Cognitive Engagement in Virtual Collaboration:

The Role of Social Presence, Sociability and Immersion

仮想的協同行為における認知的従事:

社会的存在感、社交性、イマージョンの役割

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Dedication

This dissertation is dedicated to my family, Candelaria M. Mendoza (R.I.P), Pedro A. Garcia, Abel G. Mendoza and “Samu” (R.I.P.) whose unconditional love and support gave me the strength to keep moving forward in my life journey.

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Abstract

There is an ongoing debate in the field of online education on whether or not students can be cognitively engaged at high levels in virtual environments. Previous empirical studies have claimed that the asynchronous nature of communication in discussion forums provides periods for reflection that lead to critical reasoning, creative thinking and reflective writing (Kim, Liu, & Bonk, 2005; So, 2008). Surprisingly, several studies have reported the opposite to be true and that only relatively few students were able to demonstrate high levels of cognitive engagement in virtual collaboration. The majority of students who engaged in discussions tend to remain at superficial levels of information processing, such as making social connections and providing elementary answers without further explanation (Casimiro, 2016; Shukor, Tasir, Van der Meijden & Harun, 2014). This issue of concern became the central aim of this research to investigate factors that influence fully online students' cognitive engagement in virtual collaboration.

This study used the concepts of social presence, sociability, and immersion as tools to explore students' cognitive engagement in collaborative virtual environments. The study was composed of three studies of which two collected qualitative data and one quantitative data. It first explored the levels of cognitive engagement of fully online students in virtual collaboration. Then, it investigated students' perceptions of social presence, sociability and immersion in the virtual collaborative environment. Next, it identified the relationships amongst social presence, sociability, and immersion in virtual collaboration. Finally, it discussed and drew conclusions on the influence of these three variables on the students' contribution of knowledge to the discussions and levels of cognitive engagement in virtual collaboration.

Study One explored the levels of cognitive engagement of eight groups of fully online students in synchronous and asynchronous discussions in virtual collaboration. It was a qualitative

descriptive analysis that took a naturalistic approach to analyze text-based and video-based discussions, based on the cognitive engagement categories developed by Van der Meijden (2005). Then, it explored the patterns of knowledge contribution by the students in these discussions and, finally, analyzed the quality of the discussion wrap-up reports, based on specific rubrics.

The main findings of Study One backed up previous claims that student levels of cognitive engagement are strongly influenced by the type and design of the task assigned and the type of contributions made by group members during the process. Moreover, it found out that, aside from the editors' writing skills, leaders' management skills and teamwork, other factors such as feedback, communication, and interaction among group members had a direct influence on the quality of group wrap-up reports. Finally, it caused claim that the insufficient argumentation in all discussions was another factor affecting students' cognitive engagement and prevented groups from taking discussions to the "next level", for example, the discovery of new ideas or resolution of group members' differences.

Study Two was a qualitative content analysis study that took a directed approach in examining the experiences and perceptions of social presence, sociability, and immersion in virtual collaboration of eight participants from Study One through in-depth-interviews. The questions posed were designed based on the sociability framework of Gao, Dai, Fan and Kang (2010) and a review of the literature of immersion and related areas such as Flow, cognitive absorption, and presence in virtual spaces.

Findings of Study Two demonstrated that social presence influences sociability as it contributes to stabilizing psychological safety and building social climate within virtual group collaboration. In addition, social presence and sociability can positively impact students' satisfaction with their performance; however, they may equally negatively influence students' level of cognitive engagement as high degrees of social presence become distracting and formality and

politeness of the social climate influence the way students' express their ideas. In the case of immersion, similar constructs to those mentioned in previous empirical studies on video games and three-dimensional (3D) virtual worlds were found, namely: attention, emotional engagement, and physical world detachment. It was further found that participants had two different, yet closely related immersive experiences; in the text-based discussions this was described as "a detachment from the physical world," while in the video-based discussions it was "a feeling of being transported to another place".

Study Three examined the relationships between immersion, social presence, and sociability factors by analyzing survey data of 102 users who had experienced collaboration in virtual space. The data was collected from a cross section of academia and the private sector, namely a fully online course, and blended online course, offered by an Open University in the Philippines; an online course offered by an Open University in Malaysia, an external group of students from residential universities and working adults who had experience with virtual collaboration.

The overall results of Study Three showed that indeed, the three variables -social presence, sociability and immersion- are positively and statistically significantly correlated among one another at the construct level. On the other hand, at the variable level, most variables were both positively and significantly correlated with regard to each other, with the exception of "emotional involvement" which only correlated with "detachment from the physical world".

This study provides evidence that it is possible to engage fully-online students at high-levels of cognitive engagement, which contradicts previous generalizations that students remain at low levels of cognitive engagement. However, in order for this to happen, the type of task needs to be carefully crafted. It should require students not only to apply practical but also theoretical knowledge when proposing alternative solutions to the problem in question. Further, it should

require a certain degree of interdependence among group members so that it encourages students' individual participation, interaction with other group members and lays the ground for collaboration. Within the process of collaboration, argumentation must be nurtured. Through argumentation, all group members have an opportunity to express their views, challenge existing beliefs and create an impact on the group final outcome. In so doing, students will be able to either explore ideas to their logical conclusions, discover new concepts or find resolutions of ideological differences.

To develop a suitable virtual collaborative environment for cognitive engagement to happen, firstly, psychological safety needs to be established through social presence. This is a necessary factor in maintaining a suitable degree of social interaction. If social presence is not established, interactions do not occur as desired and few users will contribute to the discussions, leading to the demise of the virtual community. Social presence, therefore, lays the foundations for building sociability which, ultimately, contributes to creating a suitable social climate. As members of the community become more familiar with each other, and feel connected, respected and cared about, they become more willing to share personal information, which in turn, facilitates discourse leading to knowledge construction.

Once social presence and sociability set the stage for the work to progress, immersion comes into play. Immersion takes social presence and connects it to sociability, taking it to a deeper level through psychological realism and feelings of closeness. It makes users become emotionally engaged while attempting to empathize with their groups mates whom they have yet to know in person. Empathy helps people to understand what others really need and, therefore, to know how they can be helped. This puts users in a more receptive state of mind, which may help to reduce communication barriers among users during conversations. At the same time, immersion brings deep thinking and the construction of mental models of the situation or problem needing to be

discussed. Therefore, it can be concluded that social presence, sociability, and immersion are three closely related variables that support the process of cognitive engagement in virtual environments.

This dissertation contributes knowledge to the fields of education technology, distance education, and psychology. It is one of the first studies to introduce the theory of immersion into the theory of virtual collaboration by exploring students' immersive experiences in virtual platforms used for work-based tasks in educational settings. Further, it explains the relationships between social presence, sociability and immersion, and how these variables are related to cognitive engagement. In addition to the foregoing, it provides a framework that explains social presence, sociability, and immersion variables that influence students' cognitive engagement in virtual collaboration.

要旨

オンライン教育分野では、高次元の仮想環境において、学習者が実際に認知的関与に到達できるか否かについて議論が交わされている。先行の実証研究からは、非同期的なコミュニケーションこそが、創造的・省察的な議論乃至批判的な思考を促す時間的な間隔を提供できる要素であると(Kim, Liu, & Bonk, 2005, So, 2008)。逆説的に、高度な認知的関与に達した生徒が参加者の中で、割合的に数少ない生徒のみであるという、こうした結果の正反対とも言える反証が得られた事例もある。議論に参加する学習者の大半は、議論されている質問に対して基礎的な回答や、社会的な交流を成立させるに努めるなど、情報処理の表面的なレベルに止まる傾向を示している(Casimiro, 2016; Shukor, Tasir, Van der Meijdenb & Harun, 2014)。上述の事情は、本研究の主目的、すなわち、オンライン学習者の仮想環境上の協同行為において認知的関与に影響を与える諸要素を調べることとなる。

本研究は社会的存在感、社交性、イマージョンの概念を、協同的な仮想環境における学習者の認知的関与を探究する道具として使用する。本研究は 2 つの定性的研究および 1 つの定量的研究から構成されている。第一に、仮想的な協同行為に対する完全にオンライン環境のみにいる学習者（以下：オンライン学習者）の認知的関与の度合いを調査する。そして、仮想的な協同行為において、社会的存在感、社交性及びイマージョンの概念が、どのように学習者の認知的関与に影響を及ぼすかを研究する。最後に、上記の三つの要因の間の繋がりを特定し、これらが認知的関与に与える影響を巡って、結論を導き出す。本研究では、第 1 章に提起された三つの研究問題に対応する形で、相互に関連性を持つ 3 点の独立した論文をもって、答えを提示する構造を採用した。

研究１は、仮想的な協同行為上の同期的・非同期的な議論（Recitation 1：ピアザのテキストによる議論、Recitation 2：Google のハングアウトでビデオによる議論）おいて、8 つのグループに属する完全オンライン学習者の認知的関与のレベルを調査する論文である。この研究は、認知的関与のカテゴリーを定義した Van der Meijden (2005)の理論に基づいて、動画もしくは文章を媒体とする議論を分析するにあたって、自然論的なアプローチによる記述式な定性的手法を採用した。上記と共に、対象の議論における学習者の知識的な貢献のパターンを研究し、そして、最後に、特定の評価基準に基づいて、要約レポートの質を分析した。

研究 1 の主な発見は、学習者の認知的関与は、与えられた課題の設計と他のメンバーの貢献の種類によって大きく影響されているという先行研究で提唱されたような主張を裏付ける結果となった。さらに、編集者の文章力、リーダーらの企画力と協同作業、フィードバック等のような要因の如何にかかわらず、コミュニケーションや各グループメンバー間の交流が、議論の要約レポートの質に直接影響を及ぼすことが確認された。すべての議論で見られた不完全な論説は、学習者の認知的関与を決定的に左右させ、メンバー間の意見対立や新しい発想の創出などといった議論の高次元化を妨害するものであったと最後に結論付ける。

研究 2 は、研究 1 の参加者 8 名に対して行われた綿密な個別インタビューを通じて、仮想的協同行為における社会的存在感、社交性及びイマージョンに対する認識と体験を対象とする、指向的なアプローチを用いた内容分析を行う定性的研究である。インタビューの設問は、Gao, Dai, Fan and Kang (2010)によって提唱された社交性枠組みと、フロー、認知的専心性（cognitive absorption)、仮想環境での存在感とイマージョン

に関する領域の文献に基づいて考案された。

研究 2 が確認したところによると、社会的存在感はグループ内の仮想的な協同行為での社会環境を樹立させることによって、心理的安心感を安定化させることに寄与する。さらに、社会的存在感と社交性には、学習者が自己のパフォーマンスに対する満足度を向上させる効果がある。しかし、高度な社会的存在感が注意力を低下させる他、社会環境での礼儀正しさが学習者が持つ自らの考えの表現方法に制約をかけることから、こうした要素が同時に学習者の認知的関与に好ましくない作用を及ぼすこともある。イマージョンに関しては、「注意力」、「情緒的な関与」、「物理的世界からの離脱」といった参考文献で取り上げられるような要素が確認された。上記に加え、参加者が体験したイマージョン自体が異なるものの、こうした体験が密接に関連し合っていることが伺える。Recitation 1 では、参加者が自らの体験を「物理的世界からの離脱」のように表現したのに対し、Recitation 2 の参加者は、「別の場所に連れて行かれたような感覚」として叙述した。

研究 3 では、仮想環境で協同行為を経験したことのある 102 の利用者に対して実施された調査を分析し、イマージョン、社会的存在及び社交的な要素の間の関係を繙いていく。データは、フィリピン及びマレーシア両国の大学がそれぞれ提供するオープンキャンパス主催の完全オンライン講座並びに部分的なオンライン講座、そして、仮想環境上の協同行為に経験を持つ大学宿舎在住の学生と社会人から構成されるグループといった官学両部門から採取された。

研究 3 の結果を要約すると、社会的存在感、社交性、イマージョンの 3 つの変数は相互に、明確且つ正比例的な相関性を持っていると言える。一方、変数の次元において、

「物理的世界からの離脱」に限った相関性を持つ「情緒的関与」を除いて、変数の大半は、相互に正比例の確かな相関性があることが分かった。

本研究はオンライン学習者を高度な認知的関与に参与させることが可能であることを証明し、学習者の認知的関与が低度に止まることを唱える一般的な見解に反論する形になっている。しかし、こうした状況を作り出すためには、課題が慎重に計画されなければならない。これは、学習者に対して、特定の問題への解答を呈する際に実践的な知識のみならず、理論的な知識の応用を要するものである。さらに、学習者の個人的な参加と他のメンバーと交流を促し、協同を可能にする一定の相互依存関係を必要とする。また、協同行為が展開される過程で、討論が養成されるべきだと考えられる。討論の展開を通じて、各メンバーには自己主張を行う機会が与えられ、グループの最終的な結論に寄与するに当たって、既存の固定観念に挑戦することができる。こうした過程にいて、学習者には自己の発想を検証したり、論理的な結論を導き出したり、新しい概念を創り出したり、思想的な対立を超越したりするなどの機会が与えられる。

認知的関与に必要な仮想的な協同行為を可能にする環境を作るに当たって、心理的な安心感は社会的存在感をもって確保されなければならない。これは、適度の社会的交流を維持するために必要な条件である。社会的交流が相応でない場合、議論に参加するユーザーが減り、仮想的な共同体の崩壊に至りかねない。このため、社会的存在感は、社交性の基礎となる要素であり、適切な社会環境を築き上げることに寄与する。グループメンバーは親しくなり、互いに認め合い、思いやり合うようになっていくにつれて、知識の構築に繋がるような言説を活発化させる個人情報の共有に賛同しやすくなる。

社会的存在感と社交性が協同行為の基礎条件を敷設した後に登場するのは、イマージ

ョンである。イマージョンは社会的存在感を社交性に掛け合わせることで、これらを高次元の心理的現実性と臨場感へと昇華させる。これにより、ユーザーが以前実際に知り合ったメンバーと交流する中で、情緒的な関与を持つようになる。思いやりは他人が何を必要としているのかを理解することを助け、すなわち、いかにして他人に便宜を供与することができるかということに思い至らしめるものである。思いやりはユーザーの心理を寛容にし、コミュニケーションを妨害する障壁を取り除くのに役立つ。同時にイマージョンは、与えられた課題や状況を巡って、思考を深化させ、メンタルモデルの構築をもたらす。このため、社会的存在感、社交性及びイマージョンは、仮想環境上の認知的関与に至る過程を支える、密接に関連し合っている変数であると結論付けられる。

本発表は教育技術、遠隔学習及び心理学の領域を拡大させることを目的とする。これは、イマージョン理論を教育現場における課題解決プラットフォームに使用される仮想環境上の学習者による協同行為での経験調査に先駆ける研究の一つである。さらに、本研究は社会的存在感、社交性、イマージョンの相関性の他に、こうした要素が認知的関与と如何にして繋がっているかを示すものである。上記に加え、社会的存在感、社交性とイマージョンに関わる、認知的関与に影響を与える要素を説明する枠組みを提供する。

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CHAPTER 1

Introduction

This chapter starts by providing an overview of current research on virtual collaboration and common factors that influence cognitive engagement of students in virtual collaborative environments. There then follows an introduction into the main purpose and research questions employed in this study, along with the research's significance to the field of online education and education technology. It concludes by outlining the issues that are addressed by the study.

