDIVIDU slope, u_1	0.96833	0.93767	7	12.09947	0.097	7%
COLLECTI slope, u_2	1.08242	1.17164	7	8.91243	0.258	8%
LOWPOWER slope, u_3	**0.73434**	**0.53925**	**7**	**17.31603**	**0.015**	**4%**
LOWCONTE slope, u_4	**1.11460**	**1.24234**	**7**	**22.81632**	**0.002**	**9%**
NEUROTIC slope, u_5	**0.97191**	**0.94460**	**7**	**16.29294**	**0.022**	**7%**
EXTROVER slope, u_6	0.58460	0.34175	7	5.34210	>0.500	2%
OPENNESS slope, u_7	**1.07989**	**1.16617**	**7**	**24.32289**	**0.001**	**8%**
AGREEABL slope, u_8	0.74667	0.55752	7	7.41758	0.387	4%
CONSCIEN slope, u_9	**0.92554**	**0.85663**	**7**	**22.32172**	**0.003**	**6%**
level-1, *r*	2.04133	4.16703				30%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Exploratory random effects obtained through the full model are reported in Table 5-45. Results showed significant random effects for the intercept. This suggests that some groups used more Impersonal Message Tones in their messages than others.

In the full model, Low Power Distance, Low Context, Neuroticism, Openness to Experience and Conscientiousness displayed significant random effects for slopes. However, they showed small interaction effects.

5.3.10. Contextual Message Structure

5.3.10.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H08	IND	LCT	OPN	CON
The extent to which a student use contextual structures in messages is predicted by	-	-	-	-

The deviance statistic (Table 5-8) between the null and the RIRS model decreased substantially from 2.32 to -55.31 (smaller is better). The unexplained variance between these models decreased by 37%, suggesting a modest explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects (Table 5-46) showed a student's level of Low Context and Conscientiousness to be significant negative predictors of their use of Contextual Structures in messages. There were no significant fixed effects for any other hypothesized predictors as to how students used Contextual Structures in messages.

Table 5-46 Estimates for Fixed Effects: CONTEXTUAL STRUCTURE (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.274197	0.016444	16.674	23	<0.001		
INDIVIDU slope, β_1	-0.020024	0.018252	-1.097	23	0.284	(-)	No
LOWCONTE slope, β_2	**-0.218374**	**0.032626**	**-6.693**	**23**	**<0.001**	**(-)**	**Yes (-)**
OPENNESS slope, β_3	-0.031563	0.023078	-1.368	23	0.185	(-)	No
CONSCIEN slope, β_4	**-0.046206**	**0.015119**	**-3.056**	**23**	**0.006**	**(-)**	**Yes (-)**

Exploratory Test Results for Random Effects

Exploratory random effects obtained through the full model are reported in Table 5-47. There were no significant random effects for the intercept nor any of the slopes reported in this model.

Table 5-47 Estimates for Variance Components: CONTEXTUAL STRUCTURE (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.05411	0.00293	23	23.34627	0.441	5%
INDIVIDU slope, u_1	0.04776	0.00228	23	18.21886	>0.500	4%
LOWCONTE slope, u_2	0.10403	0.01082	23	29.41918	0.167	20%
OPENNESS slope, u_3	0.06998	0.00490	23	31.52567	0.110	9%
CONSCIEN slope, u_4	0.02204	0.00049	23	23.42924	0.436	1%
level-1, *r*	0.18304	0.03350				61%

5.3.10.2 All Predictors

The deviance statistic (Table 5-9) between the null and the full RIRS model decreased from 2.32 to -67.03 (smaller is better). The unexplained variance between these models decreased by 65%, suggesting a substantial explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Table 5-48 Estimates for Fixed Effects: CONTEXTUAL STRUCTURE (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.279079	0.010691	26.103	23	<0.001		
INDIVIDU slope, β_1	0.000370	0.020101	0.018	23	0.985	(-)	No
COLLECTI slope, β_2	-0.028026	0.037428	-0.749	23	0.462		
LOWPOWER slope, β_3	0.001276	0.022869	0.056	23	0.956		
LOWCONTE slope, β_4	**-0.216261**	**0.035463**	**-6.098**	**23**	**<0.001**	**(-)**	**Yes (-)**
NEUROTIC slope, β_5	-0.006840	0.018322	-0.373	23	0.712		
EXTROVER slope, β_6	-0.006243	0.019198	-0.325	23	0.748		
OPENNESS slope, β_7	-0.055499	0.028437	-1.952	23	0.063	(-)	No
AGREEABL slope, β_8	**0.066170**	**0.025133**	**2.633**	**23**	**0.015**		**Yes (+)**
CONSCIEN slope, β_9	**-0.069994**	**0.016928**	**-4.135**	**23**	**<0.001**	**(-)**	**Yes (-)**

Exploratory test results for fixed effects (Table 5-48) confirmed findings of the hypothesized model, where a student's level of Low Context and Conscientiousness were significant negative predictors of their use of Contextual Structures in messages. Additionally, a student's level of Agreeableness was a significant positive predictor of their use of Contextual Structures in messages.

Exploratory Test Results for Random Effects

Table 5-49 Estimates for Variance Components: CONTEXTUAL STRUCTURE (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.02400	0.00058	7	6.41766	>0.500	1%
INDIVIDU slope, u_1	0.07153	0.00512	7	3.71394	>0.500	5%
COLLECTI slope, u_2	**0.15967**	**0.02550**	**7**	**17.34849**	**0.015**	**23%**
LOWPOWER slope, u_3	**0.08697**	**0.00756**	**7**	**17.93162**	**0.012**	**7%**
LOWCONTE slope, u_4	0.13970	0.01952	7	9.44227	0.222	17%
NEUROTIC slope, u_5	**0.06394**	**0.00409**	**7**	**14.59784**	**0.041**	**4%**
EXTROVER slope, u_6	0.06592	0.00435	7	12.89223	0.074	4%
OPENNESS slope, u_7	0.11848	0.01404	7	9.93980	0.191	13%
AGREEABL slope, u_8	0.09731	0.00947	7	6.29955	>0.500	8%
CONSCIEN slope, u_9	0.05361	0.00287	7	7.12925	0.416	3%
level-1, *r*	0.13596	0.01849				17%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Random effects obtained through the full model are reported in Table 5-49. The random effect for the intercept was again not significant.

In contrast to the hypothesized predictor model, several predictors showed significant random effects for slopes in the full model. Collectivistic Values showed a large interaction effect. This meant the group membership of a student had a significant and substantial effect on the relationship between Collectivistic Values and Contextual Message Structure. Low Power Distance and Neuroticism also showed significant random effects. But they showed small interaction effects.

5.3.11. Reasoning

5.3.11.1 Hypothesized/All Predictors

The hypothesis developed for this outcome variable was as follows

H10	IND	COL	LPR	LCT	NEU	EXT	OPN	AGR	CON
The extent to which a student use reasoning in messages is predicted by	+	-	+	+	-	-	+	-	+

For this outcome variable, the hypothesized predictor model includes all of the predictors, thus a separate exploratory analysis for the full model was not presented.

The deviance statistic (Table 5-8 and Table 5-9) between the null and the RIRS model decreased from 441.80 to 418.28 (smaller is better). The unexplained variance between these models decreased by 54%, suggesting a notable explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects (Table 5-50) showed a student's level of Low Context-Based values to be a significant positive predictor of their use of Reasoning in messages. There were no significant fixed effects for any other hypothesized predictors as to how students used Reasoning in messages.

Table 5-50 Estimates for Fixed Effects: REASONING (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	2.478998	0.078010	31.778	23	<0.001		
INDIVIDU slope, β_1	0.034071	0.084255	0.404	23	0.690	(+)	No
COLLECTI slope, β_2	0.026213	0.111159	0.236	23	0.816	(-)	No
LOWPOWER slope, β_3	-0.131283	0.071189	-1.844	23	0.078	(+)	No
LOWCONTE slope, β_4	**0.212058**	**0.102157**	**2.076**	**23**	**0.049**	**(+)**	**Yes (+)**
NEUROTIC slope, β_5	0.089748	0.066599	1.348	23	0.191	(-)	No
EXTROVER slope, β_6	-0.001053	0.084503	-0.012	23	0.990	(-)	No
OPENNESS slope, β_7	0.028059	0.092890	0.302	23	0.765	(+)	No
AGREEABL slope, β_8	0.074516	0.086811	0.858	23	0.400	(-)	No
CONSCIEN slope, β_9	0.075308	0.055313	1.361	23	0.187	(+)	No

Exploratory Test Results for Random Effects

Table 5-51 Estimates for Variance Components: REASONING (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.341280	0.11647	7	12.63986	0.081	9%
INDIVIDU slope, u_1	0.284800	0.08111	7	8.69202	0.275	6%
COLLECTI slope, u_2	0.460700	0.21225	7	9.02408	0.250	17%
LOWPOWER slope, u_3	0.283170	0.08018	7	11.73294	0.109	6%
LOWCONTE slope, u_4	0.389630	0.15181	7	9.59228	0.212	12%
NEUROTIC slope, u_5	0.256030	0.06555	7	5.96540	>0.500	5%
EXTROVER slope, u_6	0.329250	0.10840	7	7.95593	0.336	8%
OPENNESS slope, u_7	0.380700	0.14494	7	7.31814	0.397	11%
AGREEABL slope, u_8	0.327420	0.10721	7	8.41083	0.297	8%
CONSCIEN slope, u_9	0.133210	0.01775	7	6.19304	>0.500	1%
level-1, *r*	0.437680	0.19157				15%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Results of random effects for Reasoning obtained through the hypothesized model are reported in Table 5-51. There were no significant random effects for the intercept or for the slopes reported in the model. This meant that there were no group effects noted for Reasoning in argumentative discourse during the discussion.

5.3.12. Refer to Evidence

5.3.12.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H11a	COL	NEU	EXT
The extent to which a student refers to evidence in messages is predicted by	+	-	+

The deviance statistic (Table 5-8) between the null and the RIRS model decreased substantially from 16.35 to -3.15. The unexplained variance between these models decreased by 3%, suggesting a marginal explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects are reported in Table 5-52. There were no significant fixed effects for any hypothesized predictors as to how students Referred to Evidence in messages.

Table 5-52 Estimates for Fixed Effects: REFER EVIDENCE (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.266109	0.022777	11.683	23	<0.001		
COLLECTI slope, β_1	0.013307	0.015470	0.860	23	0.399	(+)	No
NEUROTIC slope, β_2	0.014051	0.021227	0.662	23	0.515	(-)	No
EXTROVER slope, β_3	0.011730	0.022998	0.510	23	0.615	(+)	No

Exploratory Test Results for Random Effects

Results for random effects are reported in Table 5-53. Results showed a significant random effect for the intercept. This meant that some groups Referred to Evidence in their messages more than others. None of the predictors in the model showed any significant random effects for slopes.

Table 5-53 Estimates for Variance Components: REFER EVIDENCE (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.08590**	**0.00738**	**23**	**37.41175**	**0.029**	**13%**
COLLECTI slope, u_1	0.01323	0.00018	23	21.23263	>0.500	0%
NEUROTIC slope, u_2	0.05585	0.00312	23	17.42306	>0.500	5%
EXTROVER slope, u_3	0.04148	0.00172	23	29.49869	0.164	3%
level-1, *r*	0.21629	0.04613				79%

5.3.12.2 All Predictors

The deviance statistic (Table 5-9) between the null and the full RIRS model decreased from 16.35 to 6.47 (smaller is better). The unexplained variance between these models decreased by 28%, suggesting a modest explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Exploratory test results for fixed effects (Table 5-54) confirmed findings of the hypothesized model. There were no significant fixed effects for any hypothesized predictors as to how students Referred to Evidence in messages.

Table 5-54 Estimates for Fixed Effects: REFER EVIDENCE (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.269873	0.021879	12.335	23	<0.001		
INDIVIDU slope, β_1	-0.054471	0.032540	-1.674	23	0.108		
COLLECTI slope, β_2	0.012357	0.021866	0.565	23	0.577	(+)	No
LOWPOWER slope, β_3	0.026546	0.021325	1.245	23	0.226		
LOWCONTE slope, β_4	-0.014116	0.021774	-0.648	23	0.523		
NEUROTIC slope, β_5	-0.002480	0.020575	-0.121	23	0.905	(-)	No
EXTROVER slope, β_6	0.032522	0.025168	1.292	23	0.209	(+)	No
OPENNESS slope, β_7	-0.038796	0.023882	-1.625	23	0.118		
AGREEABL slope, β_8	-0.044762	0.030325	-1.476	23	0.153		
CONSCIEN slope, β_9	0.019748	0.019355	1.020	23	0.318		

Exploratory Test Results for Random Effects

Table 5-55 Estimates for Variance Components: REFER EVIDENCE (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	0.08730	0.00762	7	7.58560	0.370	8%
INDIVIDU slope, u_1	0.10864	0.01180	7	7.63159	0.366	13%
COLLECTI slope, u_2	0.06052	0.00366	7	13.12201	0.069	4%
LOWPOWER slope, u_3	0.05799	0.00336	7	11.12837	0.132	4%
LOWCONTE slope, u_4	0.03376	0.00114	7	11.23765	0.128	1%
NEUROTIC slope, u_5	0.06680	0.00446	7	12.74829	0.078	5%
EXTROVER slope, u_6	0.06938	0.00481	7	9.59585	0.212	5%
OPENNESS slope, u_7	**0.08584**	**0.00737**	**7**	**21.30345**	**0.004**	**8%**
AGREEABL slope, u_8	0.10528	0.01108	7	12.19372	0.094	12%
CONSCIEN slope, u_9	**0.05341**	**0.00285**	**7**	**16.28257**	**0.022**	**3%**
level-1, *r*	0.18500	0.03423				37%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Random effects of the full model are reported in Table 5-55. The random effect for the intercept was again not significant.