Background of the Study

Not long ago, *space* as a concept belonged exclusively to the physical world; this is now no longer the case, as it has been redefined by a new world built of light, zeros and ones. This *virtual world* has allowed human consciousness to be transported to a visual-spatial dimension (Benedikt, 1991; Silva, 2005). Its ever increasing presence has unfolded new landscapes of ideational and electronic complexity where language becomes not only an expression of the human body, but also the content of an idea expressed, as a data image, that can be transported globally (Keating & Mirus, 2003). It has become an extension of the human conceptual space mediated by interfaces of computing devices, which, in turn, function as boundaries between the perceptual world of humans and the conceptual world of digitalized information.

The virtual world has not only become an extension of the human consciousness, but also an extension of the human social environment (Anders, 2001). Human interactions, of both a private and public nature in the physical world, have become displaced to that of the virtual world and with this displacement, the way human communication, interaction and the development of

relationships with others has also radically changed. People have become adept at engaging in the process of building virtual relationships in virtual communities while shaping their online personas simultaneously (Hillis, 1999). In this modern world, individuals gather in *virtual spaces*, within the virtual world, such as Facebook, Twitter, LINE and the like, to either share information, collaborate or simply socialize.

Virtual spaces are de facto *virtual platforms* used by virtual communities to engage in both formal and informal conversations that stimulate interests and encourage peer learning (Ko, 2012). This is especially true when virtual community members engaged in *collaboration* to achieve common goals. The term collaboration here can be taken to mean "work together to understand and formulate an information need through the help of shared representations; seeking the needed information through a cyclical process of searching, retrieving and sharing; and put the found information to use" (Karunakaran, Reddy, & Spence 2013, p.2). Collaboration in virtual communities, herein shortened to *virtual collaboration*, provides opportunities to explore socio-cultural issues to a great extent with the understanding of constructivist theories, which explain the development of knowledge as the result of social interaction rather than individual exploration (Palloff & Pratt, 2005; Shukor, Tasir, Van der Meijden, & Harun, 2014). Constructivism, together with the socio-cultural theory and the transformative learning theory of learning, explains that individuals create their perceptions of the world through social interactions with other individuals within society. The acquisition and construction of knowledge are active processes that happen through discourse with more knowledgeable individuals. Connectivism supports these views and explains that learning rests in the diversity of opinions, the connection of sources and the nurturing of one's social network in a digital ecosystem supported by web-based technologies.

The construction of knowledge, from a constructivist perspective, requires that individuals become involved in active and continuous interaction and exchange of thoughts at a group level

before they internalized new knowledge at an individual level. *Cognitive engagement*, therefore, becomes a crucial element in the process of virtual collaboration. Corno and Mandinach (1983) point out that cognitive engagement occurs when a student gives sustained attention to a task that requires mental effort, and that authentic useful learning is produced by extended engagement in optimally complex cognitive activities. In the formal educational setting, this is apparent in virtual discussion forums which connect students in synchronous and asynchronous ways. McConnell (2000) argues that these virtual spaces allow learners greater freedom in exchanging ideas, opinions, facts, experiences, and expectations; similarly, Suthers (2006) claims that in such spaces learners can create a learning culture, wherein participatory and inter-subjective meaning-making are promoted beyond time and space. Previous empirical studies indicate that students communicating in asynchronous ways posted more messages of higher-levels of knowledge construction than they did messages in synchronous communication (Van der Meijden, 2005; Veerman & Veldhuis-Diermanse, 2001). One of the reasons for this is the time that asynchronous nature of communication actually requires, which provides periods for reflection and the processing of information (Kim, Liu, & Bonk, 2005, Veerman & Veldhuis-Diermanse, 2001) which, in turn, promotes critical reasoning, creative thinking and reflective writing (So, 2008).

Surprisingly, several studies have reported the opposite to be true and that only relatively few students were able to demonstrate higher levels of cognitive engagement in virtual spaces (Asif, Vertejee & Lalani, 2015; Casimiro, 2016; Chou, 2002; Guan, Tsai, & Hwang, 2006; Perkins & Murphy, 2006; Shukor, Harum, & Tasir, 2011; Shukor, et al., 2014; Zhu, 2006). The majority of students who engage in virtual collaborations tend to remain at superficial levels of information processing, such as making social connections and providing elementary clarifications without further explanation. This apparent contradiction has been attributed to different factors that affect students' contributions, such as the course being undertaken and discussion requirements (Guan,

Tsai, & Hwang, 2006; Perkins & Murphy, 2006), students' ICT skills and knowledge, prior knowledge in the subject under discussion, and the low virtual presence of the facilitators (Asif, Vertejee, & Lalani, 2015), as well as students' cultural backgrounds (Casimiro, 2016), among others. Interestingly, a common view amongst the authors is that in addition to instructors and facilitators being involved in the discussions, it is the design of the activity, as well as the characteristics of the task which play a crucial role in students' cognitive engagement. However, as yet, they have failed to provide evidence to back up these beliefs. Most of the studies have compared their findings to studies which used different coding schemes (Bloom's Taxonomy, Henri's framework, Perkins and Murphy's analytical model, Van der Meijden's coding scheme, Zhu's analytical model, etc.). There has been no measuring and comparing of different types of tasks/activities using the same coding scheme in any single study. This is one of the reasons why the generalization of their results is problematic.

Two crucial factors, often mentioned in the literature, influencing students' performance in virtual collaboration, and with it, cognitive engagement, are *social presence* and *sociability.*

Social presence is considered a key element for human interaction in both physical and virtual settings. Based on a review of a variety of definitions previously suggested, this study refers to social presence as the psychological awareness of being connected and interacting with a real person within a virtual environment (Garrison, Anderson, & Archer, 1999; Gunawardena & Zittle, 1997; Heeter, 1992; Kreijns, Kirschner, Jochems, & Buuren, 2004; Lombard & Ditton, 1997; Short, Williams, & Christie, 1976; Tu & McIsaac, 2015)

According to Slater, Linakis, Usoh and Kooper (1996), social presence is concerned with the way human beings respond physically and psychologically to a virtual environment and the way human behavior in the virtual world matches that in real life. Some studies claim that a high sense of social presence in a virtual space enhances the performance of its users (Bowman &

McMaham, 2007; Witmer & Singer, 1998). Jerome and Witmer (2004) studied the relationship between presence and performance using data from five different studies and found that the sense of presence in virtual environments had a direct causal relationship with performance. Similarly, Beer, Slack and Armitt (2005) reported that social presence was helpful in enhancing collaboration and team-work; and Mikropoulos (2006) found that the use of avatars enhanced social presence, which had a positive impact on student performance.

Nevertheless, the influence of social presence on users' performance in virtual spaces has been questioned and criticized by others. Slater, et al. (1996) compared students' performance in 3D (tridimensional) and 2D (two-dimensional) virtual spaces and found that indeed social presence was highly perceived by the participants in the 3D virtual space. However, the results did not reveal any significant impact on the participants' performance. Similar findings were reported by Ustun and Pazos (2012) who claimed that the level of social presence had no significant correlation with performance. Their study compared the performance of a group of students who used a 3D virtual world with another group who used a web-conferencing meeting space. The results showed that the participants who interacted via the 3D virtual world perceived higher levels of social presence, but they reported lower levels of group performance satisfaction in comparison to their counterparts. According to Slater et al. (1996), higher levels of social presence cause users to behave in similar ways to those of the physical world. Consequently, it can be stated that social presence, per se, does not enhance performance, but that it only brings into play natural reactions to a situation, which will not necessarily enhance students' performance.

Findings from the studies above seem to be contradicting. Some studies support the idea that social presence influences performance; whereas others suggest that not to be the case. One possible reason for this disagreement may be the unsettled definition of social presence. According to Slater (2003), when people talk about social presence, they are often referring to different

concepts. Lombard and Ditton (1997) say that this is in part because researchers interested in social presence come from many varied academic fields. Evidently it is important to propose a terminology that will clear up the confusion; otherwise, another study on social presence may not bring anything new to this debate. A second explanation of this contradiction may be the over generalization of the term performance which makes it difficult to draw a conclusion about the influence of social presence on cognitive engagement. Performance does not necessarily translate into cognitive engagement. Every task requires selected individuals to use different skills and engage cognitively at different levels.

Sociability is another important factor when considering the influence of cognitive engagement in virtual collaboration. Kreijns, Kirschner, Jochems and Buuren (2004) refer to sociability as "the extent to which a computer-supported collaborative learning environment is perceived to be able to facilitate the emergence of a sound social space with attributes such as trust and belonging, a strong sense of community, and good working relationships" (p.157). According to Garrison, Anderson and Archer (1999), social presence supports cognition by facilitating indirectly the process of critical thinking carried on by an online community. Aligned with this idea, Kreijns et al. (2013) claim that cognitive engagement happens in a social space where trust, sense of community, and strong interpersonal relationships exist. This is influenced by the degree to which people experience each other as real in the communication. Gao, Dai, Fan and Kang (2010) call this suitable and comfortable atmosphere for social interactions *social climate*. Casimiro (2016) shares similar thoughts to Kreijns and Gao et al. but adds that socialization supports discourse which in turn leads to knowledge construction. Casimiro, however, says that a learning community is supportive of discourse only up to a certain extent and that when intellectual conflicts occur among members, they tend to shy away from engaging in critical discourse. This action is considered to be a way of preserving good relationships among the group members. Therefore,

policies play a vital role in regulating unfriendly or inflammatory behavior amongst team members (Asif, Vertejee, & Lalani, 2015; Gao et al., 2010).

In 2010, Gao et al. (2010) published a paper on a series of studies that identified and validated factors that influence sociability in virtual communities. They gathered 46 items from a literature review and 44 items from in-depth interviews with internet users and inserted them into an initial pool. They identified three similar factors as those previously found by Preece and Maloney-Krichmar (2003) called *policy, people* and *purpose*. However, in Gao's study, they were referred to as *social climate, people*, and *purposes and benefits*. The first, social climate, as mentioned earlier, refers to a suitable and comfortable atmosphere for social interactions; the second, people, refers to the number of members that can be easily reached through the social software, and the third, purposes and benefits, refers to the users' individual expectations of online interactions. In addition to these three factors, Gao's team found three more factors: interaction richness, how easily users can customize the way they interact with other users; self-presentation, how well social software helps users convey an impression of themselves to other users and develop their reputation through the system; and formal interactions, formal communication characterized by structured relationships, organized conversations and the formal language registered. Gao's study did not finish there; further analyses were carried out to find the correlations of these six factors with sociability. The results showed that any affect on sociability depended on the type of social software employed and the type of social interactions it supported. For e-mail, social climate strongly contributed to sociability whereas for blog applications and Social Network Systems (SNS) interaction richness and people were the contributors, for instant messaging applications all six factors were found to contribute significantly to sociability.

Gao et al. (2010) provided theoretical and practical contributions to the design and evaluation of social software. More importantly, they explored and verified six sociability factors, through a combination of qualitative and quantitative methods, which resulted in a reference framework to evaluate software application performance along with sociability dimensions. However, both of their studies focused exclusively on analyzing social software and did not explore factors that possibly support sociability in the software used for educational purposes. Moreover, they failed to explore the context of students who were enrolled in fully online universities, their data was collected from students who were enrolled in a residential university. It is likely that perceptions of sociability, in virtual spaces, are affected by face-to-face interactions in the physical world and therefore, the results of an identical study may differ when considering online students who have not had the opportunity to meet their classmates face-to-face or have sporadic face-to-face interactions.

To date, research on virtual collaboration has predominantly focused on investigating social factors in order to understand students' cognitive engagement. This can be clearly seen by the large number of studies on social presence and sociability existent in the field. These studies have ignored a specific factor strongly related to attention, focus and willingness to concentrate: key elements to become cognitively engaged. This factor is called *immersion*.

Jerome and Witmer (2004) refer to immersion as "having a feeling of being there in the artificial environment and to become removed from real-world stimuli" (p. 2613). According to McGreevy (1992), immersion is dependent on a human's attention to continuities, connectedness, and coherence of a stimuli flow. Likewise, Witmer and Singer (1998) say that immersion relies on how well individuals connect within the virtual environment stimulus, rather than the novelty of the technology in use. Fully immersed individuals, therefore, are those who feel themselves to be

interacting directly with the virtual environment. However, to become fully immersed is not a one-step process, but rather a process with several levels which indicate the degree to which a person becomes immersed in a virtual space. A review of the literature of immersion in virtual spaces reveals that there are at least four stages to the process.

At the superficial level, immersion requires attention and willingness to concentrate. Nakamura and Csikszentmihalyi (2014) state that intense and focused concentration in what one is doing, in the present moment, is one of the main conditions to enter a subjective space. Similarly, Witmer and Singer (1998) say that for individuals to become engaged in any activity, they need focus their energy and attention to coherent stimuli or meaningful activities and events. In a study with video game players, Brown and Cairns (2004) identified three sources of attention: visual, auditory and mental. They claimed that the level of immersion felt by gamers correlated to the number of attentional sources experienced and the degree to which each was experienced.

Secondly, immersion involves emotional engagement. Nakamura and Csikszentmihalyi (2014) argue that it is important for individuals to tackle a series of manageable goals in order to make any activity extrinsically rewarding. In effect, a feeling of being challenged is crucial to having an immersive experience. In the same way, Jennett, Cox, Cairns, Dhoparee, Epps, Tijs and Walton (2008) say that emotional involvement is key in video game immersion. In an experiment with video game players, Jennett's team noticed that gamers who became caught up in challenging tasks also became highly engaged emotionally. According to Brown and Cairns (2004), there is a high level of emotional investment when putting effort into, and paying attention to, an activity which may lead people to the point of feeling emotionally drained.

Thirdly, multi-sensory stimulation is important to perceive immersion. Slater, et al. (1996) claim that the reason extensive and surround displays tend to be considered immersive is because they accommodate multiple sensory systems. The information in such virtual environments can

also be received by users' sense organs from multiple directions. According to Höll, Leplow, Schönfeld and Mehdorn (2003), most users rely exclusively on auditory and visual sensations, which is a limitation in getting additional information from virtual environments. Bowman and McMahan (2007) say, therefore, that it is important to design systems that stimulate different senses. The more senses a system stimulates, the more it allows individuals to construct their own internal mental models of reality, and at the same time, the higher the levels of sensory fidelity a virtual space provides, the more similar to those real world senses they become

Finally, immersion creates a feeling of physical-world detachment. The combination of time and effort investment and emotional engagement may lead individuals to keep working on a certain task, leading to a feeling of total immersion. At this point, the individual feels cut off from reality to the extent that the activity undertaken is all that matters. Jennett et al. (2008) believe that total immersion could be the precursor for Flow which, according to Csikszentmihalyi (2008), provides individuals a sense of discovery and a creative feeling of transporting themselves into a new reality.

Immersion can provide students with a perception of existence within the virtual environment, causing them to be completely attracted by, and involved in, the activity. According to Witmer and Singer (1998), students have more meaningful experiences if they perceive themselves to be inside the virtual world. They postulated that learning improves when individuals are in an integral part of the stimulus flow, and that meaningfulness and active control over a user's experiences aids learning. Similar thoughts are shared by Dede (2009) in an article on information technology used by children. He discusses the theory that immersive virtual environments can shift students' frames of reference from being exocentric (a view of a phenomenon from the outside) to egocentric (a view within the phenomenon) leading to a more embodied and concrete learning experience. According to Zhou and Deng (2009), this happens because when people become a part

of the world constructed in their minds, the imaginary world becomes a virtual reality. This, they argue, can enhance students' confidence in their academic abilities by facilitating the transfer of knowledge to the real world via simulated situations. Brown and Cairns (2004) believe that becoming fully immersed could be advantageous in carrying out more traditional work-based tasks. For them, it is clear that engagement, and possibly engrossment, are necessary parts of the learning process. Better educational software for engaging students in learning could be developed through a better understanding of immersion and its manipulation.

Although immersion is a term commonly found in studies focusing on virtual spaces; it is barely mentioned in studies dealing with virtual spaces for learning and collaboration. Past research on immersion has been limited to explaining users' experiences with video games and 3D virtual worlds, leaving other virtual platforms, commonly used for work-based tasks, barely investigated. It is not clear, therefore, whether individuals become immersed in more traditional virtual platforms, used in educational settings, such as Moodle or Piazza. Further, only limited research has been conducted towards understanding which components cause students to feel immersed in such virtual platforms and if these components differ from those of 3D virtual worlds. By incorporating the theory of immersion to the study of virtual collaboration, it opens a new door to explore deeper the conceptual spaces, which may lead to the discovery of other factors that influence cognitive engagement in virtual collaboration.

Research Purpose and Questions

This research aims to explore students' cognitive engagement in collaborative virtual environments using as tools the concepts of social presence, sociability and immersion. Its main objective is the development of a framework that explains cognitive engagement in virtual collaboration encompassing three variables – social presence, sociability and immersion. The

research empirically explores cognitive engagement of fully online students in synchronous and asynchronous discussions whilst engaged in virtual collaboration. It then incorporates the concept of immersion into the social presence and sociability theory in order to create a framework; enabling a deep exploration of online students' perceptions and experiences with virtual collaboration. It goes on to collect quantitative survey data, allowing for the analysis of relationships amongst social presence, sociability and immersion. Finally, based on its main findings, it discusses the impact of these major factors on students' levels of cognitive engagement.

The key research questions that this study seeks to answer are:

I. What are the levels of cognitive engagement of fully online students in synchronous and asynchronous discussions in virtual collaboration?

II. What are the perceptions of social presence, sociability and immersion of fully online students in the virtual collaborative environment?

III. What are the relationships amongst social presence, sociability, and immersion in virtual collaboration?

Significance of the Study

This study is of particular significance in the domain of education technology and online education as it contributes to research on virtual collaboration. It offers important insights in helping to understand social and psychological factors affecting students' cognitive engagement when collaborating virtually in groups. It is one of the first studies that attempts to incorporate the theory of immersion into the theory of virtual collaboration, in the formal educational setting, and examine its relationships with social presence and sociability. Furthermore, it attempts to explain the relationships between social presence, sociability, and immersion and how these variables can predict students' cognitive performance. At the same time, it refines and validates previously used

instruments to measure students' levels of cognitive engagement and their perceptions of social presence, sociability and immersion in virtual environments. Finally, it provides a framework that explains specific social presence, sociability and immersion variables that influence students' perceived performance. Future online instructors, online community developers, and instructional designers may be able to optimize students' performance utilizing a broader understanding of the social and psychological factors affecting students' cognitive engagement in virtual environments provided by this study.

The Scope of the Study

The research of virtual collaboration currently available throws up three main problems which will be addressed by the present study as follows: firstly, by treating the problems as three separated studies, using qualitative and quantitative methods to collect data; Secondly, gathering the results of each study to identify trends and finally, drawing conclusions and implications from the results of each study.

Previously discussed empirical studies have claimed that students remain at low levels of cognitive engagement whilst in virtual collaboration but have yet to provide evidence to back up these claims. To date there has been no measuring and comparing of different types of tasks using the same coding scheme in any single study and consensus among researchers on the coding scheme is still needed. In an attempt to address this problem, **Study One** in the present research applies a coding scheme system previously used by five studies to measure cognitive engagement in virtual collaboration and explores how its results differ from those of previous studies by looking into the design of the activity. In addition, it analyzes patterns of student's patterns of knowledge contribution and the way such patterns influence cognitive engagement during the collaborative activity.

Social presence and sociability are widely considered to be key factors influencing students' performance, and along with it, their cognitive engagement. Previous studies have used different conceptualizations of social presence and overgeneralized the term performance making it difficult to compare studies in order to draw wider conclusions. Although some empirical studies claim high levels of social presence enhance users' performance it is not yet clear whether social presence enhances students' cognitive engagement in virtual collaboration. Moreover, social presence is associated with immersion (Brown & Cairns, 2004). Virtual spaces that generate high levels of immersion produce high levels of social presence (Bowman & McMaham, 2007; Witmer & Singer, 1998); however, care must be taken over such claims as they have mainly come from studies on video games and 3D worlds with high levels of virtuality. Immersion has hardly been explored in virtual platforms with low levels of virtuality, commonly used in the formal educational setting. The subjective experience of immersion is a factor that cannot not be ignored as it comprises attention, focus and effort which are crucial for students to become cognitively engaged.

As for sociability, work undertaken by Preece (2001) established preliminary frameworks to describe factors that support sociability in online communities. Later, Gao et al. (2010) explored sociability factors that influence sociability in virtual communities resulting in the creation of a reference framework to evaluate social software performance alongside six sociability dimensions. Both studies, unfortunately, focused exclusively on analyzing social software and failed to explore factors that support the sociability of software used for educational purposes. Despite online forums being considered a part of Gao's study, the data collected was insufficient to determine if the same sociability factors had an equal impact on virtual collaboration.

Study Two of this research, therefore, takes a directed qualitative approach to examine, through in-depth interviews, the perceptions and experiences of social presence, sociability, and immersion in virtual collaboration amongst fully online learners based on a theoretical framework.

In doing so, it will address gaps in previous research described above. The results of study two will, in turn, be used to further explore and interpret the main findings of Study One.

Finally, it is important to remember that the relationships, if any, amongst social presence, sociability and immersion in virtual collaboration remain unclear. There has not yet been a study that explains how these three constructs are related to each other. To address this issue, **Study Three** in the present research investigates the relationships between social presence, sociability and immersion variables through a quantitative correlational analysis. The data of a large group of users with experience of virtual collaboration is collected by using previously validated social presence and sociability scales by Kreijns et al. (2004), and the immersion questionnaire by Jennet et al. (2008). Furthermore, it explores which factors in each construct are strongly related to students' perceived performance. Findings in Study Three will be interpreted based upon those of Studies One and Two and used to explain the influence of social presence, sociability and immersion on cognitive engagement.

CHAPTER 2

Review of Literature

This chapter reviews the literature on cognitive engagement in virtual collaboration. The chapter introduces the concepts of virtual world and virtual spaces, this is followed by a description of the theories behind virtual collaboration. Previous empirical studies on cognitive engagement in virtual environments are then reviewed, before the main factors influencing cognitive engagement – social presence, sociability and immersion are revised. Finally, the instruments that will be used to collect data in the present study are presented.

The Virtual World

Computers and web-based technologies have added levels of visual communication to the distribution of information which has taken language to a more tactile and visual dimension. This has led to the creation of a new world, in which human beings can share digital information and engage with knowledge, while building relationships with others through online personas. This conceptual world has come to be known as the virtual world.

In a TED Talk in 2010, Amber Case, a cyborg anthropologist who studies the ways humans and computers interact and evolve together, explained that for many years people have used a wide variety of different tools as extensions of their physical self. For instance, “a hammer is an extension of your fist; a knife is really an extension of your tooth…” and, now the virtual world has become an extension of the human consciousness. Similarly, Silva (2005) associates our memory and the storage of ideas in our brains with the world of computerization, and believes the

virtual world emerged as extensions of the thoughts stored in people's brains.

Benedikt (1991) describes the virtual world as "the silent space in which human memory and identity are transported globally" (p. 36), and Heim (1998) says that it is a space made up of information. Novak (as cited in Hillis, 1999) shares a similar view and refers to it as the "spatialized visualization of all information in the global information process systems [that] enable full co-presence and interaction of multiple users" (p. xiv). Benedikt believes that the virtual world connects the senses of the human body to what can be described as computer cross-breeding of the real and the simulated. It is a new form of human experience that becomes tangible through interaction with media. These human-media interactions happen on a daily basis through the interfaces of computers, smartphones, and similar devices, which function as boundaries between the perceptual spaces of humans and the spaces of digitalized information.

The virtual world has not only become an extension of the human consciousness, but also an extension of the human social environment (Anders, 2001). People's interactions both of a private and public nature, that once belonged exclusively to physical spaces, have been displaced to *virtual spaces*. These spaces have generated new methods of reaching out and engaging with others on a global scale. Hillis (1999) believes that virtual spaces have the potential to remap the modern experiential distance and change the very concept of human embodied relationships with the world.

According to Keating and Mirus (2003), virtual spaces unfold and expand new landscapes of ideational and electronic complexity where language is not only an expression of the human body but the content of an idea expressed as a data image. It creates a situation where not only can human beings interact with others, but also with the content itself. This is demonstrated where readers are able to select parts of hypertext (text which is not constrained to be linear) on web pages and interact with the information while navigating and reading through a document via multiple

paths. What is more, readers are able to alter the way in which text and other visuals are created to express themselves dynamically using sound, color and motion.

However, virtual spaces are not all alike. Barnes (2011) explains that the *level of virtuality* of virtual spaces ranges from very low to high. Some examples of virtual spaces with low levels of virtuality are virtual platforms used for quick communication such as online forums, chats and blogs. On the other hand, examples of virtual spaces with high levels of virtuality are 3D games and virtual reality games which create a sense of immersion in a parallel world. It has been said that virtual spaces with high levels of virtuality can stimulate more bodily senses than those with lower levels and trigger similar patterns of behavior to those displayed in the physical world.

The virtual world has become an extension of both the human consciousness and social environment. In other words, it has become an extension of individuals' conceptual and social spaces. In existing literature there seems to be that no clear distinction between the virtual world and virtual space; indeed authors have used these terms interchangeably. Throughout this study the virtual world refers to *the complete spatialized visualization of all global information*. The term virtual spaces refers to *any virtual (online) platform developed for a specific purpose whether it be socializing, collaborating or simply sharing information, pictures, etc*. It can be stated therefore, that there exist, within the virtual world, distinct virtual spaces, individual spaces, where users gather for a single particular purpose or multiple purposes.

Theories of Virtual Collaboration

The origins of virtual collaboration are rooted in constructivist theories which explain the development of knowledge as the result of social interaction rather than individual exploration (Palloff & Pratt, 2005). *Constructivism* is a learning theory in the area of psychology that explains how people acquire new knowledge from a cognitive perspective. It posits that learning is an active

and constructive process, in which the individual becomes a constructor of information. That is to say; people construct their own understanding and knowledge of the world through experiencing things and reflecting on those experiences. Constructivism does not deny the existence of the real world, as it might be assumed, but maintains that what individuals know of the world stems from their interpretations of their experiences (Ertmer & Newby, 1993). Consequently, constructivists give great importance to culture and context in understanding what occurs in society.

Constructivism is closely associated with theories developed by Piaget and Vygotsky whose views of learning are profoundly focused on the social process. Piaget (1968) claims that learning is a dynamic process which involves successive stages of adaption to reality in which learners actively construct knowledge by creating and testing their perceptions of the world. In the same vein, Vygotsky (as cited in Cole, John-Steiner, Scribner, & Souberman, 1978) claims that "children generate opportunities for intellectual development while imitating elders in culturally patterned activities" (p.129). He claims that both playing and formal instruction play a crucial role in creating a Zone of Proximal Development (ZPD) in which young individuals elaborate socially available skills and knowledge which are later internalized. Both Piaget and Vygotsky see learning as an active process of creating meaning not only through interactions with their environment but also through interactions with more knowledgeable individuals who live in those environments.

Another theory that can be related to virtual collaboration is *the socio-cultural theory* by Vygotsky which states that human beings develop higher cognitive functions out of social interactions. Vygotsky combined the social with the cognitive arguing that people help peers to learn more effectively because they offer other perspectives and experiences. Based on Vygotsky's ideas, it is argued that collaboration can be explicit, relying on social experiences with others, and implicit, drawing on the voices that rise out of those social experiences and that echo in the writer's mind (Decosta, Clifton & Roen, 2010). Similar to Constructivism, the social-cultural theory claims

that individual's development is embedded in social events and their interaction with other people, objects, and events within the environment. Thus, from this perspective, the development of individuals cannot be understood by only studying individuals themselves but also by examining the external social world in which those individuals developed (Scherba de Valenzuela, 2002).

Further, virtual collaboration can be related to the *transformative learning theory* which encourages learners who live in the contemporary society to make their own interpretations rather than act on the purposes, beliefs, judgments, and feelings of others. Mezirow (1997) argue that learners must become critical of their own and others' assumptions to facilitate transformative learning. They must find a frame of reference and use their imagination to redefine problems from different viewpoints. From this perspective, learning is considered a social process in which discourse plays a crucial role in making meaning. Through discourse, learners can validate their understanding to establish new points of view or transform that point of view and arrive at a certain conclusion or judgment. Consequently, participation, as well as interactions in small group discussions, is considered a significant element that must be fostered and assisted among students in virtual environments.

Finally, *Connectivism* is another learning theory which can also be associated with collaboration in virtual settings. This theory seeks to explain how web-based technologies such as virtual discussion forums, wikis, and Social Networking Systems (SNS) have created new opportunities for people to learn and share information amongst them. It emphasizes that knowledge is no longer gained exclusively through experience, but also through connections in one's networks. As Siemens (2005, para. 25) explains, "Personal knowledge is comprised of a network, which feeds into organizations and institutions, which in turn feed back into the network, and then continue to provide learning to individuals."

Among the eight core principles of Connectivism defined by Siemens (2005), three are in

line with the theory of current study: a) Learning and knowledge rest in diversity of opinions; b) Learning is a process of connecting specialized nodes or information sources, and c) Nurturing and maintaining connections is needed to facilitate continual learning. These principles emphasize that knowledge and understanding happen through the extension of the individuals' personal network. Although Connectivism is a theory which is still in development, it is taken into consideration because it addresses the impact of new digital tools on the creation and sharing of knowledge among networks in the current digital age.

To sum up, Constructivism, the socio-cultural theory and the transformative learning theory of learning explain that individuals create their perceptions of the world through social interactions with other individuals the society. The acquisition and construction of knowledge are active processes that happen through discourse with more knowledgeable individuals. These theories laid the groundwork for new theories such as Connectivism which explains that learning rests in the diversity of opinions, the connection of sources and the nurture of one's social network in a digital ecosystem supported by web-based technologies. These theories put together become the basis to understand the importance of collaboration in both the physical and the virtual world, and therefore, they become the theoretical framework of the current study.

Collaborative Virtual Spaces

Virtual spaces, created and maintained by state-of-the-art internet-based technologies, have radically changed the way people communicate and socialize. Social and collaborative virtual environments began to be heavily utilized after the introduction of the Web 2.0. Internet users were no longer merely receivers of information, making postings, with opinions, onto blogs, discussion forums, chat rooms and other virtual spaces thus becoming more productive and active. As a result, seeking out information through network contacts as well as collaboratively building understanding

with others, engaged in similar pursuits, became more and more relevant to users (Pegrum, 2009).

In recent years, students have become more and more interconnected through new virtual platforms such as; Facebook, Twitter, and LINE, to name a few, both inside and outside their classrooms. They engage in the process of building virtual communities with classmates, friends and others, while shaping their virtual identities. They collaborate, exchanging opinions and suggestions, to achieve compatible goals. In this way, information sharing and information seeking have become two primary activities in *collaborative virtual communities*. Such communities can stimulate interest, encourage peer learning and decrease dependency on instructors (Ko, 2012). In these environments, learners are primarily seen as social and interdependent beings, and there is, therefore, a strong emphasis on learning with and through others (Kurtz, 2014). Members of virtual communities "work together to understand and formulate an information need through the help of shared representations; seeking the needed information through a cyclical process of searching, retrieving and sharing; and put the found information to use" (Karunakaran, Reddy & Spence, 2013, p.2.). In virtual collaboration, members are considered co-constructors of knowledge rather than just consumers of it. They need to get together as a team to exchange their ideas actively, responding to one another, while engaging in argumentation through reflective questioning of existing orthodoxies and exploration of novel ideas, before arriving at a logical conclusion. This whole process requires that members become involved in active and continuous interaction and exchange of thoughts with their peers in order to come up with a synthesis of the group ideas. Cognitive engagement, therefore, becomes crucial to the process of collaboration.