In contrast to the hypothesized predictor model, Openness to Experience and Conscientiousness displayed significant random effects for slopes. However, they showed small interaction effects.

5.3.13. Applying Evidence

5.3.13.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H11b	IND	LPR	LCT	EXT	OPN	CON
The extent to which a student apply evidence in messages is predicted by	+	+	+	-	+	+

The deviance statistic (Table 5-8) between the null and the RIRS model increased from 8.48 to 22.67 (smaller is better). The unexplained variance between these models decreased by 16%, suggesting a marginal explanation of the variance by the hypothesized predictors. The increase in the deviance statistic suggests that the hypothesized predictors did not contribute to predict the outcome variable. The change in the unexplained variance was also marginal. Therefore, results obtained from this model were not reported. Exploratory test results obtained through the full model are presented below.

5.3.13.2 All Predictors

The deviance statistic (Table 5-9) between the null and the full RIRS model increased from 8.48 to 20.72 (smaller is better). However, the unexplained variance between these models decreased by 33%, suggesting a modest explanation of the variance by all predictors. The increase in the deviance statistic in the full model suggests predictors in the model did not explain the outcome variable adequately. However, considering the notable change in the unexplained variance, results of this model was reported, but interpreted cautiously.

Exploratory Test Results for Fixed Effects

Table 5-56 Estimates for Fixed Effects: APPLY EVIDENCE (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.308559	0.034052	9.061	23	<0.001		
INDIVIDU slope, β_1	0.018679	0.021476	0.870	23	0.393	(+)	No
COLLECTI slope, β_2	0.010030	0.024431	0.411	23	0.685		
LOWPOWER slope, β_3	-0.044811	0.024237	-1.849	23	0.077	(+)	No
LOWCONTE slope, β_4	**0.086916**	**0.024250**	**3.584**	**23**	**0.002**	**(+)**	**Yes (+)**
NEUROTIC slope, β_5	0.026582	0.018526	1.435	23	0.165		
EXTROVER slope, β_6	-0.009145	0.026819	-0.341	23	0.736	(-)	No
OPENNESS slope, β_7	0.009506	0.027573	0.345	23	0.733	(+)	No
AGREEABL slope, β_8	0.045027	0.032835	1.371	23	0.184		
CONSCIEN slope, β_9	**0.049432**	**0.016091**	**3.072**	**23**	**0.005**	**(+)**	**Yes (+)**

Exploratory test results for fixed effects (Table 5-56) showed a student's level of Low Context and Conscientiousness to be significant positive predictors of how they Apply Evidence in messages.

Exploratory Test Results for Random Effects

Table 5-57 Estimates for Variance Components: APPLY EVIDENCE (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.15701**	**0.02465**	**7**	**19.22423**	**0.008**	**21%**
INDIVIDU slope, u_1	0.04235	0.00179	7	6.13001	>0.500	2%
COLLECTI slope, u_2	0.06180	0.00382	7	12.60027	0.082	3%
LOWPOWER slope, u_3	0.09096	0.00827	7	6.17858	>0.500	7%
LOWCONTE slope, u_4	0.05793	0.00336	7	4.98419	>0.500	3%
NEUROTIC slope, u_5	0.05788	0.00335	7	8.74014	0.271	3%
EXTROVER slope, u_6	**0.08918**	**0.00795**	**7**	**16.72593**	**0.019**	**7%**
OPENNESS slope, u_7	**0.10220**	**0.01044**	**7**	**25.32254**	**<0.001**	**9%**
AGREEABL slope, u_8	0.13299	0.01769	7	11.68691	0.111	15%
CONSCIEN slope, u_9	0.03598	0.00129	7	6.18101	>0.500	1%
level-1, *r*	0.18179	0.03305				29%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Random effects obtained through the full model are reported in Table 5-57. The random effects for the intercept were significant. Extroversion and Openness to Experience displayed significant random effects for slopes. However, they showed small interaction effects.

5.3.14. Hard Evidence

5.3.14.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H12a	IND	LPR	LCT	OPN	CON
The extent to which a student use hard evidence in messages is predicted by	+	+	+	+	+

The deviance statistic (Table 5-8) between the null and the RIRS model decreased from 610.07 to 593.87 (Smaller is better). The unexplained variance between these models decreased by 21%, suggesting a modest explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects (Table 5-58) showed a student's level of Low Context and Conscientiousness to be significant positive predictors as to how they used Hard Evidence in messages. There were no significant fixed effects for any other hypothesized predictors as to how students used Hard Evidence in messages.

Table 5-58 Estimates for Fixed Effects: HARD EVIDENCE (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	1.449063	0.145506	9.959	23	<0.001		
INDIVIDU slope, β_1	-0.037729	0.077639	-0.486	23	0.632	(+)	No
LOWPOWER slope, β_2	-0.140330	0.088621	-1.583	23	0.127	(+)	No
LOWCONTE slope, β_3	**0.413949**	**0.120243**	**3.443**	**23**	**0.002**	**(+)**	**Yes (+)**
OPENNESS slope, β_4	-0.011609	0.123923	-0.094	23	0.926	(+)	No
CONSCIEN slope, β_5	**0.188448**	**0.054456**	**3.461**	**23**	**0.002**	**(+)**	**Yes (+)**

Exploratory Test Results for Random Effects

Table 5-59 Estimates for Variance Components: HARD EVIDENCE (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.65663**	**0.43117**	**23**	**64.50021**	**<0.001**	**28%**
INDIVIDU slope, u_1	0.13308	0.01771	23	18.62493	>0.500	1%
LOWPOWER slope, u_2	0.21503	0.04624	23	18.97057	>0.500	3%
LOWCONTE slope, u_3	0.33281	0.11076	23	24.75865	0.363	7%
OPENNESS slope, u_4	**0.44031**	**0.19387**	**23**	**35.37196**	**0.047**	**12%**
CONSCIEN slope, u_5	0.05997	0.00360	23	20.1054	>0.500	0%
level-1, *r*	0.86962	0.75623				48%

Random effects of the full model are reported in Table 5-59. Results reported a significant random effect for the intercept. This suggests that some groups used more hard evidence in messages than others.

Openness to Experience showed a significant random effect for slopes. Their interaction effects were large.

5.3.14.2 All Predictors

The deviance statistic (Table 5-9) between the null and the full RIRS model decreased from 610.07 to 572.76 (smaller is better). The unexplained variance between these models decreased by 51%, suggesting a substantial explanation of the variance by all predictors.

Exploratory Test Results for Fixed Effects

Exploratory test results for fixed effects (Table 5-60) confirmed the findings of the hypothesized model where a student's level of Low Context-Based Values and Conscientiousness to be significant positive predictors of how they used Hard Evidence in messages.

Table 5-60 Estimates for Fixed Effects: HARD EVIDENCE (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	1.417016	0.151632	9.345	23	<0.001		
INDIVIDU slope, β_1	0.026838	0.116917	0.230	23	0.820	(+)	No
COLLECTI slope, β_2	0.186686	0.124925	1.494	23	0.149		
LOWPOWER slope, β_3	-0.154395	0.096322	-1.603	23	0.123	(+)	No
LOWCONTE slope, β_4	**0.373394**	**0.115089**	**3.244**	**23**	**0.004**	**(+)**	**Yes (+)**
NEUROTIC slope, β_5	0.093127	0.078701	1.183	23	0.249		
EXTROVER slope, β_6	-0.172448	0.144208	-1.196	23	0.244		
OPENNESS slope, β_7	0.101188	0.135266	0.748	23	0.462	(+)	No
AGREEABL slope, β_8	0.050607	0.122865	0.412	23	0.684		
CONSCIEN slope, β_9	**0.221076**	**0.064471**	**3.429**	**23**	**0.002**	**(+)**	**Yes (+)**

Exploratory Test Results for Random Effects

Table 5-61 Estimates for Variance Components: HARD EVIDENCE (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.70972**	**0.50370**	**7**	**24.82748**	**0.001**	**20%**
INDIVIDU slope, u_1	0.43482	0.18907	7	8.56773	0.284	7%
COLLECTI slope, u_2	**0.42806**	**0.18324**	**7**	**23.38030**	**0.002**	**7%**
LOWPOWER slope, u_3	**0.36812**	**0.13551**	**7**	**21.18725**	**0.004**	**5%**
LOWCONTE slope, u_4	**0.32590**	**0.10621**	**7**	**19.19319**	**0.008**	**4%**
NEUROTIC slope, u_5	**0.23314**	**0.05436**	**7**	**32.40819**	**<0.001**	**2%**
EXTROVER slope, u_6	**0.62285**	**0.38794**	**7**	**23.41254**	**0.002**	**15%**
OPENNESS slope, u_7	**0.54708**	**0.29929**	**7**	**55.40021**	**<0.001**	**12%**
AGREEABL slope, u_8	0.45397	0.20609	7	9.54956	0.215	8%
CONSCIEN slope, u_9	**0.16419**	**0.02696**	**7**	**23.72493**	**0.002**	**1%**
level-1, *r*	0.68770	0.47294				18%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Random effects of the full model are reported in Table 5-61. The random effect for the intercept was again significant.

Seven predictors showed significant random effects for slopes in the full model. Openness to Experience (confirming results of the hypothesized model) and Extroversion

showed significant random effects for slopes. Their interaction effects were also large. The rest of the predictors (Collectivism, Low Power Distance, Low Context, Neuroticism, and Conscientiousness) also displayed significant random effects. But they showed small interaction effects.

5.3.15. Soft Evidence

5.3.15.1 Hypothesized Predictors

The hypothesis developed for this outcome variable was as follows

H12b	COL	LCT	EXT	AGR
The extent to which a student use soft evidence in messages is predicted by	+	-	+	+

The deviance statistic (Table 5-8) between the null and the RIRS model decreased from -61.75 to -74.43 (smaller is better). The unexplained variance between these models decreased by 29%, suggesting a modest explanation of the variance by the hypothesized predictors.

Confirmatory Hypothesis Test Results for Fixed Effects

Confirmatory test results for fixed effects are reported in Table 5-62. There were no significant fixed effects for any hypothesized predictors as to how students used Soft Evidence in their messages.

Table 5-62 Estimates for Fixed Effects: SOFT EVIDENCE (HYPOTHESIZED PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	**0.160347**	**0.019765**	**8.113**	**23**	**<0.001**		
COLLECTI slope, β_1	-0.026343	0.025247	-1.043	23	0.308	(+)	No
LOWCONTE slope, β_2	0.004486	0.031406	0.143	23	0.888	(-)	No
EXTROVER slope, β_3	-0.007220	0.020564	-0.351	23	0.729	(+)	No
AGREEABL slope, β_4	0.022606	0.020439	1.106	23	0.280	(+)	No

Exploratory Test Results for Random Effects

Table 5-63 Estimates for Variance Components: SOFT EVIDENCE (HYPOTHESIZED PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.07765**	**0.00603**	**23**	**43.28437**	**0.007**	**10%**
COLLECTI slope, u_1	0.08827	0.00779	23	22.33428	>0.500	13%
LOWCONTE slope, u_2	0.10772	0.01160	23	32.99281	0.081	20%
EXTROVER slope, u_3	0.06078	0.00369	23	27.29904	0.243	6%
AGREEABL slope, u_4	0.05262	0.00277	23	23.24755	0.447	5%
level-1, *r*	0.16372	0.02681				46%

Results for random effects for Soft Evidence are reported in Table 5-63. Results showed a significant random effect for the intercept. This suggested that some groups referred to Soft Evidence in messages more than others.

There were no significant random effects for slopes. This meant the student's group membership did not have any effect on the relationship between the predictors and student's use of Soft Evidence in messages.

5.3.15.2 All Predictors

Exploratory Test Results for Fixed Effects

Table 5-64 Estimates for Fixed Effects: SOFT EVIDENCE (ALL PREDICTORS)

Fixed Effects	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value	Hypo	Sig
INTRCPT1, β_0	0.155741	0.018777	8.294	23	<0.001		
INDIVIDU slope, β_1	0.001707	0.027841	0.061	23	0.952		
COLLECTI slope, β_2	-0.023218	0.026202	-0.886	23	0.385	(+)	No
LOWPOWER slope, β_3	-0.012806	0.017393	-0.736	23	0.469		
LOWCONTE slope, β_4	0.010643	0.028666	0.371	23	0.714	(-)	No
NEUROTIC slope, β_5	**0.033165**	**0.012225**	**2.713**	**23**	**0.012**		**Yes (+)**
EXTROVER slope, β_6	0.006507	0.017497	0.372	23	0.713	(+)	No
OPENNESS slope, β_7	0.030539	0.020064	1.522	23	0.142		
AGREEABL slope, β_8	0.038992	0.029430	1.325	23	0.198	(+)	No
CONSCIEN slope, β_9	0.019482	0.017518	1.112	23	0.278		

The deviance statistic (Table 5-9) between the null and the full RIRS model decreased from -61.75 to -82.23 (smaller is better). The unexplained variance between these models decreased by 57%, suggesting a substantial explanation of the variance by all predictors.

Exploratory test results for fixed effects (Table 5-64) showed a student's level of Neuroticism to be a significant positive predictor of how they used Soft Evidence in messages.

Exploratory Test Results for Random Effects

Table 5-65 Estimates for Variance Components: SOFT EVIDENCE (ALL PREDICTORS)

Random Effects	Standard Deviation	Variance Component	*d.f.*	χ^2	*p*-value	*% Random Effect*
INTRCPT1, u_0	**0.08002**	**0.00640**	**7**	**32.79495**	**<0.001**	**7%**
INDIVIDU slope, u_1	**0.11529**	**0.01329**	**7**	**21.19243**	**0.004**	**14%**
COLLECTI slope, u_2	**0.10625**	**0.01129**	**7**	**20.78937**	**0.004**	**12%**
LOWPOWER slope, u_3	**0.06821**	**0.00465**	**7**	**16.08027**	**0.024**	**5%**
LOWCONTE slope, u_4	**0.11242**	**0.01264**	**7**	**16.91452**	**0.018**	**13%**
NEUROTIC slope, u_5	0.03366	0.00113	7	10.69621	0.152	1%
EXTROVER slope, u_6	**0.05758**	**0.00332**	**7**	**25.37723**	**<0.001**	**4%**
OPENNESS slope, u_7	0.08024	0.00644	7	11.45004	0.120	7%
AGREEABL slope, u_8	**0.12204**	**0.01489**	**7**	**20.07959**	**0.006**	**16%**
CONSCIEN slope, u_9	**0.06437**	**0.00414**	**7**	**20.15346**	**0.006**	**4%**
level-1, *r*	0.12656	0.01602				17%

Note: The chi-square statistics reported above are based on only 8 of 24 groups that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Random effects obtained through the full model are reported in Table 5-65 below. The random effect for the intercept was again significant.

Several predictors showed significant random effects for slopes in the full model. Individualistic Values, Collectivistic Values, Low Context-Based Values and Agreeableness, showed a large interaction effect. This meant that group membership of a student had a significant and a substantial effect on the relationship between these predictors and a student's use of Soft Evidence in messages. Low Power Distance-Based values, Extroversion and Conscientiousness also displayed significant random effects. However, they showed small interaction effects.

5.4. Chapter Summary

This chapter presented results of the study. It started off by carrying out a preliminary analysis to assess the tenability of statistical assumptions of data to run successful multilevel models. Upon verifying these assumptions, results obtained from the models were then reported. Results from both hypothesized and full predictor models were reported for each outcome variable. Fixed effect estimates obtained through the hypothesized models included confirmatory hypotheses test results in the study. Random effect estimates obtained through the hypothesized models highlighted many group effects noted in the results. Both fixed and random effects results explored through full models were reported for future exploration. The next chapter will discuss these findings and their educational significance.

Chapter 6.

Discussion and Conclusions

6.1. Summary of Results

6.1.1. Summary of Global (Fixed) Effects

The summary of global effects for the degree of participation, attending to others and attending to the task speaking dimensions are discussed below.

As for **degree of participation**, a student's level of conscientiousness positively predicted the number of messages they posted during the online discussion. Additionally, a student's level of low context-based cultural values was identified as a possible predictor of average words and warranted future exploration.

In terms of **attending to others** during the discussion, a student's level of agreeableness and conscientiousness positively predicted the degree of social presence exhibited in their messages. However, the conscientiousness result was not robust to the exploratory modeling of the full set of predictors. Instead, this result indicated that a student's level of individualism was a potential predictor of social presence. Several personality traits predicted the degree of discursiveness during discussions. A student's level of agreeableness and conscientiousness positively predicted the degree of references made to others in messages. Additionally, a student's level of agreeableness positively predicted how students fully agreed with others in their messages and their level of conscientiousness positively predicted the extent to which students disagreed with others in their messages. Speaking actions representing message tone was least predicted by their hypothesized predictors. A student's level of low context-based cultural values positively predicted the degree of autonomous message tone exhibited in their messages. However, this result was not robust to the exploratory modeling of the full set of predictors. Instead, it indicated that a student's level of extroversion was a potential factor for future investigation. Exploratory results further showed that a student's level of extroversion and low power distance potentially predicted the number of connected and impersonal tones used in messages, respectively.

Finally, as to how students **attend to the task** at hand, several cultural and personality factors predicted the way students structured their messages during the discussion. A student's level of low context-based cultural values and conscientiousness negatively predicted the number of contextual message structures exhibited in messages. Additionally, exploratory results with the full set of predictors showed the level of agreeableness as a potential factor that can predict the use of contextual structures in messages. Cultural values and personality traits further predicted argumentative actions displayed by students in messages. A student's level of low context-based cultural values positively predicted the degree of reasoning exhibited by students in messages. Further, a student's level of low context-based cultural values and conscientiousness positively predicted the extent to which they used hard evidence in messages. Additionally, exploratory results with the full set of predictors, showed that a student's level of low context-based cultural values and conscientiousness were possible predictors to determine how often students applied evidence in their messages. A student's level of neuroticism was another potential factor identified to predict how students used soft evidence in messages.

6.1.2. Summary of Group (Random) Effects

Table 6-1 Summary of Group Effects for Degree of Participation

Degree of Participation	Differences in Absolute Level of Activity Across Groups	Interactions between Predictors and Local Group Membership								
		IND	COL	LPR	LCT	NEU	EXT	OPN	AGR	CON
HYPOTHESIZED PREDICTOR MODEL										
Number of Posts	Sig	**X**		X	X	X		**X**		X
Average Words	*No results due to poor model fit*									
FULL MODEL (ALL PREDICTORS)										
Number of Posts	Sig	**X**				X		**X**		
Average Words	Sig							X		

Note: A large X symbolizes when the interaction accounts for 10% or more of the total random effects. A smaller x symbolizes when the interaction accounts for less than 10% of the total random effects. The blackout cells indicate those predictors that were not originally included in the hypothesized predictor model.

There were two types of group effects on speaking activities found in this study. First, there was a clear difference in the absolute levels of activity across groups for different speaking actions. Second, there were notable interaction effects between cultural/personality factors and students' local discussion groups on several online speaking behaviours. Details of these effects for each category of outcome variables are as follows.

For **degree of participation** (Table 6-1), there was a clear difference in the number of messages posted by students across groups with some groups posting many more messages than others. Results for the length of messages could not be obtained due to poor model fit. However, when full exploratory models were run, there was a clear difference in the number of messages posted and the length of messages across groups.

There were several noteworthy interaction effects between cultural/personality characteristics and students' local discussion groups on speaking behaviours related to the degree of participation. These interaction effects suggest the local discussion group context as an essential moderator of individual student characteristics on online speaking behaviours. All cultural and personality characteristics, except agreeableness and extroversion, showed at least one interaction effect in the hypothesized predictor model for number of messages. Individualistic cultural values and openness to experience showed large interaction effects. Results for message length was not reported due to poor model fit. Exploratory results with the full set of predictors showed fewer noteworthy interactions between cultural/personality factors and students' local discussion groups on speaking actions related to the degree of participation. As reported in the hypothesized model, individualistic values and openness to experience continued to show large random effects.

As for **attending to others** (Table 6-2), there was a notable difference in the absolute level of social presence, autonomous message tones, and disagreements displayed in messages across groups. However, the autonomous message tone and disagreement with others results were not robust to the exploratory modeling of the full set of predictors. While the absolute level of social presence in messages continued to be different across groups, the full model results showed a notable difference in activity for the number of messages with impersonal tones across groups.

Table 6-2 Summary of Group Effects for Attending to Others

Attending to Others		Differences in Absolute Levels of Activity Across Groups	Interactions between Predictors and Local Group Membership								
			IND	COL	LPR	LCT	NEU	EXT	OPN	AGR	CON
HYPOTHESIZED PREDICTOR MODEL											
Discursiveness	Reference to Others			**X**					X		
	Some Disagreement	Sig	X	X			X				
	Full Agreement			**X**				X		X	
Social Presence		Sig		**X**		**X**			X		X
Message Tone	Autonomous Tone	Sig									X
	Connected Tone									**X**	
	Impersonal Tone	*No results due to poor model fit*									
FULL MODEL (ALL PREDICTORS)											
Discursiveness	Reference to Others			**X**		X			X	X	X
	Some Disagreement										
	Full Agreement			**X**		X					X
Social Presence		Sig		**X**	X	**X**		X	X	X	X
Message Tone	Autonomous Tone									X	
	Connected Tone		**X**	**X**							**X**
	Impersonal Tone	Sig			X	X	X		X		X

Note: A large X symbolizes when the interaction accounts for 10% or more of the total random effects. A smaller x symbolizes when the interaction accounts for less than 10% of the total random effects. The blackout cells indicate those predictors that were not originally included in the hypothesized predictor model.

There were also several significant interaction effects between cultural/personality characteristics and students' local discussion groups on speaking actions that reflected how students attended to others. All cultural and personality characteristics (except for low power distance) showed at least one interaction effect. The interaction effects between collectivistic cultural values and a student's local discussion group on many speaking actions that reflected how students attended to others were large. Exploratory results with the full set of predictors showed additional interaction effects between cultural/personality factors and a student's local discussion groups.

Table 6-3 Summary of Group Effects for Attending to the Task

Attending to Task		Differences in Absolute Levels of Activity Across Groups	Interactions between Predictors and Local Group Membership								
			IND	COL	LPR	LCT	NEU	EXT	OPN	AGR	CON
HYPOTHESIZED PREDICTOR MODEL											
Contextual Structure				■	■		■	■		■	
Argumentation	Reasoning										
	Refer to Evidence	Sig	■		■	■			■	■	■
	Apply Evidence	*No results due to poor model fit*									
	Hard Evidence	Sig		■			■	■	**X**	■	
	Soft Evidence	Sig	■		■		■		■		■
FULL MODEL (ALL PREDICTORS)											
Contextual Structure				**X**	X		X				
Argumentation	Reasoning										
	Refer to Evidence								X		X
	Apply Evidence	Sig						X	X		
	Hard Evidence	Sig		X	X	X	X	**X**	**X**		X
	Soft Evidence	Sig	**X**	**X**	X	**X**		X		**X**	X

Note: A large X symbolizes when the interaction accounts for 10% or more of the total random effects. A smaller x symbolizes when the interaction accounts for less than 10% of the total random effects. The blackout cells indicate those predictors that were not originally included in the hypothesized predictor model.

Finally, as for **attending to the task** (Table 6-3), there was a notable difference in the absolute levels of how students used evidence (hard vs. soft evidence, refer evidence) in messages across groups. However, refer to evidence results were not robust to the exploratory modeling of the full set of predictors.

There was a significant interaction effect between openness to experience and students' local group context as to how they use hard evidence in their messages. With this exception, there were no other interaction effects between cultural/personality characteristics and local discussion groups on how students attended to the task in their messages. However, exploratory results with the full set of predictors showed multiple interaction effects between cultural/personality factors and students' local discussion group context on many speaking actions that reflected how students attended to the task. This discrepancy in significant interaction effects between the hypothesized and the full exploratory models may be partly due to several predictors not being included in the original hypothesized models. Therefore, in discussing the impact of interaction effects on how students attend to the task, results of the full exploratory models need to be considered.

6.2. Discussion of Findings

The results of this study confirmed personality traits to strongly predict online speaking behaviours in two important ways. First, students with high levels of conscientiousness and agreeableness showed several global effects on online speaking. In other words, these two personality traits significantly predicted several online speaking behaviours regardless of group membership. Second, the predictive relationships between multiple personality traits and speaking behaviours were moderated by a student's local discussion group context. These results are important for several reasons. Researchers in the past have used personality traits to predict a student's academic discourse in general ways. Propopat (2009) in a meta-analysis, reported several personality traits that predicted the academic performance of students. Online discussion researchers (Ellis, 2003; Chen & Carapreso, 2004; Ingram & Hathorn, 2005; Nussbaum, Hartley, Sinatra, Reynolds & Bendixen, 2004; Buchanan, Johnson & Goldberg, 2005 among others) have also relied on personality traits to predict students' online behaviours

in general ways. The effects shown in this study confirmed some of the previously reported findings. Additionally, results of the current study showed several significant effects not previously reported that are capable of enhancing our understanding of a student's online discussion behaviour in specific ways. Such examples will be discussed later in this chapter. Besides, the intrinsic qualities of personality are promising. Previous studies have reported personality traits to be stable over a person's period of life, making them reliable predictors of behaviour (McCrea & Costa, 2004). Personality traits represent the psychological makeup of an individual (Triandis & Suh, 2002) that are more causally proximate to behaviours, than demographic characteristics often used in previous studies. All these point towards the confidence we can place on personality traits as reliable predictors of online discussion behaviours.

However, cultural values did not predict a student's online speaking behaviour as anticipated. First, a student's level of individualistic and collectivistic cultural values did not show significant global effects on speaking. This was surprising given the enormous attention these cultural values have received in the past, across many educational settings. Oyserman et al. (2002) referred to over 170 studies that have reviewed implications of individualistic and collectivistic values on various educational contexts. Several studies in the past had reported predictive relationships between individualistic and collectivistic cultural values with online discussion behaviours. Similarly, low power distance cultural values also did not show any significant global effects. This was again surprising since there were a number of studies that had reported predictive relationships between power distance and online discussion behaviours of students. Second, a student's level of low context-based cultural values did show significant global effects. Although context-based cultural values had received wide attention in general cultural literature, there were only a handful of studies (Frank & Toland, 2002; Morse, 2003; Salleh, 2005; Kim & Bonk, 2012) that reported relationships between context-based cultural values and on online discussion behaviour. In addition, these studies mostly use the student's citizenship as a proxy to report this cultural value. Therefore, the multiple significant global effects shown by this cultural value in the current study were surprising.

Collectively, this study's findings on cultural values are important for several reasons. First, past research (including the current study) focused on popular cultural values due to their widespread use and the availability of instruments to measure them.