Cognitive Engagement in Virtual Collaboration

Cognitive Engagement

Cognitive engagement is critical for educational success and to enhance achievement. Students can not expect to achieve their learning goals unless they concentrate, work and invest themselves in the mastery of school tasks. Newman (1992) considers cognitive engagement a "psychological investment in learning." Corno and Mandinach (1983) point out that cognitive engagement occurs when a student gives sustained attention to a task that requires mental effort, and authentic, useful learning is produced by extended engagement in optimally complex cognitive activities. It can, therefore, be assumed that a great deal of focus, attention, and effort are required to become truly cognitively engaged.

Cognitive engagement in the virtual world is visible in *online discussion forums* (this term is referred to as *virtual discussion forums* for the purpose of consistency) which have provided a middle space between online and traditional classrooms settings for students to engage with others in synchronous and asynchronous ways (Agosto, Copeland, & Zach, 2013). McConnell (2000) argues that these spaces allow learners more freedom in exchanging ideas, opinions, facts, experiences and expectations; also, Suthers (2006) claims that in such spaces learners can create a learning culture, wherein participatory and inter-subjective meaning-making are promoted beyond time and space. So (2008) argues that it is *the asynchronous nature* of virtual collaborative discussions which allows learners to promote creative thinking, reflective writing and critical reasoning.

The assumption that virtual discussion forums can promote more critical thinking than found in physical classrooms has led a number of researchers to analyze postings from virtual forums and measure students' levels of cognitive engagement during virtual collaborative activities.

Surprisingly, several studies have reported the opposite to be true and that only relatively few students were able to demonstrate higher levels of cognitive engagement (Asif, Vertejee & Lalani, 2015; Casimiro, 2016; Chou, 2002; Guan, Tsai & Hwang, 2006; Perkins & Murphy,2006; Shukor, Harum & Tasir, 2011; Shukor, Tasir, Meijden, & Harun (2014); Van der Meijden, 2005; Zhu, 2006). The majority of students tend to remain at superficial levels of information processing, such as making social connections, providing elementary clarifications without further explanation, etc. Table 2.1 provides an overview of previous empirical studies that have measured cognitive engagement in virtual discussions.

Table 2. 1

Studies on Cognitive Engagement in Virtual Collaborative Spaces

Study	**Application**	**Purpose**	**Participants**	**Method& Coding Scheme**	**Findings**
Asif, Vertejee & Lalani (2015)	Online discussion forums.	To explore students' interactions and cognitive engagement in online discussion forums.	81 students.	Discourse Analysis. Online Survey. *Zhu's analytical model.*	The majority of the participants answer *direct questions (opinions, feedback).* None of the participants used *Reflection.*
Casimiro (2016)	Online discussion forums.	To explore the conditions that support cognitive engagement in online classes.	14 fully online graduate students.	Discourse Analysis. *Bloom's Taxonomy.*	A higher percentage of interaction remained at the *Connecting* level.
Guan, Tsai & Hwang (2006)	Online discussions forums.	To investigate the nature of non-course-based online	213 participants 6 selected groups.	Content Analysis *Henri's framework.*	The most frequently involved interaction type was

		discussion. Required vs Non-required.			*Direct response*, and the most frequently used cognitive skill was *Elementary Clarification.*
Perkins & Murphy (2006)	Online discussions forums.	To develop a model for identifying and measuring individual engagement in critical thinking in an online asynchronous discussion.	8 Graduate students.	Content Analysis *Perkins and Murphy's Analytical model.*	Participants tended to engage more in *Clarifying* rather than *Inferring.*
Shukor, Harum & Tasir, (2011)	Online discussions forums.	To explore underlying processes of asynchronous discussion in e-Learning.	Not specified.	Content Analysis. *Van der Meijden* coding scheme.	Most of the students' discussion revolved around *answering* without explaining opinions on the given issue.
Shukor、Tasir, Van der Meijden & Harun (2014)	Online discussions.	To evaluate the quality of learning through students' cognitive engagement.	20 Undergraduate students.	Content Analysis *Van der Meijden* coding scheme.	Students' levels of cognitive engagement were markedly low.
Sayamon (2013)	Online discussion forums.	To investigate the use of web board for enhancing the ethic and knowledge construction of undergraduate	45 undergraduate students.	Content Analysis *Van der Meijden* coding scheme.	High-level elaboration 32.69 %; low-level elaboration 19.14 %; affective contributions 25.80 %;

		students.			regulative contributions 12.69 % and non- task related was at 9.68 %.
Zhu (2006)	Online discussion forums.	To analyze and determine student's cognitive engagement in the online discussion.	71 Undergraduate students.	Content Analysis *Zhu's analytical model.*	Low levels of cognitive engagement and surface level of information processing
Van der Meijden, 2005	Online discussion forums Face-to-face discussions	To compare the collaboration between children in two conditions: Face-to-face and text-based.	84 Elementary school students: six graders	Content Analysis *Van der Meijden* coding scheme.	In both face-to-face and text-based conditions, the frequency of high-levels elaborations was low.

According to the authors of these studies, there are several factors that prevent students from achieving high-levels of cognitive engagement. Perkins and Murphy (2006) say that the course requirements and personal variations among students are two main factors. Guan, Tsai and Hwang (2006) claim that whether the discussion is a required activity or not has a strong impact on students' contributions. They also highlight other factors such as the design of the activity, the relevance of the topic of discussion, students' attitudes towards text-based communication and virtual discussions, feedback and encouragement from peers and moderators. Interestingly, Shukor, Tasir, Van der Meijden and Harun (2014) claim that the enormous amount of information on the internet, and its accessibility might disadvantage students' cognitive engagement. In their study, they noticed that some students tended to copy and paste information from the web during virtual discussions. Further, Asif, Vertejee and Lalani (2015) add that students' ICT skills and knowledge, prior knowledge in the subject of discussion, and the low virtual presence of the facilitators are

other factors that hinder students' performance. Moreover, Casimiro (2016) says that students' cultural backgrounds influence their engagements in virtual discussions. In a study with international students she noticed that some tended to agree with others' answers and opinions more than others. She also noticed that there was avoidance in disagreeing when it came to controversial issues.

However, although evidence exists of a serious problem with students' cognitive engagement in virtual discussions, the studies have some limitations worth highlighting. First of all, studies have used different units of analysis; that is, some used statements as units of analysis while others have used messages or even complete ideas, which may include several paragraphs. While there are similarities in defining the constructs to measure/code students' levels of cognitive engagement from low to high, there has yet to be established a standard coding scheme or analytical model. Previous studies developed and adopted different analytical models/dimensions to measure cognitive engagement in virtual discussion forums. Consensus among researchers who study this specific area is, therefore, needed.

Implications for the current study. Interestingly, a common view amongst the authors is that besides instructors and facilitators being involved in the discussions, it is the design of the activity, as well as the characteristics of the task, which play a crucial role in students' cognitive engagement. However, as yet, they have failed to provide evidence to back up these beliefs. Most of the studies have compared their findings to similar studies which used different coding schemes. There has been no measuring and comparing of different types of tasks/activities using the same coding scheme in any single study. For these reasons, along with others, it is difficult to draw conclusions and generalize the results of previous studies.

Factors Affecting Cognitive Engagement

Several studies have revealed various factors influencing cognitive engagement in virtual spaces. Among them, three key factors – social presence, sociability and immersion- that are closely related to, and are of particular relevance in the present study and will be further discussed.

Social Presence

Social presence is considered a crucial factor in influencing students' performance in virtual spaces. Empirical studies on tridimensional virtual environments (3D technology with high levels of virtuality) have claimed that high levels of social presence enhance users' performance. To mention a few examples, in a meta-analytical study, Jerome and Witmer (2004), examined the relationship between social presence and performance using data of 203 college students from five different studies. In these studies, participants were required to carry out different tasks in various 3D virtual environments. To analyze the data, Structural Equation Modeling (SME) was used; which is a method used to analyze the structural relationship between measured variables and latent constructs. Findings of the study showed that social presence had a direct causal relationship upon students' performance. Likewise, Mikropoulos (2006) conducted a qualitative study on learning outcomes in educational virtual environments. Participants (60 students) had to navigate around a city by following verbal instructions given by other avatars. The data were obtained, through observations and questionnaires, on social presence and learning outcomes. The results showed that the students' representation in the virtual environment and their socialization with other avatars gave a high sense of social presence which helped students complete their tasks successfully.

Although not directly related to virtual discussion, such studies do contribute by providing important insights into the relationship between social presence and performance in virtual spaces.

They also throw up more questions such as “Can virtual spaces with high-levels of virtuality enhance students’ performance more than virtual spaces with low-levels of virtuality? If so, can students’ cognitive engagement in virtual discussion be enhanced by making them collaborative in a more realistic 3D virtual environment?

Ustun and Pazos (2012) examined the relationship between social presence and performance satisfaction in two different virtual meeting spaces, Second Life® (a 3D virtual world), and Adobe Connect® (a web-conferencing meeting space). A total of 60 undergraduate students were recruited for the study, divided randomly into 20 teams of 3 members and assigned equally to one of the two virtual meeting spaces. Both sets of teams had to engage in text-based communication; however, the Second Life teams used avatars; whereas the Adobe Connect teams only used chatrooms and discussion boards. Both sets of teams needed to solve a decision making task using their assigned virtual space. Data were collected through questionnaires and ranking scores by evaluators; and analyzed using ANOVA and multiple regression analysis. The results showed that the teams that collaborated via Second Life perceived higher levels of social presence compared to those who used Adobe Connect. This was attributed to the presence of avatars and the rich interactive environment of Second Life, which provided a more dynamic way of communication amongst users. However, surprisingly, there was no significant relation between social presence and team performance satisfaction. Contrary to what was expected, the Adobe Connect groups reported higher average group satisfaction with the process than those in Second Life. The authors argued that the unique configuration of the two environments and the way the system connected users with each other, along with users’ experience with technology, were some factors that influenced participant’s performance satisfaction.

Preliminary work on *social presence* and performance satisfaction was undertaken by Gunawardena and Zittle (1997) who examined students’ overall satisfaction with text-based

interactions in computer-conferences. In their study, 50 graduate students (62% female) from six different universities in the United States were required to hold discussions on research via a virtual discussion forum named GlobalEd®. The discussions were part of their academic requirements and lasted a full semester. Following the culmination of the conference, all participants were required to answer a 61-Likert scale item on a paper-based questionnaire to evaluate social presence, attitudes, satisfaction, barriers and other aspects related to the experience with GlobalEd. To examine the relationship, if any, between social presence and satisfaction, a Stepwise regression analysis was used to obtain the amount of explained variance added by respective predictors. The results of the study showed that social presence alone contributed approximately 60% of the variance, suggesting that it was a strong predictor of satisfaction in a text-based computer conference. They also supported the view that social presence is an important element contributing to the overall satisfaction of task-oriented or academic computer conferences.

Another study by Caspi and Blau (2008), investigated the relationship between social presence and perceived learning (a belief that learning has occurred) in virtual discussion groups. Six hundred and fifty-nine students ranging in age from 17 to 65 (more than 50% women) participated in the study. They answered a web-based survey distributed via 50 course websites. Through the use of Factor analysis with Varimax, factors measuring social presence and students' perception of learning were identified and then clustered into separated constructs. Social presence was divided into two constructs: social presence as open communication and cohesiveness, and social presence as emotional expression and group identification. As for perceived learning, it was divided into three constructs: skill, sharing opinions and contribution to learning. The study also examined the demographics and activity on the system (i.e. login and posting) of the participants, using multiple analysis of variance (MANOVA), which for the purposes of analysis were considered as dependent variables. The results of the study showed that the more students logged

in and posted messages onto the course's discussion group, the more they were able to perceive *social presence* and registered a higher level of perceived learning. Logging in and posting also correlated significantly with two social presence factors, *open communication and cohesiveness*, and *group identification*. Furthermore, *self-presentation*, another factor that constructed *social presence*, was found to be positively correlated with perceived learning. The authors concluded that when people deal with virtual learning environments, identification with a group or group cohesiveness may play an important role.

Findings from the studies above seem to be contradicting. Some studies support the idea that social presence influences performance; whereas others suggest that not to be the case. One possible reason for this disagreement may be the unsettled definition of social presence. According to Slater (2003), when people talk about social presence, they often refer to different concepts. Lombard and Ditton (1997) say that this is in part because researchers interested in social presence come from many varied academic fields. In order to conceptualize social presence in the current study, first, different definitions of social presence taken from previous empirical studies were collected and revised, Table 2.2 below.

Table 2. 2
Definitions of Social Presence in Virtual Environments

Author and Year	Definition
Short, Williams, & Christie (1976)	The "degree of awareness of another person in an interaction and the consequent appreciation of an interpersonal relationship" (p.65)
Heeter (1992)	The "extent to which other beings (living or synthetic) also exist in the world and appear to react to you" (para. 5)
Gunawardena &Zittle (1997)	"The degree to which a person is perceived as real in mediated communication" (p.9)
Lombard & Ditton (2006)	The "perceptual illusion of non-mediation. When a person fails to perceive or acknowledge the existence of a medium in his/her communication environment and responds as he/she would if the

Author and Year	Definition
	medium were not there" (para. 38)
Witmer & Singer (1998)	"The subjective experience of being in one place or environment, even when one is physically situated in another" (p. 225)
Garrison, Anderson & Archer (1999)	"The ability of participants in a community of inquiry to project themselves socially and emotionally, as real people (i.e., their full personality), through the medium of communication being used" (p.94)
Waterworth & Waterworth (2003)	"The feeling of being bodily in an externally-existing world" (para. 10)
Slater (2003)	"The extent to which the unification of simulated sensory data and perceptual processing produces a coherent place that you are in and in which there may be the potential for you to act" (p.2)
Kreijns, Kirschner, Jochems & Buuren (2004)	The "degree of illusion that others appear to be real physical persons in either an immediate or a delayed communication episode" (p.157)
Beer, Slack & Armitt, (2005)	The "psychological awareness of being and interacting in the VLE [virtual learning environment]" (p. 6)
Tu & McIsaac (2015)	"The degree of feeling, perception, and reaction of being connected by Computer-Mediated Communication (CMC) to another intellectual entity through a text-based encounter" (p. 140)

The literature review disclosed three core concepts of *social presence.*

(1) the degree of awareness of being interactive with a real person in mediated communication (Gunawardena &Zittle, 1997; Heeter, 1992; Kreijns, et al., 2004; Short, Williams, & Christie, 1976).

(2) the feeling of being socially and emotionally connected with another entity through a medium of communication (Garrison, Anderson & Archer, 1999; Lombard & Ditton, 2006; Tu & McIsaac, 2015).

(3) the sensation of being interactive in a bodily external existing environment which

stimulates behaviors similar to those felt in the physical world (Beer, Slack & Armitt, 2005; Waterworth & Waterworth, 2003; Witmer & Singer, 1998).