The popularity of Hofstede's cultural model and its use across multiple settings is indicative of this. However, that does not mean all popular cultural values that are frequently cited are best suited to differentiate behaviours that take place in an educational setting, and in particular, in an online environment. Second, there may be other cultural values (similar to low context-based cultural values) that are more relevant in measuring cultural differences, especially in an educational setting. For example, Parrish and Linder-VanBerschot's (2010) Cultural Dimensions of Learning Framework (CDLF) model identified several cultural factors based on social relationships, epistemological beliefs and temporal perceptions that related to an educational context. The temporal dimension referred to a student's perception of time that has implications for meeting deadlines. Epistemological beliefs dimension referred to student beliefs on stability vs. their acceptance of uncertainty. Such values may predict how students engage in argumentative discourse in an online discussion. As reviewed in chapter two, although this model had not considered intricacies about measuring these values at an individual student level, the direction taken by these authors is a potential step towards identifying cultural differences that relate to an educational setting. Perhaps such efforts may motivate the establishment of a specific cultural model pertaining to online discussion behaviour in a future study. Third, cultural values held by individuals are inherently psychological in nature. This would make them causally proximate to behaviour than demographic characteristics as previously discussed. However, not all cultural values are causally proximate to behaviours in similar ways as hypothesized in this study. Significant results noted across all types of cultural values provided evidence of this. Thus, researchers need to pay close attention when selecting the appropriate type of cultural characteristic to predict behaviours rather than applying popular cultural values across the board.

In addition, the prediction of several speaking behaviours by cultural and personality factors were moderated by students' local discussion groups. For example, the interaction effects between collectivistic cultural values and students' local group context on several speaking behaviours were significant. When all predictors were included in full exploratory models, collectivistic values continued to show large interaction effects. This was also the case for individualistic cultural values although it resulted in a fewer number of large interaction effects. Similarly, personality traits showed significant

interaction effects moderated by students' local discussion groups. The openness to experience trait also showed large interaction effects. This was interesting because neither individualistic or collectivistic cultural values nor openness to experience traits showed significant global effect in predicting any of the speaking behaviours. It may be that these factors are particularly susceptible to moderation by the local group context.

The above general findings are important for several reasons. First, the prediction of several speaking behaviours by cultural and personality factors is moderated by a student's local discussion group. This suggests cultural values and personality traits do not affect behaviour in a vacuum, but that the context of the social situation in which students are placed in (in this case the group) also matters. Second, some cultural values and personality traits showed both global and interaction effects at the same time. This suggests these factors can affect online behaviours in different ways simultaneously.

Having discussed general themes identified for personality traits, cultural values and group effects in this study, the following section will now discuss results obtained for specific predictors. First, predictors with both global and interaction effects will be discussed. Then, predictors with significant and large interaction effects only will be detailed. Finally, predictors that have the potential for future exploration will be discussed.

6.2.1. Predictors with Both Significant Global and Interaction Effects

Conscientiousness was a significant predictor of several speaking behaviours that represented all three speaking dimensions (degree of participation, attend to others and attend to the task) in this study. Conscientiousness showed several significant global and interaction effects. Previous studies have shown that a student's level of conscientiousness predicted online discussion behaviours in general ways. For example, highly conscientious students were known to take part in online discussion tasks more efficiently and productively than in a face-to–face environment (Verela et al., 2012). These students were reported to earn better grades than less conscientious students as they engaged in various online discussion tasks (Schniederjans & Kim, 2005). Findings from the current study goes beyond such general claims; to report how a student's level of conscientiousness predicts their online speaking behaviours in very specific and nuanced

ways not previously reported. For example, results showed that students with high levels of conscientiousness posted more messages, referred to others more often, disagreed with others during discussions, and used hard evidence to support their ideas. These specific findings are further discussed below.

As hypothesized, students with high levels of conscientiousness posted many messages during the discussion, indicating a high degree of participation. Characteristics reported in previous studies such as high achievement orientation, work ethic (Schniederjans & Kim, 2005), organization skills, and self-discipline (Hurter, 2009) may have helped these students display a higher degree of participation during the discussion. Participation in the online discussion is important for several reasons. First, if students do not participate in the discussion, then the discussion may not get traction. Thus participation ensures that the discussion moves forward. If students don't participate or post messages on time, then the opportunity to collaborate with others is diminished. Further, high levels of participation can result in the generation of multiple ideas, thereby helping others to consider alternate viewpoints which they otherwise may not have been exposed to. Ideas generated during the discussion can also spark additional thoughts from others that can take the discussion to a higher level. On the contrary, we may expect students with low levels of conscientiousness to demonstrate a lower degree of participation. In order to successfully sustain the discussion and reap the full benefits offered by this medium, we should encourage students with low levels of conscientiousness to participate actively in the discussion.

Students with higher levels of conscientiousness also referred to their colleagues' ideas and disagreed with them more often. Qualities like low levels of anxiety, high levels of receptivity and critical thinking (Poropat, 2009), high degrees of competence and deliberation skills (Hurter, 2009), shown amongst conscientious students in previous studies, may have potentially motivated them to refer to others and disagree with them. This is important since previous studies have shown (Gunawardena, et al., 1997; Garrison et al., 2000; Pena-Shaff & Nicholls, 2004) that students learn and engage in knowledge creation activities during online discussions as they build on others' ideas, as well as when they disagree with others. Disagreements can lead to meaningful discussions and improved learning outcomes. For example, disagreements among participants are expected to help students understand their positions more clearly (Paulus, 2006).

Students who contest others' ideas during discussions are known to provide high-quality reasons in challenging them (Clark et al., 2007). When students are faced with disagreements during a discussion, the originator of the initial idea is reported to generate more reasons and evidence to support his or her position (Price et al., 2002). Dennen and Wieland (2008) noted that disagreements during discussions, in general, tend to uncover many alternative ideas, prompt students to react to them and ultimately negotiate with each other. Thus, students with high levels of conscientiousness contribute towards successful discussions in two important ways: frequently referring to others' ideas and disagreeing with them during discussions. Further, we may expect students with low levels of conscientiousness to not refer to others frequently and/or disagree less during online discussions. Such behaviours will undermine achieving learning outcomes for all students (who are high and low on conscientiousness) since one may depend on another for well-thought-out ideas in a collaborative environment.

Results also showed a surprising relationship between students with high levels of conscientiousness and the degree of social presence they exhibit in messages. The original hypothesis predicted a negative relationship between these two variables. The heavy focus on the task at hand (Verela et al., 2012) and self-discipline (Hurter, 2009) often displayed by conscientious students were thought to prevent them from being distracted by the message content. On the contrary, the results showed a notable positive effect between conscientiousness and social presence. In other words, students with high levels of conscientiousness posted many messages that included indicators of social presence during discussions. This is important because social presence in messages can enhance a sense of community that can lead to the development of trust during online discussions (Rourke et al., 2007). Knowlton (2005) and Rovai (2007) have both argued conceptually how social conversations in an online discussion can potentially encourage students to engage with each other. In an earlier study to verify the relationship between social presence and engagement, Wise, Chang, et al. (2004) reported that social presence in messages did not enhance the engagement among students. However, these authors noted that both levels of social presence used in their study might have been above the threshold required. Oztok and Brett (2011) who reviewed literature examining the relationship between social presence and online behaviours highlighted important relationships between the two. They made the following conclusion.

> To summarize, the literature suggests that social presence is an important construct that is closely related to individuals' behaviors in online learning environments (Jung et al., 2002; Kearsley, 2000; Tu & Mclsaac, 2002). Students with a higher degree of social presence participate more actively, and thus interact with others more frequently. Therefore, one could argue that there is a positive relationship between social presence and individuals' behaviors and interactions in online environments (Oztok & Brett, 2011).

The relationship found between conscientiousness and attending to others (referring to others, disagreeing with others and social presence) in the current study is important. Students' high levels of social presence and their frequent collaboration with others seemed to suggest that conscientious students are genuinely interested in engaging with others, and hearing what others have to say. This suggests that such students not only pay attention to completing the task, but are also conscientious about what others have to say and respond to their comments. Similarly, disagreement with others also suggest an interest in others' comments. Attending to the task and attending to others are two very important speaking behaviours that can lead to successful online discussions that conscientious students seem to balance very well. This is an important finding that is highlighted in this discussion.

Regarding attending to the task, results of the study confirmed students with high levels of conscientiousness demonstrated greater use of hard evidence to support their claims in messages. Previous studies have shown that conscientious students demonstrated the ability to use the internet and other tools to gather information (De Raad & Persugini, 2002; Poropat, 2009). Other studies highlighted that conscientious students displayed a high level of work ethic, thoroughness and high cognitive abilities (Schniederjans & Kim, 2005; Poropat, 2009). These qualities may potentially explain their motivation and propensity to gather, and then use, hard evidence in messages to support their claims. The significant predictive relationship between conscientiousness and the use of hard evidence in messages is important for several reasons. Students, who use evidence or grounds to back their positions/claims in a message, are reported to engage in stronger forms of argumentation during online discussions (Weinberger & Fisher, 2006). Evidence also provides legitimacy and believability to a claim made in a message. Further, evidence provides contextual reference to previous situations. Hard evidence, such as factual data, direct quotes and citations etc. are often published by third parties and

verified independently. Therefore, students who use hard evidence in their messages verify their claims based on either previous knowledge or an independent party that may have previously addressed this issue. These all indicate of usage of stronger forms of argumentation during online discussions.

Finally, high levels of conscientiousness in students negatively predicted their use of contextual message structures. As reported by Poropat (2009), their superior organizational skills, backed up by logical thinking, may have motivated these students to arrange their ideas by connecting one idea with another in a purposeful manner to build a strong clear argument. This is important since others will be in a better position to follow their ideas and logic in their messages. If students understand what others say, then the chances of them responding to these ideas are potentially high. In addition, if ideas are presented in a logical and a clear manner, then the chances of them being misunderstood will also be minimized. All these behaviours can lead to productive online discussions. This finding is unique to this study as contextual vs. linear message structure has not been extensively studied.

In addition to the effects discussed above, the hypothesized predictor model results further show several interaction effects between conscientiousness and students' local discussion groups on the number of messages posted, social presence and the use of autonomous tones in messages. These interaction effects are important. They emphasize that the local discussion group can significantly moderate the relationship between conscientiousness and certain speaking actions, in addition to the global effects already reported. Although we may not know the exact reasons for these interaction effects due to the lack of group-level predictors, we may expect groups with lower levels of conscientiousness to not post as many messages and/or to not display social presence in their posts. Therefore, the importance of including group-level predictors into models when there are significant interaction effects cannot be emphasized enough. Further, when full exploratory models were run with all predictors, there were many significant interactions between conscientiousness and students' local discussion groups on several speaking behaviours. These effects need to be investigated in future studies.

Thus, results of this study demonstrated that a student's level of conscientiousness can predict how they engage in online discussions, in terms of the specific ways they

attend to others, attend to the discussion task and participate actively in discussions. Additionally, the prediction of speaking behaviours by a student's level of conscientiousness was also moderated by their local discussion groups.

Agreeableness was another significant predictor of several speaking behaviours, as to how students attended to others in their messages. Agreeableness showed several significant global and interaction effects. Results showed that students with high levels of agreeableness referred to others more frequently, agreed with others more often and displayed high degrees of social presence in their messages. Previous studies have also shown that a student's level of agreeableness influences their online discussion behaviours in general ways. For example, students with high levels of agreeableness were reported to engage in two-way communications during discussions (Chen & Caropreso, 2004). These students were reported to value learning through online courses in general (Keller & Karau, 2013) and reported higher grade performance during online courses (Schniederjans & Kim, 2005). The current study showed unique findings that had not been reported before. For example, results showed that students with high levels of agreeableness fully agreed with others in their messages and had a high degree of social presence in their messages. The importance of these findings will be addressed in the upcoming sections of this discussion.

It was surprising to note the lack of significant relationship between a student's level of agreeableness and their degree of participation in the current study. In past studies, Chen and Caropreso (2004) reported students with agreeableness engaged in online discussions in a particularly active manner. There was also no significant relationship between a student's level of agreeableness and how they attended to the task at hand. In the original models, agreeableness was not often hypothesized to predict speaking behaviours that represented this speaking dimension. However, exploratory results with all predictors showed high levels of agreeableness to positively predict how students organized their messages contextually. As reported in past studies, the tendency among these students to acknowledge others and seek assurance (Costa & McCrea, 1990, 1992) may have motivated them to address ideas as they appeared in the discussion, rather than cohesively build a logical argument step-by-step. These results need further exploration.

As hypothesized, students with high levels of agreeableness also posted many messages that displayed social presence. As reported in previous studies and earlier in this discussion, students with higher levels of agreeableness have demonstrated the ability to build relationships between participants during online discussions (De Raad & Perugini, 2002). Comments such as greeting someone, complimenting others' ideas, addressing people by name, are examples of social presence (Wise, Chang et al., 2004) that can potentially aid the building of relationships during a discussion. So it is not surprising that a personality trait such as agreeableness (that is known to build relationships), can predict speaking behaviours (that provides an outlet to express social relationships). As discussed earlier, this is important since social presence can enhance the overall quality of online speaking in several ways. Previous work that reported the potential relationship between social presence and interactivity in online environments were briefly discussed earlier. Rourke et al. (2007) explained the potential of social presence in messages enhanced a sense of community in online environments. Quoting several previous works, Oztok & Brett (2011) highlighted the positive relationship reported between social presence and interactions between students in online environments. For example, Moore and Kearsley (2005) quoted in Oztok and Brett, provided evidence on how social presence in messages encouraged communications between participants in online environments. Rourke et al. (1999), Tu and Mclsaac (2002) quoted in Oztok and Brett, highlighted how social presence in messages can improve the overall experience of student interactions in an online environment. The relationship between agreeableness and social presence is therefore an important finding not reported in prior studies.