As can be seen, social presence can not be considered a single term with a single definition, but rather as a construct that consists of at least three concepts. In the literature review, three concepts of social presence were identified, and one of them, the third one, seems to overlap with immersion, a separate concept but closely associated with social presence. This last concept of social presence came mostly from studies on 3D virtual worlds. Taking into account all previous concepts, this study redefines social presence as: *the psychological awareness of being connected and interacting with a real person within a virtual environment.*

Besides the differences in the conceptualizations of *social presence*, there seems to be an overgeneralization of the term performance. For instance, Caspi and Blau (2008) found that previous studies examining the relationship between social presence and performance used different operational definitions. Some studies defined it as achievement (e.g. grades); others as perceived learning (students' self-report) which are two uncorrelated and distinct measures. Every task requires selected individuals to use different skills and engage cognitively at different levels. Thus, at this point, it is difficult to draw conclusions about the influence of social presence on cognitive engagement. Future studies need to establish clearly their operational definition of performance and compare their results with studies of a similar nature, ensuring a continuous re-examining and possible re-defining of operational definitions.

Sociability

The concept of sociability, in physical settings, is generally understood to mean "the quality of being sociable" (Sociability, n.d.). Simmel and Hughes (1949) used this term to describe the union with others, achieved through social gatherings in which *talking* is the principal goal.

However, in virtual settings, Preece (2001) says that "sociability is concerned with how members of a community interact with each other via the supporting technology" (p.5). Similarly, Kreijns, et al. (2004) refer to sociability as "the extent to which a computer-supported collaborative learning environment is perceived in facilitating the emergence of a sound social space, with attributes such as trust and belonging, a strong sense of community, and good working relationships" (p.4). Further, Gao and Rau (2011) define it as "the extent to which the communication environment, mediated by social media, is perceived to facilitate social interaction and to enhance social connectivity" (p.1847).

It would appear that the definitions of sociability for physical and virtual settings highlight different aspects. In purely physical settings, Simmel and Hughes (1949) emphasize the connection with other individuals, through the use of *speech,* as the main medium of communication; however, when it comes to virtual spaces, Preece (2001), Kreijns, et al. (2004) and Gao and Rau (2011), highlight the users' perceptions of a computer-mediated environment as being suitable for social interactions. Taking into consideration these differences, along with previously given definitions, this study defines sociability as: *the extent to which a virtual collaborative environment is perceived as being suitable for social interactions and social connectivity, among group members, through synchronous and asynchronous communication*.

Sociability has been considered important in laying the groundwork for cognitive engagement. Kreijns et al. (2013) argue that cognitive engagement happens in a social environment where trust, sense of community and strong interpersonal relationships exist. Gao et al. (2010) claim that to create that type of atmosphere; the communication among group members should be open and free of security concerns. In addition, all members should behave with civility, and the psychological distance between them should be short. Similarly, Price-Mitchel (2015) says that sociability flourishes when individuals feel connected, respected, cared about and are able to

communicate their feelings of connectivity with others. Casimiro (2016) shares similar thoughts and says that socialization supports discourse which in turn leads to knowledge construction. However, she points out that learning communities tend to be supportive of discourse only up to a certain extent. When intellectual conflicts occur among members, members tend to shy away from engaging in critical discourse. This action is considered a way of preventing conflict and preserving healthy relationships among group members.

A variety of different factors are considered to influence sociability in virtual communities. Preece (2001) was among the first researchers to investigate sociability in virtual communities. He wanted to understand social interactions and dynamics within groups in virtual communities. Consequently, he reviewed different definitions of online communities and examined studies about online communities from various disciplines, such as sociology, social psychology, communication studies, and the like. He went on to discuss and draw conclusions on the main determinants that contribute to sociability in virtual communities. He identified three principal components that became the basis in establishing sociability within online communities. These components are *purpose, people* and *policies*.

Purpose refers to the community's goals or visions. It is the shared focus on an interest, needs, information, service or support that provides a reason for members to belong to the community. This component comprises four factors: namely the number of messages, interactivity, reciprocity, and quality of contribution.

People refers to the community members who interact with each other in the community and who have personal, social and organization needs. Some of these take on specific roles in the community such as leaders, moderators, protagonist, etc.

Policies refers to the language and protocols that guide the interactions of the members. They are key in supporting social interactions because every community has its individual culture

based on an agreed set of values, norms and other governance procedures.

The framework developed by Preece gives "the big picture" of key elements that support sociability in virtual communities (purpose, people and policies). However, one of the main limitations in his study is that these components were developed based exclusively on previously published works. Therefore, they lacked empirical validation, a requirement in confirming these ideas. This limitation was later addressed in a series of studies by Gao, et al. (2010) who conducted a systematic study of factors that affected sociability with empirical validation.

In 2010, Gao et al. published a paper on a series of studies that identified and validated factors that influence sociability in virtual communities. First, Gao and her research team reviewed 19 studies on sociability in online communities from various disciplines (i.e. agricultural, health, blogging, gaming, dating, social networking, etc.) and identified 46 items that repeatedly appeared in the literature. These items were then clustered into five different constructs named *purpose and benefits, people, social climate, mediated communication,* and *the technology system*. After reviewing the studies, Gao et al. realized that they had, in the main, focused on virtual communities, ignoring social software. They then decided to take a different, two-fold, approach to study sociability, first, they studied it as a whole and then they looked into sociability in different social software applications.

In an initial pilot study, Gao et al. interviewed thirty-five participants (17 female and 18 male) with ages ranging from 17 to 49. The interviews consisted of four different sessions in which participants were asked about a) their use of social communication in their daily lives, b) their usage and attitude towards various social software; c) factors that influence participants to adopt new social software; and d) their opinions on mobile social tools. As a result of transcribing the interviews and conducting content analysis of the transcriptions, they identified 44 items that influenced sociability in virtual communities. From this list, six items were selected because they

were the most emphasized by all the interviewees. These were *the amount of friends in the system, ease of use, adequacy of functionalities regarding users' needs, system speed, media richness* and *system stability*. The items that were considered less critical, but still essential were *privacy control, content quality moderation,* and *composition of system users*. They also discovered that the *technical competency* of social software was critical to its success, but it was the social and content issues which influenced its popularity the most. These findings together with the findings from the previous study became the basis of a second empirical study.

In a second study, Gao et al. attempted to identify which of the items found in the literature review and in-depth interviews were prioritized by the users. To do that, they gathered 46 items from the literature review and 44 items from the in depth-interviews and inserted them into an initial pool. This was followed by three rounds of discussions, with external reviewers, to identify factors that alone contributed to sociability. At the end, 34 items were selected and classified into five categories: *purpose and benefits, people, social climate, mediated communication,* and *technology system*. These items were then used to construct a seven-point Likert scale online survey to collate users' opinions on what they considered necessary for supporting their social software-mediated social activities, A total of 163 valid responses from university students were gathered and statistically analyzed. According to the report, the average of all items ranged from 4.04 to 6.30, which suggested that no single item was considered unimportant. Then, Exploratory Factor analysis (EFA) was conducted to identify the relevant factors, and Kaiser criterion of eight values and the screen cut-off points were used to determine what factors to retain. By examining the eigenvalues, seven factors were then extracted.

To measure the internal consistency of the seven factors, Cronbach's α coefficient was used for each item. The results ranged from 0.62 to 0.78, which was considered acceptably reliable, based on the minimum value suggested by Bradley (1994). The seven relevant factors were then

renamed and ordered based on their relevancy as shown in Table 2.3.

Table 2. 3
Factors that Contribute to Sociability of Social Software (Gao et al., 2010)

Factor	Items	Definition
Factor 1: System competency	Speed Reliability Disturbance prevention Privacy Information bandwidth	The necessary system components that are required to deliver interactive, smooth and reliable online interaction: the speed of response, the reliability of the system, the bandwidth of information transfer, and the protection of spam messages and privacy intrusion.
Factor 2: Social climate	Open communication Immediacy Friendliness Security Affective communication	The social atmosphere suitable and comfortable for social interactions: open and free communication, free from security concerns, civility, affective communication and short psychological distance among members.
Factor 3: Benefits and reciprocity	Meaning of reality Reciprocity Tangible rewards Control of content quality	The benefits that users expect from online social interactions. They expect their inputs to be rewarded fairly and their efforts to impact their real-life relationships.
Factor 4: People	Number of existing contacts Amount of users Relation to existing contacts in the system	People's perception of sociability is influenced by the number of members and of the ease of reaching members through the software.
Factor 5: Interaction richness	Customizability Information richness Socio-emotional rewards	It describes the richness with which information can be represented and how easily users can customize the way they interact with others.
Factor 6: Self-representation	Self-image building Reputation building	It refers to how well social software helps users to convey an impression of themselves to others and how well they are able to develop their reputation.

Factor: 7 Support for formal interaction	Authenticity Operation flexibility Support for group activity	This factor addresses issues related to formal communication. Users should be able to organize group activities, initiate discussions or arrange meetings among group members.

As is shown in the table above, *system competency* and *social climate* were rated as the two most important factors and explained most of the variance. Thus, the researchers suggested that designers of social software should consider these factors as indispensable for the success of their software. Self-representation and Support for formal interaction were rated the least important.

In the last empirical study of the series, Gao et al. examined the relationships between sociability and the users' attitudes and their intentions to use the software. To achieve this, a set of social software was evaluated with respect to the 7 factors that were extracted from the second study, together with the perceived sociability of the software, the users' attitudes towards them and the users' intentions to utilize them. Ten applications were selected: email, Instant Messages (IM), forum, blog, and Social Networking Systems (SNS). For each type, two social applications were selected, one Chinese and one international, except for the forum because the popularity of foreign forums in China was not high due to language barriers. Each item within each factor was reworded into a descriptive statement (e.g. immediacy: "I feel close to other users' in the system"). A seven-point likert scale anchored by the responses "strongly agree" to "strongly disagree" was employed. A total of 246 valid responses were collected. The majority of the respondents (83 females and 163 males) were college students, but the number also included 92 non-students.

To determine the impact, if any, of individual factors on the sociability of the software, Multiple Regression analyses were conducted; using the sociability score for each type of application as a dependent variable and the seven factors as independent variables. All applications were analyzed, except for the forums as only 3 responses were received, and this number was

considered too low for a meaningful statistical analysis. Given the level of 0.01, the goodness-of-fit of all the models was considered acceptable. The results of the study showed that the impact of sociability varied depending on the type of social software utilized. For the email application, *social climate* strongly contributed to sociability; whereas in Social Networking Systems, *people* was the factor that contributed the most to sociability. In addition to these findings, the factor system competency was found to be statistically insignificant with regard to sociability, leading to its removal from the seven factors, leaving just the six factors: social climate, purpose and benefits, people, interaction richness, self-representation and support for formal interaction (see Figure 2.1). The results indicate that the design of different genres of social software emphasizes different aspects of sociability. According to the report, the remaining factors could explain 61% of sociability as it pertains to social software. The authors concluded that both sociability and system competency were found to create significant impact on the users' experiences with social software. They can predict 43% of the user's attitudes towards the software and 51% of their intention to use it.

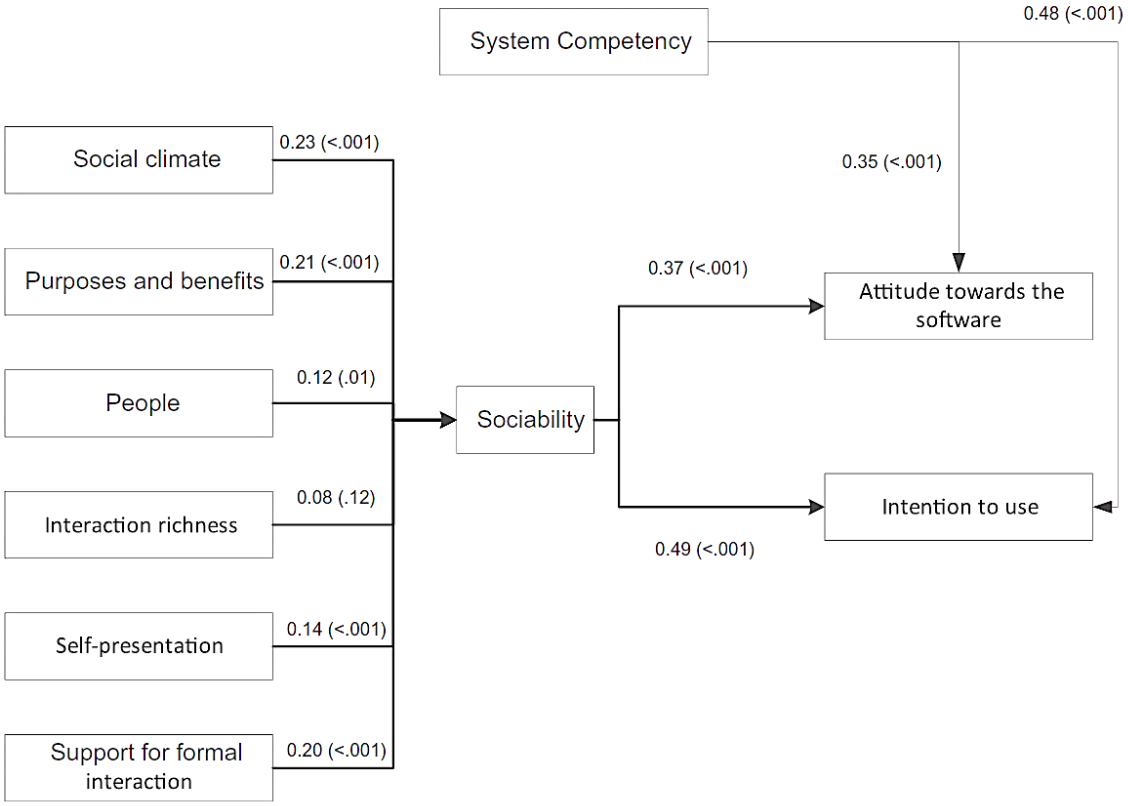

Figure 2. 1. Framework of sociability (Gao et al., 2010, p.1858).

Implications for the current study. Preliminary work on sociability undertaken by Preece (2001) and Gao et al. (2010) provided important insights into sociability in virtual spaces. Both established preliminary frameworks to describe factors that support sociability in online communities and social software. However, their studies had a number of limitations that need to be considered in future research.

Although Preece gives a broad picture of essential components that support sociability in virtual communities by presenting a sociability framework, this framework is too general as it does not specify the factors that constitute each component. Further, as previously mentioned, it was developed through solely theoretical analysis and not validated through empirical research.

As for Gao et al., they analyzed both qualitative and quantitative data and identified six

relevant factors that affected perceived sociability in online communities. However, both of their studies focused exclusively on analyzing social software, and did not explore factors that support sociability of software used for work or educational purposes. Despite online forums being considered as part of their second study, Gao's team was not able to collect enough data to determine those sociability factors that had any bearing. Besides learning how social software is used for informal social interaction, it is important to determine how it is used for formal social interactions, as well as the variables that affect these interactions.

Moreover, Gao et al. did not explore the context of students who were enrolled in fully online universities, their data being collected from students who were enrolled in a residential university. It is possible that perceptions of sociability in social software (virtual spaces) are affected by face-to-face interactions in the physical world. Therefore, the results of an identical survey may be different with online students who have not had the opportunity to meet their classmates face-to-face or have sporadic face-to-face interactions.

Finally, the studies by Gao et al. took place in China, and thus, most of the participants were local users: social life and usage of technology could have also been influenced by their cultural backgrounds. Herold (2012) investigated cultural context and the attitudes of Chinese internet users towards virtual spaces. He claimed that a large number of Chinese students referred to online spaces as being "unreal". Virtual spaces were seen as a stress-free environment which allowed all who entered to forget their real life with all its problems. Thus, for most, normal rules of behavior did not apply in online spaces, and they did not feel constrained to behave themselves. Moreover, Gao and Rau (2011) compared the perceptions of online sociability between Chinese and German users. They found that Chinese students tend to have more flexible views of online social interaction and in contrast to German students, made clear distinctions between online and real-life social networking. Chinese users were not much concerned as to whether online social networks

resembled those in real life. They had little expectations from any relationship through online social interaction and did not equate such to real life. On the other hand, German students considered online social interaction as a supplement of their social life and life in reality, so they were more serious about their online social interactions. For German students, online social relationships resemble the authenticity and impact of those in real life.