Results of the current study confirmed the hypothesis that students with high levels of agreeableness fully agreed with others in their messages. Previous studies (Costa & McCrea, 1990, 1992) reported students with high levels of agreeableness showed a tendency to seek assurance from others during communications. While referring to others' ideas were encouraged and welcomed during an online discussion, the tendency to seek assurance from others may work to their disadvantage in some contexts. During a typical online discussion, we would desire that students independently take a position on their own, then refer to others' ideas and negotiate with those who have opposing views. If students with high levels of agreeableness tend to focus on others' ideas and seek assurances on a frequent basis, then they may show a higher tendency to agree with

others regularly. This is problematic because when students agree with others without understanding why, or without debating the merits or demerits of those ideas, then such behaviours will not add value to the overall discussion. Previous studies (Veerman, 2003; Chinn, 2006; Dennen & Wieland, 2008) have reported the overall substance of the content to become diluted when students agreed with others frequently during a discussion. These authors attributed this to a lack of alternatives or opposing ideas generated in the discussion when students reach consensus hastily during a discussion. They also recognized that group members (especially those with high levels of agreeableness) might subject themselves to group think or engage in shallow levels of reasoning during online discussions.

Although previous studies have emphasized that students who agree with each other frequently was a potential shortcoming, students with high levels of agreeableness can also play a positive role during the discussion. Their tendency to agree with others can also be helpful during discussions in certain situations. During a typical online discussion, after having debated opposing views, students in the group are expected to reach consensus. When there are disagreements in the discussion, students with high levels of agreeableness may show a greater potential to identify issues the group agrees upon in order to seek common ground. This may potentially open up a path to negotiate other issues where there is no agreement. Additionally, these students have the potential to play the role of a synthesizer during a discussion. A synthesizer is one who can "make connections between posts, pull comments together, and push the conversation forward, maybe in new directions" (Wise & Chiu, 2011, p. 456). If directed properly, a student with high levels of agreeableness can assume this role and contribute positively towards the discussion.

Additionally, there were several significant interaction effects between agreeableness and students' local discussion groups on how students fully agree and use connected tones in messages. The interaction effect between agreeableness and students' local discussion groups on connected message tones was large. This means that group membership had a significant and a substantial effect on the relationship between agreeableness and students' use of connected tones in messages. Although we cannot explain reasons for these interaction effects due to the lack of group-level predictors, it nevertheless signals the presence of inconsistencies in online speaking

behaviours among groups. Additionally, when full exploratory models were run with all predictors, there were many interaction effects between agreeableness moderated by students' local discussion groups. As highlighted earlier, this once again emphasizes the importance of considering group-level predictors to make sense of these interaction effects.

Thus, results of this study demonstrate how a student's level of agreeableness can predict the ways one attends to others in an online discussion; specifically, how they referred to others, agreed with others and displayed social presence in messages. Results also revealved the prediction of speaking behaviours by a student's level of agreeableness was moderated by their local discussion groups.

Low context-based cultural values were another significant predictor of several speaking behaviours related to how students attend to the task at hand. Low context-based cultural values showed several significant global and interaction effects. They are discussed below. As discussed earlier, previous studies on online discussions paid minimum attention to this cultural value. Results of the current study showed that a student's level of low context-based cultural values predicted their online speaking behaviours in specific ways. For example, students with high levels of low context-based cultural values demonstrated a greater use of reasoning and hard evidence in messages. They also structured their messages systematically. When referring to others, these students demonstrated a greater use of autonomous tones in messages. These findings are important. Context-based cultural values aid students to communicate ideas, by placing emphasis either on the "context" or "content". Online discussions rely heavily on communicative acts of students, and using a cultural value that directly predicts communicative behaviours of students is relevant and useful. Context-based cultural values therefore may be more causally proximate to communicative acts such as online speaking than other cultural values reviewed in this study. Specifics of these will be discussed below with reference to findings of the study.

Results of the study did not report any significant relationships between low context values and the number of messages posted. Due to poor model fit results, average post length could not be reported. However, exploratory results with all predictors showed a student's high level of low context-based values positively predicted the average length of

a post. Previous studies (Frank & Toland, 2002; Kim & Bonk, 2012) had reported students from low context-based countries posted a greater number of messages during the discussion, though not confirmed in the current study. It is important to mention that comparing findings from the current study to those of the past is not fair. For example, Frank and Toland (2002) did not measure context-based cultural values of students but referred to them as a proxy of their citizenship. Comparing values directly obtained from students to those of a proxy are two very different things.

As hypothesized, a student's level of low context-based cultural values positively predicted the extent to which they provided reasoning in their messages. Previous studies have shown that these students used direct, precise and logical expression of ideas during communications (Salleh, 2005). These qualities can potentially explain why students with high levels of low context-based cultural values in the current study may have used a higher number of reasons in their messages. This is an important finding that has not been reported before, and has several implications for online discussion based learning. A student who provides insightful reasons are said to make stronger arguments during a discussion, and expose their ideas to others (Chinn & Osborne, 2010). Stronger arguments and multiple points can potentially draw comments from others, making discussions more interactive and interesting. Further, stronger reasoning may encourage students to think through issues in a detailed manner. These reasons may also help others to understand the issue at hand and expand their own thought process. Thus reasoning in general, may enhance the overall discussion quality and learning through online discussions. As reported in earlier studies, students with low context-based values with a tendency to use direct, precise, clear and explicit language when communicating ideas may improve their ability to clearly engage in reasoning. On the contrary, students with high context-based cultural values may not engage in clear reasoning since they may expect others to read between lines. This may often lead to confusion and poor reasoning in general. Based on the significant results noted between low context and reasoning, we may encourage students to focus more on the content and rely less on the context when engaging in reasoning and argumentation in general.

A student's level of low context-based cultural values also predicted how they referred to hard evidence in their messages. This is yet another important finding not reported previously. This result seemed to suggest students with low-context based

cultural values place equal emphasis on supporting their ideas as much as communicating them directly and clearly. The value of using hard evidence in messages was explained in an earlier section of this discussion. The following are a few more reasons to highlight their importance. Ideas that are supported by independently verified sources such as hard evidence will provide more credibility and believability to the claims made in messages. Therefore, messages posted by these students can potentially garner the interest of other students who want to engage in the discussion seriously. Thus, the high bar set by these students may potentially motivate others to follow suit and improve the overall quality of the entire discussion. Alternatively, we may find that students with high context-based cultural values to not use hard evidence to support their claims as much as their counterparts. Instead we may expect these students to mostly rely on opinions or hearsay evidence. Such ideas may not gain traction or be picked up by others. Thus, students with high context-based values may be encouraged to follow the examples set by their counterparts who took the time to verify their ideas with hard evidence to support their ideas in messages.

As hypothesized, a student's high level of low context-based cultural values negatively predicted their use of contextual message structures. In communicating ideas in a clear and direct manner, these students seemed to value stating their position/main argument upfront in an explicit manner. In justifying their position, these students appeared to have organized their ideas/reasons purposefully, in a step-by-step, linear fashion to build a clear and a stronger argument in their messages. The multiple threads generated during a discussion can potentially overwhelm even the most organized student. As highlighted earlier, organizing ideas in a clear, logical manner will help students navigate through their discussions productively. This is yet another important finding not reported in previous studies.

The notable positive relationship revealed between low context-based cultural values and autonomous message tones are also worthy of some discussion. Results of the current study indicated that students with low context-based cultural values used more autonomous tones in their messages. As reported in previous studies, students with high levels of low context-based cultural values explained their ideas in a direct and explicit manner (Salleh, 2005). This may have led them to take ownership of their ideas and express them in an assertive way. This may also explain why first person singular

pronounces, such as “I,” “My,” “Me” and so on were frequently used in their messages; to their boldness and independence in communicating ideas assertively. This is important, since a student who uses autonomous message tones may be able to emphasize objectivity, reasoning and be able to debate ideas independently during a discussion. Students with an autonomous tone can potentially draw attention from others and may influence the overall direction of the discussion. This is similar to taking a “traffic director’s” role, highlighted by Wise and Chiu (2011) keeping the “discussion moving in a productive direction” (p. 456). These students can also potentially play the role of devil’s advocate (Wise & Chiu, 2011), taking “a contrary position to one (or more) of … classmates’ ideas and make a reasonable defense as to why this is a logical position to take” (p.456). This finding helps us understand the important role autonomous message tones can play during different stages of the discussion. For example, during the initial stages, the independent ideas proposed through autonomous tones in messages can help provoke others in the discussion to think about issues and take a stand. When used towards the middle or the end, this tone has the potential to direct a discussion. Thus we may find students with high levels of low context-based cultural values to potentially play important roles during different stages of the discussion.

Additionally, there were several significant interaction effects between low context-based cultural values and students’ local discussion groups on how they posted messages and displayed social presence in messages. Although these interaction effects were smaller, they still highlight the important moderating role played by the local discussion group. Additionally, when full exploratory models were run with all predictors, there were many interaction effects between low context-based cultural values and local discussion groups on several speaking behaviours. As highlighted earlier, this once again emphasizes the importance of considering group-level predictors to make sense of these interaction effects.

Thus, results of this study demonstrated how a student’s level of low context-based cultural values can predict online speaking behaviours; specifically,how students engaged in reasoning, used hard evidence, structured their messages and used autonomous tones in messages. Additionally, the prediction of speaking behaviours by a student’s level of low context-based cultural values was moderated by their local discussion groups.

6.2.2. Predictors with Significant and Large Interaction Effects Only

Collectivistic and individualistic values as well as the openness to experience trait showed multiple significant and large interaction effects, moderated by a student's local discussion group context. However, none of these three predictors showed significant global effects. This was the case for both hypothesized and full exploratory modeling (with one exception for the latter). The above results are interesting and important since it alters the way we think about how cultural values and personality traits predict speaking behaviour. Some cultural and personality factors can show both global and interaction effects while others (the three cultural and personality factors discussed in this section) may show only interaction effects moderated by students' local discussion groups. Specific findings pertaining to these interaction effects are further discussed below.

The interaction effect between collectivistic cultural values and the local discussion group on reference to others, full agreement, social presence, connected message tone, use of contextual message structures and use of soft evidence speaking actions was large. When exploratory models were run with all predictors, the number of significant interaction effects for collectivistic values further increased. The vast majority of these effects were also large. Individualistic cultural values and openness to experience traits also showed several interaction effects both through the hypothesized models and full exploratory models with all predictors. Although there were multiple significant interaction effects, the number of large effects shown for these two variables were much more limited in comparison to collectivistic values.

Going back to interaction effects for collectivistic cultural values, it is interesting to note that all speaking behaviours listed above were originally hypothesized to have a positive global relationship with collectivistic cultural values. For example, collectivism is all about organizing one's behaviour around others, in terms of thinking and actions (Markus and Katiyama, 1991). The use of connected message tone is an indication of students referring to the collective. Their interest in what others have to say should theoretically motivate them to refer to others. Similarly, their propensity to seek harmony could get them to agree more during discussions. Thus, the lack of significant global effects of collectivistic values were surprising. The reporting of significant interaction

effects between collectivism and students' local discussion groups suggests that one important explanation for this lack of global effects is that the group membership of students moderated the relationship between collectivistic cultural values and the above-mentioned speaking behaviours. Unfortunately, the lack of group-level predictors did not allow us to find out reasons behind these interaction effects. Thus, future studies should consider potential group-level predictors.

One potential group-level predictor that could explain interaction effects found above, for example, can be the overall group level of collectivism. There is evidence (especially research from personality traits) from past studies that reported the overall group level could have an effect on the degree of performance. For example, Kozlowski and Bell (2003) quoted in Cooke and Hilton (2015) reported "teams with higher levels of extroversion are more effective than teams with low levels of this personality trait" (p.83). The degree of variation (standard deviation) within that overall level of collectivism is another potential group level predictor. A smaller degree of variation for collectivistic cultural values may suggest the presence of fewer students with extreme collectivistic cultural values (homogeneous) in the group. This is important since a homogeneous group of students will demonstrate a more intense level of collectivistic behaviour (high or low depending on overall group level) than those within a heterogeneous group. Also the overall group level of collectivism will also determine the degree to which the group may lean towards or away from collectivistic characteristics. These group-level predictors may explain some of the interaction effects noted above. For example, a collectivistic student who is within a collectivistic group (with a small degree of variation) may get that extra push to engage in speaking behaviours such as referring to others, using more connected tones in messages and so on (that has been identified to have effects from collectivistic values). How will this affect the collectivistic student who is in an individualistic group or one that is in a collectivistic group with a larger degree of variation? The above examples pertaining to group-level predictors may provide some useful answers to understand interaction effects noted between several predictors and the local discussion group context of the student.

Thus, results of this study demonstrated that students' local discussion groups have significant, and at times, sizable interaction effects on cultural values and personality traits.

6.2.3. Potential Predictors for Future Exploration

In addition to the above findings, full exploratory model results with all predictors, showed extroversion, neuroticism and low power distance predicted several online speaking behaviours that are worthy of future exploration.

When full exploratory models were run with all predictors, students' levels of extroversion negatively predicted the degree of autonomous message tone and positively predicted the degree of connected tones used in messages. Though there was no original hypothesis related to these relationships, these results do make sense logically. Previous studies reported extroverted students showed high levels of readiness to engage by taking initiative to start discussions (Blau & Barak, 2012), gaining energy from others, and engaging in highly social interactive conversations (Lee & Lee, 2006). Verela et al. (2012) reported that these students were short on the detail, trading quantity for quality during discussions. The above qualities may potentially explain why extroverted students used more connected message tones when trying to facilitate the discussion. In this spirit, they may have refrained from "owning" thoughts; thus avoiding the use of an autonomous tone in their messages. Additionally, full exploratory model results showed several significant interaction effects moderated by students' local discussion groups on speaking behaviours (reference to others, application of evidence, and use of hard evidence or soft evidence). While the majority of these effects were small, the interaction effects with extroversion for hard evidence was large. This meant that the use of hard evidence in messages among students with high levels of extroversion were largely moderated by their local discussion group. This highlighted the prominent role played by the local discussion group. These results need to be further investigated.

When full exploratory models were run with all predictors, a student's high level of low power distance cultural values negatively predicted the degree of impersonal tone used in messages. There was no original hypothesis relating to this relationship; however, there is a potential logical connection between the two. Impersonal message tones mostly communicate non-committal attitudes towards others during a discussion. Previous studies have reported students with low power distance to reject differences in inequality and authority that exists within just a few or with the group at large (Hofstede et al, 2010). Such students tend to be more assertive and are not afraid to take a stand on issues or

on others' ideas. Thus the negative relationship shown between students with low power distance cultural values and their lower inclination to use indirect, non-committal references to others in messages, makes sense logically. Additionally, exploratory full model results also showed several significant but smaller interaction effects between low power distance and local discussion groups on several speaking behaviours (social presence, impersonal tones, contextual structures, reasoning, hard and soft evidence). These results need to be further investigated.

When full exploratory models were run with all predictors, students' levels of neuroticism positively predicted the degree of soft evidence used in messages. There was no original hypothesis signifying this relationship; however again, a logical connection can be drawn. Previous studies have reported students with high levels of neuroticism displayed anxious and impulsive behaviours, coupled with feelings of vulnerability (Costa & McCrae, 1992). Nussbaum et al. (2004) reported students with high levels of neuroticism did not engage in argumentative discourse during discussions, due to their fear of confronting others. Other studies have reported that these students show low levels of computer self-efficacy skills (Keller and Karau, 2013). This can potentially limit their capabilities to research evidence and support ideas. These qualities may explain why students with high levels of neuroticism may avoid the use of evidence altogether. Those students who are inclined to use some evidence may resort to soft evidence that is not typically accompanied by independently verified sources. Thus the positive relationship found between neuroticism and soft evidence can be logically explained. Additionally, full exploratory model results also showed several significant but small interaction effects between neuroticism and students' local discussion groups on several speaking behaviours (number of messages, impersonal tone, contextual structure, hard evidence). This meant behaviours represented by the above speaking behaviours among students with high levels of neuroticism were moderated by their local discussion groups. These results need to be further investigated.

Thus, the exploratory results of this study demonstrated the potential existence of several non-hypothesized global effects as well as multiple interaction effects that warrant future investigation.

6.3. Limitations and Recommendations for Future Research

One limitation was the sample size used in this study. The current sample would have been sizable enough to run single-level predictive models for the number of outcome variables and predictors. However, this study required predictive models to be set up as multi-level models to account for group mediation effects. Results of a power analysis (Sections 4.6.4 and 5.1.11) indicated the current sample to be 60% of the required sample size for multilevel modelling given the number of variables. Although predictive models showed modest significant results (eliminating the need to use bootstrapping), a larger sample could have yielded more significant results across the multiple outcome variables and their predictors. Future studies can replicate the current study with a larger sample and more discussion groups with equal/similar number of students per group.

Another limitation was the composition of the sample. This study collected data with a convenience sample made up of mostly first-year undergraduate students who took business courses in a small-size university in western Canada. Also two-thirds of the sample consisted of students between the ages of 17-22 years. Interpretation of findings was thus limited to university-aged students who took first-year business courses. Future studies can replicate this study with a fair representation of mature students, students who take courses in other disciplines or students in upper years

Hofstede's cultural model was used to conceptualize cultural values in this study. The widespread use of this model across many studies within and outside the genre of online discussion literature led to its adoption in the current study. As highlighted in the results, there were no significant global effects shown for the popular cultural factors (Individualistic and collectivist values) based on Hofstede's framework; however, less popular cultural factors (such as low context cultural values) produced several significant global effects. Thus, cultural values utilized in Hofstede's model only portray a limited view of this vast concept. This narrow view, therefore, limits the scope in which cultural values are discussed in this study. There are many other models that characterize cultural values in literature. Some of the factors included in these models, but not Hofstede's, may be relevant when discussing cultural characteristics in an intra-cultural, communication-based educational setting. For example, the context-based cultural values used in this study directly assessed the cultural influence on communication context vs. content.

Further, Parrish and Linder-VanBerschot's (2010) Cultural Dimensions of Learning Framework (CDLF) model referred to earlier is another example that made a direct reference to cultural values that may be more applicable in an educational context. Future studies of online discussions should pay specific attention to cultural values that can potentially influence communicative acts and those that may be unique to an educational environment. This can be achieved by using and building upon existing frameworks and then develop, test and validate the instruments that reflect these variables. Alternatively, researchers can and should take a bolder approach and consider conceptualizing and investigating new cultural factors relevant to this context from the ground up.

The original study incorporated both online listening and speaking behaviours in conceptualizing and operationalizing discussion behaviour. Due to a technical problem during the data collection process, the log file data that recorded listening activities was not documented by the discussion software tool. Online listening behaviours were an important aspect of the original study conceptualization. Wise (2008) asserts there was inadequate focus among online researchers to understand what students do before they attend to a post during an online discussion. Not being able to report the listening component of the study was a major disappointment and continues to be a gap in current literature on online discussion behaviour. Currently, no work explains how cultural and personality characteristics influence student's online listening activities. Future studies should investigate these relationships.

In conceptualizing online speaking quantity and quality, three dimensions of speaking were discussed in this study. They include the degree of participation, attending to others and attending to the task. There were moderate correlations noted among some of the speaking behaviours that would necessitate running multivariate multilevel models to understand clustering effects among them. Although there was an attempt to run multivariate models, complications with software platforms and problems related to model convergence prohibited this. Thus, relationships between different outcome variables could not be taken into account when predicting relationships through univariate models. Future studies should consider developing simpler models; perhaps separating cultural values and personality traits to reduce model complexity. This may potentially lead to successful multivariate multilevel model convergence.

Previous sections of the study showed several exploratory significant effects between personality trait/cultural value predictors and online speaking behaviours not originally predicted in this study. Future research studies can further investigate and confirm the significance of these relationships.

The assessment of scales identified to measure cultural values in the current study was limited to investigating their bipolar and orthogonal properties. Future studies can carry out a fully-fledged analysis of the dimensionality of cultural scales with the use of exploratory and confirmatory factor analysis. Such analyses can provide more definitive reasons to confirm the complexities noted in measuring cultural values at the individual student level.

Previous sections in this chapter highlighted significant group effects and their importance. The current study did not capture or consider group-level predictors and thus was not able to investigate the reasons behind these effects. Group level predictors should be a priority for investigation in future studies. In the previous section, overall group level of a cultural value/personality trait and its degree of variation were suggested as potential group-level predictors. The size of the group is another potential group level predictor. Students in larger groups may influence their peers in different ways than those in smaller ones. Therefore, we may potentially expect different interaction effects between predictors and smaller discussion groups vs. large ones. Engel, Woolley, Jing, Chabris, and Malone (2014) found the collective intelligence of the group to predict differences in performance between groups. Perhaps this is another potential group level predictor that can be considered. The overall skills level of the group is another potential predictor. For example, groups with high levels of language skills, analytical or numerical skills (depending on the task) can potentially display different interaction effects with predictors than those with lower language skills and so on. So group-level predictors as described above may have the potential to explain reasons behind interaction effects moderated by the local discussion group reported in this study.

Lastly, methodologies adopted in this study utilized quantitative methods to investigate the issue. Many qualitative approaches can be used to understand cultural characteristics of students that quantitative techniques may fail to report. In the current study, self-reports on behaviour (frequency scales) across several cultural values were

used to measure students' cultural characteristics. A conceptual argument supported with reliable Cronbach alpha values reported self-reports on behaviour (frequency scales) to capture responses of students were better than self-reports on beliefs or feelings (agreement scales) in measuring cultural values. However, the frequency scales used in this study were also self-reports of behaviour that could be potentially subjected to the social desirability bias. Alternative qualitative methods such as in-depth interviews, ethnographic methods such as observing specific types of behaviours could be used to make a fair assessment of an individual's cultural characteristics. Future studies may consider incorporating larger components of qualitative methods to investigate cultural values given the complexity in measuring this elusive concept.

6.4. Implications for Practice

The findings of this study have several important implications for practice.

First, the significant global effects shown in this study highlight some of the ways in which cultural and personality factors directly predict students' online speaking behaviours. Knowing these characteristics of students by having them complete assessments on cultural values and personality traits prior to running online discussions would be beneficial. First, through these assessments, students can be made aware of their own cultural and personality profiles to facilitate their own learning (self-regulated learning). Barnard-Brak, Paton and Lan (2010) profiled self-regulated learners and reported characteristics that led to successful academic outcomes in online environments. Amongst those profiles that showed higher academic results, they found these students continuously self-evaluated their personal characteristics so that they were aware of potential positive and negative consequences imposed from them. Through self-assessments of personality traits and cultural values, and sharing research findings as to how certain characteristics have effects on online behaviours, instructors can create an environment to propagate self-regulation among interested students. Second, instructors could advise students who are low on certain cultural and personality characteristics to pay extra attention to certain behaviours they are expected to have (or not have) when engaging in online discussions. For example, results of this study showed how low conscientious students referred less to others in their messages, used less hard evidence

to support their ideas, and did not participate actively in discussions. These students could be asked to make a concerted effort to avoid falling into these traps during discussions. For example, they could be asked to use more hard evidence to support their claims. Perhaps instructors can show them how to research hard evidence or use potential sources to find them. These students can be reminded to refer to others' ideas and post a minimum number of messages. Results also found students with high context-based cultural values engaged less in reasoning, and did not communicate their ideas as clearly as expected. These students can be given strategies to write their ideas in a clear and explicit manner. Additionally, results also showed that students with high levels of agreeableness fully agreed with others during discussions, which could potentially dilute the overall discussion quality. These students can be advised to critique others more or to engage in synthesizing roles, harnessing their natural abilities, to find common ground. Perhaps instructors can look out for some of the specific negative behaviours during the initial stages of the discussion, or when providing feedback, to remind students of these potential pitfalls. The above initiatives may prepare students for success and enhance their learning experience through online discussions. Third, if the cultural and personality profile of the class could be known in advance, practitioners will be in a position to tailor online discussion tasks and provide guidelines to steer behaviours in a direction to achieve student success. For example, if personality profile data reveals a large number of students in the class to display high levels of agreeableness (which can potentially predict high levels of agreement), an instructor could include controversial topics that have the propensity to generate disagreements. This could be accompanied with guidelines or grading criteria highlighting the need for students to challenge each other during discussions. Marks could be distributed in order to reward students who disagree more in their messages. Although these initiatives are not new practices, the ability to tailor tasks, guidelines or grading criteria based on the knowledge of the cultural and personality make up of a class, is a practice not widely reported

Another important implication for practice is the manner in which students are grouped for discussions. Results discussed so far in this study clearly highlighted the interaction effects between the local discussion groups and cultural/personality factors on speaking behaviours. Therefore, practitioners should pay close attention as to how students can be best assembled into groups. There are many references in literature that

shed light on team composition and assembly. Cooke and Hilton (2015) stated most researchers in the past have focused on individual characteristics and the diversity of students when addressing issues of team assembly and performance. These studies have reported mixed results. Mannix and Neale (2005) and Feist (2011), reported diversity of personality traits amongst students to predict degrees of success in group performance. Further, Mannix and Neale (2005) reported demographic diversity (gender, race, age) among students to account for differences in group performance, while Horwitz and Horwitz (2007) found no significant relationships between demographic diversity and group performance. Others have shown characteristics and diversity alone will not help identify assembly of successful groups (Klimoski & Jone, 1991 quoted in Cooke & Hilton, 2015). Contractor (2013) reported a combination of factors when considering the assembly of successful groups. This author highlights the importance in considering a variety of additional factors when assembling successful groups for higher performance**.** These include compositional characteristics (size of groups, characteristics of individuals), relational attributes (relationships within individuals), multimodal networks (fit between individuals and tasks) and ecosystems (prior relationships before formation of the group). Findings from these studies collectively highlight the complexities around assembling groups. While all these studies acknowledged that personal characteristics play a role (mixed results), these studies also reminded practitioners to go beyond using personal characteristics of individuals within the group and consider other relational and multimodal inter-relationships. Earlier in this chapter, the value of using group-level predictors to understand interaction effects were discussed. Once identified, perhaps these same group-level predictors can be considered when assembling groups for online discussions.

Studies have reported several tools that are available for practitioners to assist them in assembling groups. For example, “My Dream Team Assembler” is a tool developed by SONIC Research Group at the Northwestern University (Contractor, 2013). According to the author, this tool allows students/instructors to assemble a group based on a social network analysis (Contractor). Students first complete a set of questions in terms of their skills (leadership skills, social skills, creativity, etc.) and expectations (availability, cross-cultural sensitivities, values) in working with a group. Based on this information, this tool makes a set of recommendations considering potential compatibilities among students. A tool like this can be very useful to assemble groups for an online

discussion. It not only takes into account student characteristics, but also relational and multimodal (task vs. relationship) interrelationships. In order for this tool to work, as suggested earlier in this discussion, students should be made aware of their own personality traits, cultural values and perhaps other skills. Using the principles and tools discussed above, instructors may be in a better position to assemble successful online discussion groups than using arbitrary methods.