These studies provided an insight into the impact of cultural predisposition towards virtual spaces. Stromer-Galley and Martey (2009) say that virtual worlds can trigger schemas related to an individual's understanding and experiences from the physical world. These schemas can contribute to shaping social norms and frameworks for interaction that users attach to the virtual world. It is necessary, therefore, to investigate sociability in virtual spaces with students from cultural backgrounds other than Chinese, in order to compare it with the findings by Gao's team and if possible to validate them.

Immersion

Immersion is a factor associated with social presence. It is defined variously as "absorbing involvement" and "as instruction based on extensive exposure to surroundings or conditions that are native or pertinent to the object of study" (Merriam-Webster Dictionary, 2017). The latter definition is most commonly used in the discipline of foreign language education, however, when it comes to virtual spaces, the former definition appears more appropriate. Jerome and Witmer (2004) define immersion as the "feeling of being there, in the artificial environment, and to become removed from real-world stimuli" (p. 2613). According to McGreevy (1992), this feeling relies on the attention to continuities, connectedness and coherence of the stimuli flow. In the same vein, Witmer and Singer (1998) define immersion as "a psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a

continuous stream of stimuli and experiences" (p. 227). They claim that when individuals feel fully immersed, they have a feeling of interacting directly with the virtual environment. This sensation of being immersed is believed to rely more on how well users connect within the entire environment stimulus than the novelty of the technology in use.

A review of the literature of immersion in virtual spaces reveals immersion not to be a single concept, but rather a construct that consists of several factors which indicate how immersed a person becomes in a virtual space (see Figure 2.2).

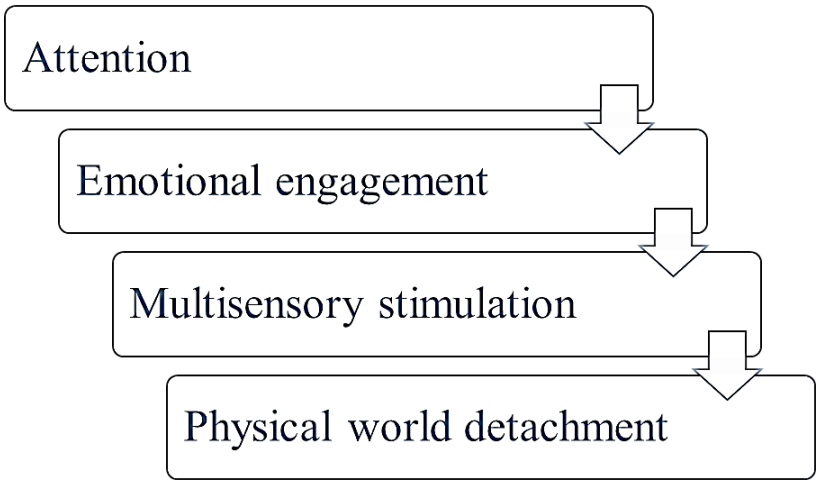

Figure 2.2. Constructs of immersion in virtual spaces

Firstly, at the superficial level, immersion requires *attention* and *willingness to concentrate*. Nakamura and Csikszentmihalyi (2014) state that intense and focused concentration in what one is doing, in the present moment, is one of the main requirements to enter a subjective space. Similarly, Witmer and Singer (1998) say that for individuals to become engaged in any activity, they need to be in "a psychological state, experienced as consequence of focusing one's energy and attention to coherent stimuli, or meaningful activities and events" (p. 227). Brown and Cairns (2004) used a

grounded theory approach to investigate the immersion experiences of video-game players. They interviewed seven people, 4 male and 3 female, in their 18's and 20's about their feelings of presence and their perception of time while playing video games. Analysis of the interviews identified three sources of attention: visual, auditory and mental. The level of immersion felt by gamers was found to be correlated to the number of attentional sources and the degree of each attentional type. As an example, more effort was required to play the video game when the players were required to pay attention to sight and sound simultaneously. They further claimed that time was an additional factor having a bearing on the video game players becoming focused; the more time they spent playing, the more they became involved in the video game.

Secondly, immersion requires *emotional engagement*. Nakamura and Csikszentmihalyi (2014) argue that a feeling of being challenged is crucial to having an immersive experience. In short, it is important for individuals to tackle a series of manageable goals in order to make any activity extrinsically rewarding. According to Brown and Cairns (2004), there is a high degree of emotional investment when putting effort into and paying attention to an activity. This expenditure of emotion may lead people to the point of feeling emotionally drained. This view is supported by Jennett, et al. (2008) who claim that emotional involvement plays an important role in immersion. In a study with thirty-six university students, 19 female and 17 male, they investigated the relationship between immersion and the speed of computer interface interaction by comparing the participants' subjective ratings of immersion and state-anxiety. During the study, the participants played a video game which required simply clicking on squares, with the left mouse button, when they appeared on the screen; the squares then disappeared and reappeared elsewhere on the screen. The participant with the fastest response time received a prize. The game had four speed settings: slow externally-paced, fast externally-paced, increasing externally-paced, and self-paced. On completion of the game, participants answered an immersion and a state-anxiety questionnaire.

Results showed that the increasing externally-paced setting had the highest mean immersion score, followed by the fast externally-paced setting and then the slow externally-paced setting. The participants not only got caught up in the task, as it became more difficult over time but also became more highly emotionally charged. The mean of the state-anxiety scores of participants in the fast and increasing externally-paced settings was also higher than the mean scores experienced in the other four settings. The researchers made the assumption that the participants felt more pressured as they gained a certain level of proficiency and, therefore, had higher expectations of winning the video game. The study concluded that the increasingly fast externally-paced interactions with the computer interface, along with a sense of progress and emotional involvement with the tasks, created in the participants a high degree of immersion while playing the video game.

Thirdly, *multi-sensory stimulation* is important to perceive immersion. Slater et al. (1996) made the claim that one of the reasons extensive and surround 3D displays tend to be considered immersive is because they accommodate a variety of sensory systems. The information, in such virtual environments, is received by sense organs from multiple directions. Höll, et al. (2002) studied spatial behavior by employing a desktop virtual environment and a real locomotor maze task. They claimed that it was possible to transfer information acquired during training in a virtual environment into its equivalent real-world environment. They asked two middle-aged groups of participants to identify 5 out of 20 target locations in a real maze and also in its virtual reality equivalent. The first group was confronted with a virtual maze and then transferred to a real maze. The other group was confronted exclusively with the real maze and was not able to benefit from any training period. Although the results of the study showed that transferring information from a virtual world to the real world was possible, it required a more elaborate cognitive process than mere exploratory behavior. This was reflected in the time taken and number of trials needed by the participants, who were confronted with the virtual maze, to achieve the learning criterion and

exploration. This was attributed to the fact that in the virtual world, auditory and visual stimuli are the only feedback channels available to participants. On the other hand, there was a richer multi-sensory input in the locomotor task that provided participants with additional information in order to solve the task. Therefore, as Bowman and McMahan (2007) state, it is important to design systems that stimulate different senses. The more senses a system stimulates, the more it allows individuals to construct their own internal mental models of reality, while at the same time, the higher the levels of sensory fidelity a virtual space provides, the more similar to those in the real world they become.

Fourthly, immersion creates *a feeling of physical-world detachment*. According to Slater et al. (1996), immersive virtual spaces are "inclusive to the extent that all external sensory data from the physical world is shut out" (p.3). In the study by Brown and Cairns (2004), already mentioned above, video game players described a sense of detachment, of being cut off from reality to such an extent that the game was all that mattered. Jennett et al. (2008) claim that immersion may be a precursor to Flow*;* a sense of being so involved that nothing else matters but the activity itself. They further postulated that becoming immersed in a virtual environment is associated with losing track of time and a difficulty in re-engaging with the real world once the virtual activity is complete. Jurnet, Beciu and Maldonado (2005) believe that spatial intelligence, introversion, anxiety and other personal individual characteristics may affect the extent of immersion perceived in virtual spaces.

Immersion is considered to have a positive impact on cognitive engagement. Dede (2009) believes an immersive virtual space provides a more engaging learning environment and more frequent opportunities for reflection which, in turn, enables learners to develop sophisticated problem-solving skills. Further, it can enhance students' confidence in their academic abilities and facilitate the transfer of knowledge to the real world via simulated situations. Witmer and Singer

(1998) say that learning improves when users are an integral part of the stimulus flow, and that meaningfulness and active control over a user's experiences aids learning. Despite this, Brown and Cairns (2004) report that immersion may be divorced from the actual results of the task. People do not always carry out certain tasks because they wish to become immersed; it is simply the result of enjoyment. Brown and Cairns (2004) claim that enjoyment and immersion are closely related, and Mikropoulos (2006) states that enjoyment, the ability to work in a virtual environment, success and an individuals' sense of presence are all interrelated. It may well be that enjoyment plays an important role in experiencing immersion but does not necessarily mean it leads to cognitive engagement. Other factors such as an individuals' background, knowledge, gender (Slater et al. 1996), spatial intelligence, introversion (Jurnet, Beciu, & Maldonado, 2005), age, and face-to-face interaction anxiety (Bahk, 2008) could also play a part in the degree of immersion experienced. However, these factors have mostly been highlighted in final remarks and assumptions in theoretical works, and are yet to be empirically investigated.

Implications for the current study. Immersion is a term commonly found in studies focusing on virtual spaces; it is, however, barely mentioned in studies dealing with virtual spaces for learning and collaboration. Past research on immersion has been limited to explaining users' experiences with video games and 3D virtual worlds, leaving other virtual platforms, commonly used for work-based tasks, barely investigated. It is not clear, therefore, whether individuals become immersed in more traditional virtual platforms used in educational settings, such as Moodle or Piazza. Further, only limited research has been conducted towards understanding which components cause students to feel immersed in such virtual platforms and if these components differ from those of 3D virtual worlds.

Brown and Cairns (2004) were among the first authors to study immersion in virtual spaces. Through qualitative research, they identified several aspects of immersion, such as attention, emotional engagement and the feeling of being cut off from the real world. However, their study, as explained above, has some limitations. The results were based solely on interviews with a small group of participants (seven). Quantitative data from a large number of users was not collected to back up their assumptions. Further work has not been done in order to validate their study results. Immersion, as explained previously, is a construct made of a series of components or stages that an individual needs to go through before feeling self-immersed in a virtual environment. However, previous definitions or concepts did not make any reference to this process. Also, the names of these stages have yet to be formalized, since differing terminology has been used to refer to similar components. For instance, Brown and Cairns (2004) named these stages *engagement, engrossment* and *total immersion*; whereas Jennet et al. (2008) referred to them as *cognitive involvement, real world dissociation, emotional involvement*. Therefore, it is important to establish clear definitions and establish common terms and explanations to avoid future misunderstandings, along with learning more about the hierarchy within these components. Finally, there might be other factors that influence the perception of immersion necessitating further exploration and study of other types of virtual platforms.

Measurement Tools

This study will utilize four distinct instruments: *the Sociability Scale* together with *the Social Presence Scale,* both designed and validated by Kreijns et al. (2004), *the Immersion Questionnaire,* developed and validated by Jennet et al. (2008); and the coding scheme, created by Van der Meijden (2005). Full details on the development and validation process of each instrument

are laid out below.

The Sociability and Social Presence Scales

Kreijns et al. (2004) developed and validated two instruments with which to measure sociability, and social presence in Computer-supported Collaborative Learning (CSCL) environments. Their study was based upon a theoretical framework encompassing the ecological approach to social interaction (social affordances), the concept of sociability of CSCL environments and Social Presence theory.

The ecological approach to social interaction employs the concept of social affordances as its central theme. These are "the properties of a CSCL environment that act as social-contextual facilitators relevant to a learner's social interactions" (p. 156). Sociability refers to "the extent to which a CSCL environment is able to facilitate the emergence of a social space" (p. 157). Social space here is taken to mean the human network of social relationships that exist between group members, which is embedded in group structures of norms and values, roles, beliefs and ideals. Social presence is defined as "the degree to which the other participant in any given communication has the appearance of a real physical person" (p.157). From this, it can be seen that social presence influences the degree to which social interaction takes place in CSCL environments.

In their study, Kreijns et al. claimed that the greater the sociability within a CSCL environment, the more likely it is to result in the emergence of a sound social space. However, after reviewing previous instruments used to measure sociability and social presence, specifically, the Gunawardena Social Presence Indicators, the Gunawardena and Zittle Social Presence Scale, the Price and Mueller Work Group Cohesion Index, and Fiedler's Group Atmosphere Scale, they discovered that most instruments had overlapping items and yet others measured unrelated factors. Moreover, a number of these instruments referred to social climate as *social environment* rendering

the terminology inconsistent. Furthermore, not all of these instruments had construct validity, neither had they produced data which demonstrated, beyond question, their internal reliability. These reasons, amongst others, reported in a review of literature, led the team to develop two new instruments with which to measure sociability and social presence.

Regarding the Sociability Scale: it is a self-reporting questionnaire, which measures the perceived sociability of a CSCL environment. It was initially composed of 34 items, but this was reduced to 10 in the final refined version. The construction of the items was based upon theoretical review of group awareness, communication, and potential for facilitating the creation of a community of learning. The Social Presence Scale is a self-reporting questionnaire that measures the perceived degree of social presence in a CSCL environment. It was initially composed of eight test-items but later reduced to five items. This scale was developed based on research conducted on telepresence, which refers to a set of technologies that enable people to feel themselves present in a location which they are not in physically.

Validation. A questionnaire that included both the Sociability and Social Presence scales was created in order to validate both. Researchers used this questionnaire to collect data from students in three different distance education courses at an Open University in the Netherlands. In each course, the participants were assigned to carry out different collaborative tasks as members of small groups. The first course was Virtual Environmental Consultancy of the Department of Natural Sciences (25 males, 10 females). Students were assigned to one of eight groups (Group size was between 3-8 members each). Each group had to choose a case from a pool of 13 and write an environmental advice report. The course, which lasted 14 weeks, included three face-to-face meetings with their group mates, one at the start of the course, another one halfway, and the final one at the end. The questionnaire was administered electronically after the second face-to-face

meeting. Disappointingly from the total of 35 students, only nine students responded to all the items in the questionnaire.

The second and the third courses were taken from the Statistics Education Innovation Project at the Department of Psychology. A total of 38 adult undergraduates, 6 male and 32 female, enrolled in the second course were assigned to one of seven groups each consisting of five or six members. All groups had to study the same study-material emphasizing practicing psychological experimentation and the usage of Analysis of Variance (ANOVA, a statistical method). The course lasted 18 weeks, during which three face-to-face meetings were organized. The same electronic questionnaire was administered, at the same point in the course. From the 26 students who completed the course, 18 students responded to the questionnaire.

In the third course, one hundred and thirteen adult undergraduates, 34 male and 79 female, were enrolled. The students were assigned to either one of eight "slow" groups, eight "fast" groups, or two "free" groups. All groups had to study the same material emphasizing the use of questionnaires, moderation analysis with ANOVA, and regression methods. The third course was of variable length. Slow and free groups had ten months to complete the course while fast groups had six. At the time of the data collection, slow and free groups were still studying, while the fast groups had completed the course. From 93 students, who actually participated in the course, only 52 students responded the questionnaire. Subsequent to the collection and analysis of the data, the raw version of the Sociability Scale was refined in three steps. In the first step, 24 items from the 34 initial test items were removed as they either addressed a utility aspect or a usability aspect. Although these items can be related to sociability, they are generally used for assessing the usefulness of a CSCL environment and therefore, were not included in the Sociability Scale.

In the second step, a factor analysis (Principal Component Analysis, no rotation) was performed on the remaining test items. This step revealed that the sociability scale was one-

dimensional (using the screen test of Catell). A few test items were removed because they did not load higher than 0.40 exclusively on the first factor. Finally, the third and last step involved reducing the remaining test items further, to 10, without losing significant explained total variance.

The resulting refined Sociability Scale is depicted in Table 2.4 below. The last three columns show, respectively, mean M, standard deviation SD, and loading on the first and only factor which explained 58.52% of the total variance.

Table 2. 4
Factor Analysis Results of the Sociability Scale (Kreijns et al., 2004, p.160)

No. Item	Item	M	SD	Factor *Sociability*
Q1	This CSCL environment enables me to easily contact my team mates	3.29	1.03	0.77
Q2	I do not feel lonely in this CSCL environment	2.90	1.18	0.69
Q3	This CSCL environment enables me to get a good impression of my team mates	2.58	0.98	0.80
Q4	This CSCL environment allows spontaneous informal conversations	2.75	1.14	0.68
Q5	This CSCL environment enables us to develop into a well performing team	2.76	1.05	0.80
Q6	This CSCL environment enables me to develop good work relationships with my team mates	3.19	1.05	0.84
Q7	This CSCL environment enables me to identify myself with the team	2.96	1.07	0.79
Q8	I feel comfortable with this environment	3.44	1.06	0.83
Q9	This CSCL environment allows for non-task-related conversations	3.61	0.99	0.69
Q10	This CSCL environment enables me to make close friendships with my team mates	2.49	1.13	0.73

As previously mentioned the raw social presence scale, employed in this research, initially consisted of eight test items but was later reduced to five and was designed to derive a one-dimensional measure. Two items were removed, from the initial eight, because they did not directly assess the feeling of “transportation of the communication partner from there to here”. Factor analysis (Principal Component Analysis, no rotation) on the remaining six test items revealed two

anomalies, one item loaded equally strongly on both factors; this item was removed. A second factor analysis (Principal Component Analysis, no rotation) was performed on the five remaining test items in order to obtain factor loadings on the first and only factor. According to the results, this factor explained 57.17% of the total variance recorded.

Table 2. 5
Factor Analysis Results of the Social Presence Scale (Kreijns et al., 2004, p.161)

No. Item	Item	M	SD	Factor *Social presence*
Q1	When I have real-time conversations in this CSCL environment, I have my communication partner in my mind's eye.	2.15	1.17	0.80
Q2	When I have asynchronous conversations in this CSCL environment, I also have my communication partner in my mind's eye.	2.75	1.16	0.70
Q3	When I have real-time conversations in this CSCL environment, I feel that I deal with very real persons and not with abstract anonymous persons.	2.90	1.50	0.70
Q4	When I have asynchronous conversations in this CSCL environment, I also feel that I deal with very real persons and not with abstract anonymous persons.	3.56	1.21	0.79
Q5	Real-time conversations in this CSCL environment can hardly be distinguished from face-to-face conversations.	1.81	1.01	0.69

Finally, factor analysis was used (Principal Component Analysis using Varimax rotation) on the ten test items of the refined Sociability Scale and the five test items of the Social Presence Scale, to confirm the uniqueness of the scales with respect to each other. The result of this analysis showed that each of the two scales indeed measure a separate phenomenon. Cronbach's alphas for the Sociability scale and the Social Presence Scale were, respectively, 0.92 and 0.81, revealing a high internal consistency for both scales.

Limitations. With the Sociability Scale and the Social Presence Scale, Kreijns et al. addressed the various limitations of previous instruments and provided more reliable instruments

to measure Sociability and Social presence in CSCL environments. These instruments were built upon a theoretical framework as well as analysis of previous instruments, plus they were validated statistically. However, the validation of the two instruments had some weak points that are worth mentioning. First, the number of collected responses was 79. A general rule of thumb to conduct Factor Analysis is that there must be a minimum of 10 cases per item. The first draft of the sociability scale contained 34 items, meaning a minimum of 170 responses would be required to achieve validation. However, its final version contained 10 items and, thus, the number required to validate was much lower (50 to 100 cases) making 79 cases more than enough. Moreover, the data collected came from three different courses with different characteristics (e.g., time aspects, CSCL environments, task type) meaning that data could not be categorized as a single sample. Consequently, further testing, refinement and validation of the immersion questionnaire is required. Despite this, the instruments are considered to have great potential in measuring sociability and social presence in virtual spaces.

The Immersion Questionnaire

Jennet et al. (2008) realized that the concept of immersion had not been clearly established, despite being a term in common use within the gaming community. They also noted that the factors which led to immersion remained unexplored. Therefore, Jennet and his team decided to investigate the subjective experiences of immersion experienced by video game players. Jennet and his team developed a questionnaire to measure self-reported levels of immersion by drawing upon concepts from the grounded theory of immersion (Brown and Cairns, 2004), Flow (Csikszentmihalyi, 1990) and cognitive absorption (Agarwal & Karahanna, 2000), See Table 2.6 for further details. According to the authors, the questionnaire items were specially designed for measuring the immersive experience triggered by a particular task rather than the general experience of using

software itself. What they focused on was the psychological aspect of immersion, not just the technological part.

Table 2. 6
Concepts Employed in the Development of the Immersion Questionnaire

Author	Concept	Components
Brown & Cairns (2004)	Immersion	Engagement, engrossment and total immersion
Csikszentmihalyi (1990)	Flow	Clear goals; high degree of concentration; a loss of the feeling of self-consciousness (sense of serenity); distorted sense of time; direct and immediate feedback; balance between ability level and challenge; a sense of personal control; intrinsically rewarding.
Agarwal & Karahanna (2000)	Cognitive absorption	Temporal dissociation; focused immersion; heightened enjoyment; control and curiosity.

The questionnaire was divided into six sections. The first three sections were concerned with varying degrees of attention to the task: basic attention, temporal dissociation and transportation. The remaining three sections were concerned with factors that could influence a person's motivation during the task, such as the challenge, emotional involvement and enjoyment. The questionnaire required participants to rate their most recent video game experience on a scale of 1 to 5, 1 being not at all and 5 very much so. The majority of questions were subjected to positive marking except for 6 (questions 6, 8, 9, 10, 18, and 20) which were subjected to negative marking. Immersion scores were computed by summing participants' answers to all 31 questions.

Validation. To validate the questionnaire and ensure that the questions fell within factors similar to those from which they were originally drawn, the questionnaire was administered to a

large sample before conducting Factor Analysis on the results. A total of 260 responses were collected, via message boards and advertisements posted on popular gaming forums. Of the 260 respondents, 16 incomplete responses were removed. 230 respondents of the remaining 244 were male and 14 were female. The data was checked for sampling adequacy, which showed that the overall KMO value was 0.845 and individual values ranged from 0.926 to. 0.590. Bartlett's test of Sphericity was also found to be highly significant ($p<0.001$). The data, therefore, was considered suitable for factor analysis. Five main factors were identified, using Cattell's scree plot method. These 5 factors accounted for 49% of the total variance. The Direct Oblimin rotation provided a far more interpretable solution than the Varimax rotation. Based on this rotation, a pattern matrix and a structure matrix were produced. The difference between the high and low loadings was far more apparent in the pattern matrix, it also had fewer complex variables and a simpler structure. Therefore, the pattern matrix was the one chosen to be interpreted.

The five factors produced were seen to have common themes in the questions they contained and, as such, were given the tags *cognitive involvement*, *real world dissociation*, *emotional involvement, challenge* and *control*. The first three factors were claimed to measure a mixture of "personal factors", while the final two measured game factors.

Limitations. The instrument developed by Jennet et al. (2008) was designed based on previous research conducted on immersion, Flow, and cognitive absorption. Further it was validated through quantitative data analysis. These are two main reasons why this instrument was chosen for measuring *immersion* in the current study. However, the questionnaire itself requires further refinement; for instance, it contains an unequal number of items for each factor and some of the items appear to overlap or even be redundant. The results of the questionnaire lack corroboration through the use of qualitative data, Jennet et al. did not interview participants who

took the questionnaire. Lastly, bearing in mind that the questionnaire was originally designed for measuring immersion experiences in video games, but not other virtual platforms, such as virtual forums or social media applications, some of the items need rewording or removing in order for it to fit the purpose of the current study.

Coding Scheme for Content Analysis

Over the years several coding schemes have been developed to analyze levels of cognitive engagement in virtual collaboration, of them, the most widely used are Bloom's Taxonomy, Henri's framework, Perkins and Murphy's analytical model, Van der Meijden's coding scheme, and Zhu's analytical model. Previous empirical studies using these coding schemes have compared their results with others which had used different coding schemes; therefore, there has been no measurement or comparison of findings using a common coding scheme in any single study. This is one of the reasons why the coding scheme by Van der Meijeden (2005) was chosen for this study as it has been previously employed in four studies (Sayamon, 2013; Shukor, et al., 2011; Shukor, et al., 2014; Van der Meijden, 2005), allowing fairer comparisons of the results to be made and, at the same time, exploring how different types of activities influence these results. Following there is a description of this coding scheme and its dimensions.

Van der Meijden (2005) investigated levels of cognitive engagement from a social knowledge construction perspective. He operationalized knowledge construction as "the provision of elaborations in the form of posing comprehension questions that require explanations, the provision of answers with arguments or justifications, the presentation of new ideas accompanied by explanations, and the acceptance or rejection of the ideas of others accompanied by arguments for doing this" (p. 13). He developed a coding scheme to measure cognitive engagement in CSCL environments based on previous studies by Veerman (2000), who had shown the importance of

argumentation, evaluation and summarization in collaborative learning. He further utilized the model by Henri (1992) whose dimensions (*cognitive*, *metacognitive* and *affective*) became key in the design of his coding scheme.

Van der Meijden divided his coding scheme into three main dimensions: *the cognitive, metacognitive* and *the affective dimensions*. Refer to Appendix A to see an overview of the codes. Messages are considered the unit of analysis for two main reasons: Firstly, the meaning of each message can be clearly identified and secondly, messages create a more manageable number of cases to be analyzed than do isolated words.

The cognitive dimension refers to the thinking activities that students use to process learning and attain learning goals. It contains 13 interaction codes divided across three main subcategories: *Asking questions*, *answering questions*, and *the provision of information*.

The first subcategory, *asking questions,* emphasizes the importance of asking questions and giving help. The codes within this category are CHV1 (asking factual questions); *CHV2 (asking comprehension questions requiring elaboration); and CHVER (asking verification questions to determine whether others agree or not).

The second cognitive subcategory, *answering questions*, includes answers, either with or without further elaboration. That is, a student can answer with *Yes/No* or provide the solution to a problem without further explanation. Alternatively, the student can give a more extended explanation using an argument involving the asking counter-questions. The codes in this category are CHG1 (answering without elaboration); and *CHG2 (answering with elaboration).

The third subcategory, *giving information*, refers to the general input of information and acceptance or rejection of information provided by others. The codes found in this category are CI1 (representation of new ideas without elaboration); CI2 (the presentation of new ideas with elaboration); CIT (references to previously discussed ideas); CIE (explicit evaluation of the content,

or summaries of previously discussed ideas). Four categories of acceptance or rejection are further distinguished: ACCEPT (acceptance without further elaboration); *ACCEPT+ (acceptance with further elaboration); NACCEPT (rejection without further elaboration); and NACCEPT+ (rejection with further elaboration).

Van der Meijden explained that the cognitive dimension of the coding system was developed having taken into account the three types of talks proposed by Mercer and Wegerif in 1999. These are *Disputational talk* or not accepting what has been said by a peer without further explanation; *cumulative talk*, or following the arguments of a peer without any further critical remarks or provisions of new information; and *exploratory talk*, or following arguments of a peer with the addition of further information or explanation.

The metacognitive dimension refers to metacognitive regulation strategies considered essential for an individual's learning. They refer to the awareness of goals, the ability to plan the learning process, the capacity to monitor a learning process and adjust this process as necessary. The codes for these strategies are RV (planning, monitoring, and evaluation of the tasks or group process); RINS (instructing, where one participant instructs another participant). *Affective* learning activities also play an important role in the learning process. Positive or negative feelings, with regard to the task at hand, can influence the learning process. Students can also express positive or negative feelings about their actions or those of others. Messages in this category are coded as A (positive, neutral or negative emotional reaction to another participant or task).

Finally, the coding scheme also includes a subcategory for *non-task related remarks, such as greetings, coded as GREET, and unfinished sentences or messages that do not fall into any of the previous categories*. Such remarks, or postings, are irrelevant to the topic of discussion.

Limitations. The coding scheme designed by Van der Meijden was decided upon for this study for three reasons. First, it was designed for analyzing synchronous and asynchronous text-based communication in CSCL environments; second, it has been used previously by other authors enabling comparison with other studies and finally, besides the cognitive and metacognitive dimensions, the coding scheme takes into account the social aspect of the collaboration. This is very important as the current study looks into the influence of Sociability in cognitive engagement. Nevertheless, it has some limitations that need to be addressed. Although the cognitive dimension includes the categories of asking question, giving answers and giving information with elaboration, it does not, however, classify the extent of the elaboration. In other words, it is not clear if by elaboration the author refers to either analyzing, evaluating or creating. Therefore, another layer of codes should be added. Bloom's Taxonomy could be useful for classifying messages in the cognitive dimension in more specific levels of cognitive engagement.

Conceptual Framework of the Study

Based on the analyses of previous studies, the theoretical framework underlying the present research is developed and presented in Figure 2.3. Virtual collaborative environments depart from constructivist theories which view learning as a self-regulated, constructive and collaborative process of knowledge construction. These constructivist environments are supported by virtual spaces which provide a third space, beyond their physical classrooms, for students to socialize with others and engage in peer or group collaboration to achieve common goals.

A comfortable social climate is considered to be vital for group members to engage in social interactions, serious discussions and group collaboration (Gao et al., 2010; Preece, 2001). For that, social presence is considered to be crucial in the development of that social environment as it is

closely associated with the perception of group members as being *real*, and higher levels of perceived learning and group performance satisfaction (Caspi & Blau, 2008; Gunawardena & Zittle, 1997; Jerome & Witmer, 2004; Ustun & Pazos, 2012). A crucial factor in perceiving social presence is immersion (Brown & Cairns, 2004; Witmer & Singer, 1998) which can draw on the power of situated learning by enabling digital stimulations of authentic problem solving (Dede, 2009). However, there is little research on immersion in virtual collaborative environments to back up this last idea. The connection between immersion and social presence still remains unclear, as well as the influence of these two components on the groups' social environment and performance.

The present study, first, explores the perception of social presence, sociability and immersion in virtual spaces. Then, it investigates how these factors influence cognitive engagement in virtual collaboration. Finally, it attempts to identify the existing connections amongst immersion, social presence, sociability and cognitive engagement.

The study is composed of three studies of which two collected qualitative data and one quantitative data.

The first study (Study One) is a qualitative descriptive analysis that takes a naturalistic approach to explore the levels of collaborative cognitive engagement, patterns of knowledge contribution and the quality of the discussions results of eight virtual collaborative groups from an Open University.