6.5. Concluding Thoughts

There are several important conclusions that can be drawn from this study

This study began by recognizing the importance of considering individual communicative acts in understanding learning within online discussions. Following a constructivist approach to account for learning through online discussions, over 15 individual communicative acts across 3 dimensions of speaking were used to identify discussion behaviours of students. 9 speaking actions in the hypothesized models and 14 in the exploratory models were significantly predicted by students' cultural and personality factors. This study did not investigate the relationship between the differences in individual communicative acts and student learning outcomes. However, the substantial variability in these communicative acts and their ability to be predicted successfully adds credibility to the importance of considering individual communicative acts to understand online discussion interactions in general.

This study also emphasized the selection and validation of scales to measure cultural values and personality traits. Several previous studies had argued in favour of using frequency scales, over agreement scales, to measure cultural values. Although these studies presented a strong conceptual case, the empirical evidence provided to support them were limited. Thus, through a pilot study, both these scales were put to the test. Results of the pilot study confirmed frequency scales to measure cultural values in a reliable manner. Cultural researchers in the past have also highlighted the dangers of using scales and measurement techniques designed to collect national level cultural data to interpret individual level behaviours. Previous studies of online discussions have paid little or no attention to these issues and have often problematically used techniques that crossed levels when measuring cultural values. This study did not fall into this trap when

selecting research instruments and scales to measure cultural values. In the current study, detailed investigation of the scale properties revealed individualistic and collectivistic values to be best considered as orthogonal while context-based and power distance values to be best considered as bipolar scales. As highlighted in previous chapters, these properties influenced both the measurement and interpretation of results. Thus, the need for close attention to scale choices in studying the role of cultural characteristics in online learning is another important takeaway from this study.

The results of this study confirmed cultural and personality factors to be useful predictors of online speaking behaviours of students. Several concerns and challenges noted in past studies that predicted online discussion behaviours of students were discussed earlier. Among them, the widespread use of students' citizenship, as a proxy of their cultural values to predict online behaviour was highlighted as a concern. Conclusions from these studies seemed to consider the ethnicity and citizenship of students to be the cause of their behaviour, assuming that all people who belonged to a group to demonstrate behaviours in the same or similar ways, without giving an explanation as to why. Further, previous attempts by researchers to use demographic characteristics (age, gender, etc.) to predict students' online discussion behaviours were also identified as a concern. While demographic factors may be useful to categorize students in general, they are not as causally proximate to behaviour as cultural and personality factors. Previous studies (Bennett et al., 2008, Guo et al., 2008; Bennett and Maton, 2010) have provided evidence to counter popular claims that all old or young people use technology in the same way ("digital natives" vs. "digital immigrants"). These studies remind us of the limited ability of demographic characteristics to precisely predict and explain the behaviours of students. Results of this study showed that cultural and personality factors were powerful in making a variety of very specific predictions of behaviour. As argued earlier, cultural and personality characteristics are far more causally proximate to behaviour than demographic factors that tend to lump students into categories based on common characteristics. This is an important conclusion drawn from the results of this study.

Another important conclusion of the study is the extent to which personality trait and cultural value variables directly predicted online speaking behaviours. Personality traits predicted several online speaking behaviours consistently in this study. Also considering their inherent qualities (genetic, psychological makeup, stability over a

person's life), these traits were identified to be reliable predictors of online speaking behaviours. This is exciting and important since several personality traits such as conscientiousness and agreeableness were identified to predict multiple online speaking behaviours that were not reported in previous studies. In contrast, cultural values did not directly predict online speaking behaviours of students as anticipated. While frequently cited, cultural values (individualistic and collectivistic values) did not produce significant global effects, other values that are not typically cited (specifically, context-based), showed many significant global effects. The need to go beyond popular and frequently cited cultural values and consider those that are more reflective of communication-based educational behaviours, were identified as important implications of this conclusion.

The results of the study also showed multiple significant interaction effects. These effects suggest the important role played by the local discussion group. Methodological researchers (Cress, 2008; Garson, 2013; Heck et al, 2013) have argued that since most online discussions are conducted in groups, they require predictive relationships to be set up as multilevel models and meet multilevel assumptions in analysis and interpretation. Yet, several previous studies that reported predictive relationships between student characteristics and online discussion behaviours have neglected to examine such potential group effects. For example, Chen and Caropreso (2004), who reported on the impact of personality differences on online interactions of students who engaged in group-based discussions, did not report group effects. Similarly, Hwang and Francisco (2010), who reported on the impact of individualistic and collectivistic values on how students communicate through electronic discussion boards in groups, did not report their group effects. Methodological researchers have pointed out the dangers of not using multilevel models to predict relationships when discussions are carried out as groups. They highlighted that in such situations, models failed to calculate the correct correlated error and prediction parameters, which may have significantly distorted the final interpretations of results (Cress, 2008; Garson, 2013). The extensive interaction effects found in this study validated these methodological concerns. Further, group level moderation effects essentially suggested the presence of meaningful differences between groups. In order to understand the nature of these effects, group-level predictors, therefore, are critical. Thus, future researchers need to identify and then test group level variables when modeling predictive relationships through multilevel models. Lastly, the prevalence of significant

interaction effects should also signal practitioners to pay close attention to the group composition of students.

In conclusion, this study has made multiple contributions to our understanding of the relationship between how students participate in online discussions and their cultural and personality characteristics. This dual finding highlights the need to study learning through online discussions by examining both the group and the individual, and most critically the complex relationship between them.

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Appendix A

Frequency Scale – Pilot and Main Study

Questionnaire 01 – Auckland Individualism and Collectivism Scale (AICS) : Shulruf, B., Alesi, M., Ciochin.NJ., L., Faria, L., Hattie, J., Hong, F., et al. (2011).

The purpose of this questionnaire is to find out how you think or behave in regard to yourself and to groups to which you belong. It is confidential, and there are no right or wrong answers. Use the scale below to answer the following questions.

1	2	3	4	5	6	7
Never	Almost Never	Occasionally	Sometimes	Often	Very Often	Always

1. I define myself as a competitive person.
2. I enjoy being unique and different from others.
3. Before I make a major decision I seek advice from people close to me
4. Even when I strongly disagree with my group members, I avoid an argument
5. I consult with superiors on work-related matters
6. I believe that competition is a law of nature
7. I prefer competitive rather than non-competitive recreational activities
8. Before taking a major trip, I consult with my friends
9. I sacrifice my self-interest for the benefit of my group.
10. I consider my friends' opinions before taking important actions
11. I like to be accurate when I communicate
12. I consider myself as a unique person separate from others
13. It is important to consult close friends and get their ideas before making a decision
14. Without competition, I believe, it is not possible to have a good society
15. I ask the advice of my friends before making career related decisions
16. I prefer using indirect language rather than upsetting my friends by telling them directly what they may not like to hear
17. It is important for me to act as an independent person
18. I discuss job or study-related problems with my parents/ partner
19. I take responsibility for my own actions
20. I do not reveal my thoughts when it might initiate a dispute
21. I try to achieve better grades than my peers
22. My personal identity independent of others is very important to me.
23. I enjoy working in situations involving competition with others
24. I consult my family before making an important decision
25. Winning is very important to me
26. I see myself as “my own person”.

Source: Used with Permission. Adapted from Shulruf, B., Alesi, M., Ciochin.NJ., L., Faria, L., Hattie, J., Hong, F., et al. (2011). Measuring Collectivism and Individualism in the Third Millennium. Social Behavior and Personality: An international journal, 39(2), 173-188.

Appendix B1

Agreement Scale – Pilot Study Only

Questionnaire 02 - Power Distance: Richardson & Smith (2007).

The following questions ask how you feel about professors in general. Try not to think about any one particular professor. It is confidential, and there are no right or wrong answers. Use the following scale to answer each of the questions below. The scale includes seven options. If you select 1, then you will strongly disagree with the statement. Alternatively, if you select 7, then you will strongly agree with that statement. Other options ranging between 1 and 7 denote degrees of your level of disagreement and agreement. If you wish to be neutral to a statement, you can pick option 4 in the scale.

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

1. Professors should consult with students before making decisions that affect them.
2. Students should be encouraged to challenge ideas the professor presents in class.
3. Students who often question professors' authority limit their teaching effectiveness.
4. Once the professor makes a decision, students should not question it.
5. It is OK for professors to refuse to discuss ideas they disagree with.
6. Professors should ask students before making decisions.
7. Compared to professors, students should enjoy equal status in the classroom.
8. Professors should tell students what to do, not consult with them.
9. Even after the semester has begun, professors can change course requirements set forth on the syllabus.
10. Professors can properly evaluate students on whatever basis the professor thinks are appropriate.
11. Professors have the right to decide standards of performance expected from students.
12. Students have the right to publicly express disagreement with their professors.

Source: Used with Permission. Adapted from Richardson, R. M., & Smith, S. W. (2007). The influence of high/low-context culture and power distance on choice of communication media: Students' media choice to communicate with professors in Japan and America. International Journal of Intercultural Relations, 31(4), 479-501.

Appendix B2

Frequency Scale – Pilot Study Only

Questionnaire 02 - Power Distance: Richardson & Smith (2007).

The following questions ask how you think or behave about actions by professors in general. Try not to think about any one particular professor. It is confidential, and there are no right or wrong answers. Use the scale below to answer the following questions.

1	2	3	4	5	6	7
Never	Almost Never	Occasionally	Sometimes	Often	Very Often	Always

1. Professors should consult with students before making decisions that affect them.
2. Students should be encouraged to challenge ideas the professor presents in class.
3. When a student questions a professor's authority, it limits their teaching effectiveness.
4. When a professor makes a decision, it is okay for students to question it.
5. It is OK for professors to refuse to discuss ideas they disagree with.
6. Professors should ask students before making decisions.
7. Compared to professors, students should enjoy equal status in the classroom.
8. Professors should tell students what to do, not consult with them.
9. Even after the semester has begun, professors have the right to change course requirements set forth on the syllabus.
10. Professors can properly evaluate students on whatever basis the professor thinks as appropriate.
11. Professors have the right to decide standards of performance expected from students.
12. Students have the right to publicly express disagreement with their professors.

Source: Used with Permission. Adapted from Richardson, R. M., & Smith, S. W. (2007). The influence of high/low-context culture and power distance on choice of communication media: Students' media choice to communicate with professors in Japan and America. International Journal of Intercultural Relations, 31(4), 479-501.

Appendix B3

Frequency Scale – (Adjusted) Main Study Only

Questionnaire 02 - Power Distance: Richardson & Smith (2007).

The following questions ask how you think or behave about actions by professors in general. Try not to think about any one particular professor. It is confidential, and there are no right or wrong answers. Use the scale below to answer the following questions.

1	2	3	4	5	6	7
Never	Almost Never	Occasionally	Sometimes	Often	Very Often	Always

1. Professors should consult with students before making decisions that affect them.
2. Students should be encouraged to challenge ideas the professor presents in class.
3. When a student challenges a professor's authority, it limits their teaching effectiveness.
4. When a professor makes a decision, it is okay for students to question it.
5. It is OK when professors refuse to discuss ideas they disagree with.
6. Professors should ask students before making decisions.
7. Students and professors should enjoy equal status in the classroom.
8. Professors should tell students what to do, not consult with them.
9. Even after the semester has begun, professors have the right to change course requirements set in the syllabus without consultation with students
10. Professors can properly evaluate students on whatever basis the professor thinks as appropriate.
11. Students have the right to publicly express disagreement with their professors.

Source: Used with Permission. Adapted from Richardson, R. M., & Smith, S. W. (2007). The influence of high/low-context culture and power distance on choice of communication media: Students' media choice to communicate with professors in Japan and America. International Journal of Intercultural Relations, 31(4), 479-501.

Appendix C1

Agreement Scale – Pilot Study Only

Questionnaire 03 - High Context and Low Context Communication: Richardson (2007)

The purpose of this questionnaire is to find out your expectations when you communicate with others. This questionnaire is anonymous, and there are no right or wrong answers. Use the following scale to answer each of the questions below. The scale includes seven options. If you select 1, then you will strongly disagree with the statement. Alternatively, if you select 7, then you will strongly agree with that statement. Other options ranging between 1 and 7 denote degrees of your level of disagreement and agreement. If you wish to be neutral to a statement, you can pick option 4 in the scale.

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

1. Listeners should be able to understand what a speaker is trying to express, even when the speaker does not say everything they intend to communicate.
2. Speakers should not expect listeners to figure out what they really mean unless the intended message is stated precisely
3. Listeners should understand the intent of the speaker from the way the person talks.
4. It is better to risk saying too much than be misunderstood.
5. It is more important to state a message efficiently than with great detail.
6. Even if not stated exactly, a speaker's intent will rarely be misunderstood.
7. The intended content of the message is more important than how a message is communicated.
8. People should be able to understand the meaning of a statement by reading between the lines.
9. Intentions not explicitly stated can often be inferred from the context.
10. A speaker can assume that listeners will know what they really mean.

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

11. People understand many things that are left unsaid.

12. Fewer words can often lead to better understanding.

13. The context in which a statement is made conveys as much or more information than the message itself.

14. Misunderstandings are more often caused by the listener's failure to draw reasonable inferences, rather than the speaker's failure to speak clearly.

15. You can often convey more information with fewer words.

16. Some ideas are better understood when left unsaid.

17. The meaning of a statement often turns more on the context than the actual words.

Source: Used with Permission. Adapted from Richardson, R. M., & Smith, S. W. (2007). The influence of high/low-context culture and power distance on choice of communication media: Students' media choice to communicate with professors in Japan and America. International Journal of Intercultural Relations, 31(4), 479-501.

Appendix C2

Frequency Scale – Pilot and Main Study

Questionnaire 03 - High and Low Context Communication: Richardson & Smith (2007)

The purpose of this questionnaire is to find what you think or behave when you communicate with others. This questionnaire is confidential, and there are no right or wrong answers. Use the scale below to answer the following questions.

1	2	3	4	5	6	7
Never	Almost Never	Occasionally	Sometimes	Often	Very Often	Always

1. Listeners can understand what a speaker is trying to express, even when the speaker does not say everything they intend to communicate.
2. If speakers want listeners to know what they really mean, their intended message must be stated very precisely
3. Listeners can understand the intent of a speaker from the way the person talks.
4. It is better to risk saying too much than be misunderstood.
5. It is more important to state a message efficiently than with great detail.
6. A speaker's intent will be understood even if it is not stated clearly
7. The intended content of a message is more important than how a message is communicated.
8. People can understand the meaning of a statement by reading between the lines.
9. Intentions not explicitly stated can be inferred from the context.
10. A speaker can assume that listeners will know what they really mean.
11. People understand things that are left unsaid.
12. Fewer words can lead to better understanding.
13. The context in which a statement is made conveys as much or more information than the message itself.
14. Misunderstandings are caused by the listener's failure to draw reasonable inferences, rather than the speaker's failure to speak clearly.
15. You can convey more information with fewer words.
16. In certain situations, ideas are better understood when left unsaid.
17. The meaning of a statement turns more on the context than the actual words.

Source: Used with Permission. Adapted from Richardson, R. M., & Smith, S. W. (2007). The influence of high/low-context culture and power distance on choice of communication media: Students' media choice to communicate with professors in Japan and America. International Journal of Intercultural Relations, 31(4), 479-501

Appendix D

Agreement Scale – Pilot and Main Study

Refer to Costa, & McCrea (1991). Neo Five Factor Inventory Form S. Psychological Assessment Resources.

Appendix E
Content Analysis Coding Scheme

Speaking Dimension			Codes/Items		Item Description	Indicators
Attending to Others	Discursiveness	Reference to Others	0	No reference to Others	Does not refer to others' ideas, questions in the post	There is no indication a student referring to others' ideas when articulating their comments
			1	Reference to Others	Refers to others' ideas, questions in the post	Statements pertaining to • Responding to an idea (Wise et al, 2014) • Responding to multiple ideas (Wise et al, 2014) • Query/question about meaning – a comment that asks for clarification of an earlier comment such as "what do you mean", I don't understand what you are saying". These comments question the meaning rather than the accuracy. • Directing questions to others (Pena-Shaff & Nicholls (2008) • Replies to questions posed by others (Pena-Shaff & Nicholls (2008) • Use of statements referring to others by name or quoting their comments verbatim. • Statements that indicate agreement, disagreement or partial agreement with others' ideas
		Degree of Agreement and Disagreement	0	No Reference to Others	Does not refer to others' ideas, questions in the post	There is no indication a student referring to others' ideas when articulating their comments
			1	Neutral to Others' Comments or Non Task Comments	Refers to others' posts but maintains a neutral position.	Refers to others' comments but maintains a neutral position neither agreeing nor disagreeing to the comments made. These posts can also relate to non-task based comments such as organization of tasks, questions pertaining to the discussion process (non-content) comments that pertaining to socialization actions within the discussion.
			2	Full Agreement with others' Comments	Agrees with other students' comments fully in the post	Statements that provides full support to previous claim(s) or rebuttal(s). Includes statements such as voicing agreement, re-words a previous comment, adds additional grounds in support, expands on the comment (Clark & Sampson, 2008, p299)

Appendix E
Content Analysis Coding Scheme

Speaking Dimension			Codes/Items		Item Description	Indicators
			3	Partial Agreement/ Disagreement with others' Comments	Partially agrees or disagrees with other students' comments in the post	• Statement(s) that indicate partial agreement or disagreement with or without reasons for and against it • Statement(s) that indicate partial agreement with alternate options with or without reasons • Statement(s) that support part of an idea with or without reasons
			4	Full Disagreement with Others	Disagrees with other students' comments fully in the post	Statements that attacks or indicate full disagreement with Evidence, Explanations, Qualifiers, Claims, Thesis Rebuttal provided by one or many ideas (Clark & Sampson, 2008, p299)
	Social Presence		0	No indication of social presence	Does not include any indicators (from the list) that suggest social presence.	Indicators include • Express emotion, feelings (I feel frustrated, I feel great, I am sorry) • Express empathy towards others (I feel the same way) • Greeting others (Great to meet you, good day every one etc.) • Thanking others (Thank you, I appreciate your comments) • Recognize contributions (I think this is a great idea) • Encouraging and motivating others (Good job, great point, well done) • Recognize contributions (I think this is a great idea) • Encouraging and motivating others (Good job, great point, well done) • Asking for help (Can some please help me figure out….) • Allusions of physical presence (reference to physical context) • Humor/playful asides • Addressing people by name
			1	Some degree of social presence	Indicators are used in a light manner as passing comments.	
	Message Tone		Connected Tone - First Person Plural		Messages with first person plural pronounces used in the messages	Count the number of pronouns such as 'we', 'us', 'our', 'ours", or similar words indicating the first person plural in messages.

Appendix E
Content Analysis Coding Scheme

Speaking Dimension		Codes/Items		Item Description	Indicators
		Autonomous Tone - First Person Singular		Messages with first person singular pronounces used in the messages	Count the number of pronouns such as 'I', 'me', 'my', 'mine' or similar words indicating the singular first person in messages.
		Impersonal Tone - Third Person Singular & Plural		Messages with third person singular and plural pronounces used in the messages	Count the number of pronouns such as he, him, his, she, her, hers, it, its, they, them, their, theirs or similar words indicating singular or plural third person in messages.
Attending to Task Content	Message Structure	0	Short comments that cannot be identified with 1 or 2	The post includes non-task-based questions	Often includes short messages, questions or clarifications Can be related to non-task-based issues such as administrative questions, social comments etc.
		1	Contextual-Circular/Implicit Organization of Thoughts	Presentation of thoughts in a fluid manner.	Messages, ideas presented in a fluid manner, expressing thoughts along the way. • Refers to thoughts in a roundabout way. • Did not refer to a thesis explicitly in the post. • Use of tentative forms of language and narrative expressions allowing the reader to interpret meaning. • Tasks may or may not been clearly marked in their responses.
		2	Linear/Explicit Organization of Thoughts	Organization of thoughts systematically in a step by step manner.	Messages with explicit statements organized sequentially from point a, to point b to point c. • Often points linked to others. • Often included an explicit thesis at the beginning or in the end. • Use of direct, pointed short statements to articulate ideas. • Clearly marked the task that was addressed in the post.

Appendix E
Content Analysis Coding Scheme

Speaking Dimension			Codes/Items		Item Description	Indicators
	Argumentation	Position - Issues	0	No position taken	Message that does not take any position towards issues pertaining to the task	
			1	Position taken	Message that takes a position	• Position related to case issue(s) • Position related to case issue(s) suggested by another. • Position related to a solution • Position related to a solution suggested by another • Statement that only refers to others' ideas (like synthesis of ideas on issues or restating what others say) but does not take a clear position is <u>not counted</u> as position statement
		Reasoning	0	No Reasons		A reason for a • Position related to case issue(s) • Position related to case issue(s) suggested by another. • Position related to a solution • Position related to a solution suggested by another When student provide direct quotes to support an idea, also count them as reasons.
			1	Single Reason		
			2	2/3 reasons		
			3	4 to 5 reasons		
			4	6 to 7 reasons and above		
			5	8 reasons and above		
		Applying Evidence	0	No Evidence	No presence of evidence in post	There is no presence of any form of evidence in posts.
			1	References to Evidence Only	Making references to evidence in posts (Reference only)	Making references to anecdotes, observations, personal experiences, examples, references to theory, direct quotes, citations, data <u>BUT</u> do not apply them to support their positions/claims made in the post.

Appendix E
Content Analysis Coding Scheme

Speaking Dimension			Codes/Items		Item Description	Indicators
			2	References and Applying Evidence to the Message	Making references to evidence in posts and applying them to support positions (Reference + Application)	Making references to anecdotes, observations, personal experiences, examples, references to theory, direct quotes, citations, data AND applying them to support their positions/claims made in the post.
	Types of Evidence		Count Hard Evidence		Hard evidence refers the use of independent forms of resources found through published sources.	Use of independent forms of resources such as references to theory, direct quotes, citations, data that are found in published sources.
			Count Soft Evidence		Soft evidence refers the use of personal forms of resources that are generated by the students themselves.	Use of personal forms of resources often generated by students such as anecdotes, observations, personal experiences, examples.

Appendix F

Online Discussion Task – Sample 01

Topic: Ethical and Social Responsibility Issues

Read the following case

The Pizza Puzzle

This case represents a scenario where a local Inn in order to increase their profits from guests, decided to introduce a fake brand name to sell pizza made internally within the motel restaurant. Internal research revealed that customers did not favour pizza offered by the motel thinking they were not as tasty as pizza offered by pizza companies. Blind tests revealed that there was no quality difference between pizzas offered by the Inn versus outside companies. The company decided to deceive customers with an operation (fake brand name, dedicated telephone line, uniforms for delivery) allowing customers to think that they were ordering pizza from a company that specializes in making pizzas. (Note: Due to copyright reasons, the full case content is not reproduced here)

Review the following resources

- Refer to summary notes on Block 06 - Ethical and Social responsibility issues related to Marketing.
- Review the Code of Ethics and Standards of Practice established by the Canadian Marketing Association - See Block 06– Online Discussion 01 – Resources
- Students are required to carry out additional research (use internet based sources such as YouTube, articles in popular magazines, newspapers and blogs) in providing evidence to support the position considered. Please provide references as you cite these sources.

Answer the following questions

a) What are the relevant ethical and social responsibility issues that relate to consumer behaviour in the identified case?
b) Identify possible alternatives available to resolve the situation the company is faced with. What are the ethical/social responsibility implications for each of the alternatives identified?
c) As a group, advise the organization how to proceed. Explain specifically the courses of action that should be taken. Justify why the selected option provides the best solution to the given situation against the alternatives discussed throughout the discussion.

Important - Please read the discussion participation requirements and expectations document and the associated marking guide before you engage in the discussion.

Appendix G

Online Discussion Task – Sample 02

Topic: Privacy Issues/Social Media and Consumer Behaviour

Read the following case

The Non-anonymous Survey

This case illustrates a situation where an advertising company that offers marketing services to a local community center on a pro-bono basis decides to sell customer data of patrons without the latter or the management of the center's knowledge to a third party for a fee. Students were required to refer to the privacy act in BC and other resources and attend to the task. (Note: Due to copyright reasons, the full case content is not reproduced here)

Review the following resources

- Personal Information Protection Act of British Columbia: See Block 06– Online Discussion 02 – Resources
- Privacy and Online Behavioural Advertising – Office of the Privacy Commissioner of Canada: See Block 06– Online Discussion 02 – Resources
- Students are required to carry out additional research (use internet based sources such as YouTube, articles in popular magazines, newspapers and blogs) in providing evidence to support the position considered. Please provide references as you cite these sources.

Answer the following questions

a) What are the relevant privacy issues that surround this case? (Consider the rights of patrons of the Community Centre, the Community Centre as a client of Market Design Inc.)

b) Identify possible alternatives (for this case) that Market Design Inc. should pursue in balancing privacy of its clients (direct/indirect) and providing/using personal information collected from clients (direct/indirect) for business purposes in a legal/ethical manner.

c) As a group advise Market Design Inc. how to proceed. Explain specific courses of action that should be taken. Justify why the selected option provides the best solution to the given situation against the alternatives discussed throughout the discussion.

Important - Please read the discussion participation requirements and expectations document and the associated marking guide before you engage in the discussion.

Appendix H

Arrangement of Multivariate and Univariate Initial Test Models

Speaking Dimension	Outcome Variables		Correlation Matrix			
Attending to Others	Discursiveness		A	B	C	D
		A. Reference to Others	1	.593**	.470**	.514**
		B. Some Disagreement		1	-.252**	.150*
		C. Full Agreement			1	.256**
	Social Presence	D. Social Presence				1
	Message Tone			E	F	G
		E. Autonomous Tone		1	.430**	.144*
		F. Connected Tone			1	.157*
		G. Impersonal Tone				1
Attending to the Task	Message Structure	H. Contextual Structure				
	Argumentation	I. Refer to Evidence				
		J. Soft Evidence				
			K	L	M	N
		K. Apply Evidence	1	.548**	.552**	.759**
		L. Reasoning		1	.730**	.616**
		M. Hard Evidence			1	.604**
Degree of Participation		N. Average Words				1
		O. Number of Posts				

Three multivariate groups (highlighted in grey) were organized. They included: discursiveness (reference, some disagreement, full agreement, social presence), message tone (autonomous, connected, impersonal), and argumentation (reasoning, apply evidence, hard evidence, average words). Considering the noted moderate correlations, social presence was combined with discursiveness and average words were combined with the argumentation cluster. Soft evidence and refer to evidence were removed from the argumentation cluster considering their weak correlations. The outcome variables that were included in the three multivariate clusters and others were also modeled separately as univariate outcome variables.