The second study (Study Two) is a qualitative content analysis study that takes a directed approach to examine the experiences and perceptions of social presence, sociability and immersion in virtual collaboration of eight students from Study One based on a theoretical framework.

Finally, the third study (Study Three) is a quantitative correlational study that investigates the relationships between social presence, sociability and immersion variables. It analyses data of a large group of users who had experienced collaboration in virtual spaces. This study was designed

to discuss findings from Study One and Study Two. The methodological approach that was taken for each study will be described in their respective chapters (Chapter 3, 4 and 5)

The ultimate goal of the study is to develop a theoretical framework that explains collaborative cognitive engagement along with specific social presence, sociability and immersion variables. Further, it attempts to incorporate the theory of immersion into the theory of virtual collaboration. Moreover, it attempts to explain the relationships amongst the three aforementioned variables and their impact on students' performance.

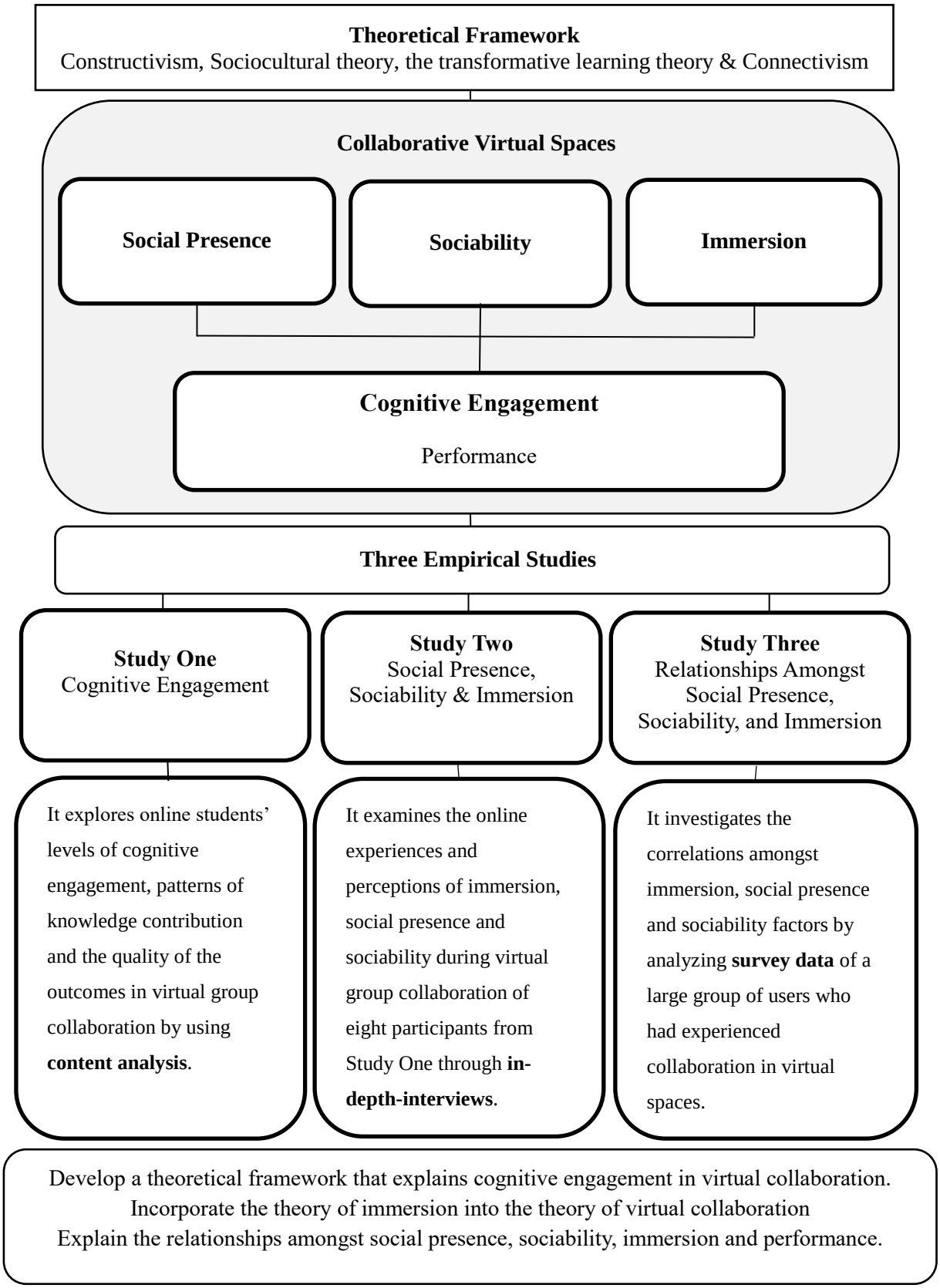

Figure 2.3. Conceptual framework of the current research

CHAPTER 3

Study One: Cognitive Engagement

This chapter briefly introduces the objectives and four sub-questions for Study One. It goes on, in 5 steps, to describe the methodology used to collect and analyze the data for the study, present the results of the content analysis of text and video-based discussions and describes the patterns of knowledge contribution found in each type of discussion. It then shows the results of the analysis of the group wrap-up reports and compares the results of Study One with those of previous studies which used the same coding scheme. Finally, the chapter ends with a discussion of the main findings in Study One.

Objectives

The objectives of Study One were, first, to explore the levels of cognitive engagement of fully online students in synchronous and asynchronous discussions and, second, to identify the main factors that influence students' cognitive processing. It aimed to achieve these by answering the following sub-questions:

a) What levels of cognitive engagement are reached by fully online students in text-based and video-based discussions?
b) What patterns of knowledge contribution are found in both text-based and video-based discussions?
c) What is the quality of the results of the text-based discussions?
d) How does the design of an activity influence students' levels of cognitive engagement?

Methodology

Study One is a qualitative descriptive analysis that takes a naturalistic approach to explore the levels of group cognitive engagement, patterns of knowledge contribution and quality of the results from the collaboration of eight small groups of fully online students from an Open University based in the Philippines.

Context

The educational institution. A distinguished open university in the Philippines was selected due to a number of logistical advantages. Firstly, computer-mediated communication was used as a medium for discussion throughout all of its courses: making it possible to observe the full impact of distance in online interactions. Secondly, English was the main medium of discourse among students and instructors, decreasing the probability of problems with students' foreign language anxiety. Finally, the short one hour time difference between Japan (GTM+9) and the Philippines (GMT+8) enabled the researcher to set up interviews and follow-up sessions with the participants and the instructor via Skype® without the need for out of hours communication.

The course context. The online course entitled "MMS 141: Principles of Programming" aimed to teach introductory programming and basic computer science knowledge. The course content was inspired by the University of California, Berkeley's open course, *The Beauty of Joy in Computing (BJC)* and the freely accessible eBook of Al Sweigart called *Automating the Boring Stuff (ABS) with Python*. However, instead of using Snap (a block-based programming language endorsed by UC Berkeley's BJC), the lectures capitalized on activities in Code.org and then mapped them later with lab activities using Python.

The course lasted 10 Weeks and it was taught from January to March 2017 and the instructor provided a clear breakdown of the activities for each week in advance. At the end of the course, students were expected to sit a final exam at one of the institution's learning centers or schedule a proctored exam. During the entire course, students were able to interact with and receive support from the instructor and fellow students via Piazza (a Q&A web-based service which was used as the learning management system for this course). It must be noted here that this researcher acted as both the teaching assistant for the course and the facilitator/moderator of the online discussions. Study One followed the schedule below (Table 3.1.).

Table 3. 1
Schedule of Study One

Date	Activity
Feb 4th	- Meeting with the course instructor via Skype. - Discussing the questions for the activity with the instructor (Blown to Bits: Chapters 1 and 2) - Designing the guidelines for the activity.
Feb 5th	- Explaining the study to students via Piazza.
Feb 7th -16th	**Recitation 1:** Text-based online discussion via Piazza. Material: Bits Chapter 1
Feb 18th	- Group wrap-up report submission via Piazza
Feb 21st- 27th	**Recitation 2:** Video-based online discussion preparation and recording. Material: Bits Chapter 2
March 10th	- YouTube live group discussion video submission.
Feb 27th	- Recruiting participants for in-depth interviews
March 11th onwards	- Conducting in-depth interviews via Skype.
April onwards	- Analyzing the data

Participants. The participants were 43 students, 18 male and 25 female, from 18 to 50 years old, enrolled in the online course entitled Principles of Programming: part of a Bachelor's program in Multimedia Studies. The vast majority of these participating students were originally from the Philippines, one male student was a foreign resident from a Middle Eastern country. All students were physically separated from each other, and never met face-to-face with the instructor in a physical setting. During the course, they undertook guided independent study supported by the instructor and specially designed learning materials in various media such as print, video and multimedia.

Instruments

Three instruments were used to collect the data for study one, namely: *The Coding Scheme for Content Analysis*; *The Rubric Table for Wrap-up Report of the Discussion* and *The Moderator's Observation Form*.

The coding scheme for content analysis. The messages posted by the participants onto the virtual platform were coded based on the coding scheme for content analysis designed by Van der Meijden (2005). *Units of meaning* were considered as the unit of analysis because the meaning of each idea can be clearly identified as opposed to using isolated words or sentences. The length of a unit of meaning varies from a complete sentence to a short paragraph. Based on the cognitive engagement categories as described by the coding scheme, all units of meaning that fit in the cognitive category were categorized into either high (H) or low (L), as shown in Appendix A.

The rubric table for wrap-up report of the discussion. After the end of the online discussion period, each team was allotted three days in which to submit *a group wrap-up report*

summarizing the main ideas of their corresponding online discussion. The report was posted on Piazza® to be evaluated by the instructor and the researcher under the following rubrics: organization, quality of content, grammar and spelling, interest level and timeliness as shown in Appendix B.

Observation form. An observation form which included a checklist and a space for comments was developed by the researcher to provide observations on the content of the virtual discussions and community building (See Appendix C).

Procedures and Data Collection

The data collected during the study was kept confidential and handled accordingly. None of the participants' real names or the educational institution was provided: nicknames being assigned instead. Research collaborators and authorized others, assigned by the researcher, had partial access to the data in order to validate its findings.

Obtaining consent from the educational institution. Prior to commencement of the study, the researcher followed protocol for external research of the educational institution in getting approval for the conducting of the study. First, a letter of request was addressed to the Open University's Chancellor along with an endorsement letter, a copy of the research proposal and a copy of the materials for data collection. The Research and Publication Committee (RPC) of the institution reviewed all pertinent documents and requested additional information from the researcher. Next, the RPC submitted a letter of recommendation to the Chancellor to request the approval of the study. The Chancellor approved the research request and sent a letter of approval to the RPC and a copy of the same letter to the researcher via e-mail to complete the process (see

Appendix D). In addition to this, the researcher had undergone the research ethical scrutiny by the Research Ethics Committee at the International Christian University (ICU hereafter) to conduct the study in the Philippines (see Appendix E).

Obtaining the participants' consent. Once approval by the educational institution was received, all participants involved in the study were informed of the purpose of the research directly and via the course instructor. The researcher specifically requested permission from all participants to use the data obtained from the online survey, the postings of the online discussions, and the recordings from the in-depth interviews solely for research purposes. In addition, the online survey included a cover letter explaining clearly the purpose of the study and specified explicitly that clicking either Yes or No would be considered a voluntary and binding agreement.

Virtual collaboration activities. Two activities were designed for use in Study One. The first was a *text-based collaborative activity* which was named by the course instructor as *Recitation 1*, and the second was a collaborative video-based activity named *Recitation 2*. These two terms, Recitation 1 and Recitation 2, will now be used when referring to each of the activities from now onward. In order to carry out these two activities, eight teams of five or six members were formed by the course instructor. The distribution of students in each team is shown in Table 3.2.

Table 3. 2

Distribution of the 43 Students in the Eight Groups.

Groups	G1	G2	G3	G4	G5	G6	G7	G8
Male 18	1	0	3	2	4	2	3	3
Female 25	5	6	3	3	1	3	2	2
Total 43	6	6	6	5	5	5	5	5

Recitation 1. In the first recitation, the groups were required to collaboratively answer *three semi-structured questions* based on course reading (Book: Blown to Bits, chapter 1). Students first had to share, then discuss their individual answers and opinions, within their groups before submitting a wrap-up report of their group answers. As explained above, Piazza, the online Question and Answer (Q&A) platform, was chosen, by the course instructor, as the online venue of these group discussions.

The instructor and the researcher moderated the eight discussion forums by encouraging students to participate by the posting of some directions, or guidance, at the beginning of and during the discussions, whilst at the same time attempting, as far as possible, not to interfere with the flow of the discussion. The moderators did not provide any answer to any question as the intention was for the participants to arrive, unaided, at their own conclusions through the process of discussion. At the conclusion of the online discussion period, each team was allotted two days to submit *a group wrap-up report* summarizing their opinions and conclusions of their discussions. The group wrap-up report was posted to the instructor and researcher for evaluation using Piazza. It is worth mentioning that the majority of groups were unable to meet the deadline; forcing the course instructor to extend the deadline by a further two days. The overriding reason for the delays was students being busy, either with other assignments or even with their jobs.

Recitation 2: In the second recitation students were required to hold a synchronous video-based group discussion by creating a YouTube Live Event. Each group was required to discuss four semi-structured questions based on course readings (Book: Blown to Bits, chapter 2) within a time frame of 30 minutes. At the end of this session, one or two students had to synthesize the group answers to share as the group's conclusion. Once the synchronous video-based discussion had finished, one of the students embedded the link of the recorded YouTube Live session on Piazza under the label of Recitation 2. Prior to the synchronous video-based discussion, it was suggested by the course instructor that the students employ a moderator and take turns in sharing their answers to ensure the efficient sharing of ideas. They were allowed to have preliminary text-based communication concerning their respective Group threads using Piazza in order to arrange their synchronous video-based discussion. Further, the students were encouraged to undertake research on the topics of discussion so that the synchronous video-based discussion would be fruitful.

Data Analysis

Recitation 1

Students' discussion messages. Messages posted on the online platform were coded based on the cognitive engagement categories developed by Van der Meijden (2005). One extra category was added (*CHG2 EXPL) which referred to those statements which provide an example to re-enforce previous answers/ideas. As earlier explained, units of meaning were represented by the unit of analysis in order to allow for the meaning of each idea to be clearly identified and categorized into either high (H) or low (L). The process of coding, clustering and analyzing the messages was carried out using qualitative analysis software (QDA Miner 5).

Group wrap-up reports. The group wrap-up reports were copy-pasted in Word files for analysis. First, the contextual spelling, grammar, punctuation, sentence, style and vocabulary of the group wrap-up reports were analyzed by using the well-known online grammar checker software, Grammarly®. This software has proofreading and plagiarism-detection resources and checks more than 250 grammar rules. The group wrap-up reports were then evaluated, based on the rubric table for wrap-up report, as explained previously in the instruments section.

Observations form. The researcher constantly monitored the discussions of the eight groups on Piazza. During the collaborative period, he filled out the observation form which included a checklist and a blank space for further comments. These comments were later used to make inferences from the interaction and communication patterns between members.

Recitation 2

Students' discussion messages. For Recitation 2, the transcripts of the video-based discussions were extracted from the video using the "Transcript" option on YouTube. These transcripts were transferred to Word files to be "tidied up" and then analyzed following the same procedure as in Recitation 1. The transcripts were divided into messages that contained complete ideas, the messages were then analyzed using the coding scheme developed by Van der Meijden (2005). To achieve this, qualitative analysis software (QDA Miner 5) was also employed in the process of coding and clustering of the messages.

Observations form. The researcher watched the recorded videos made of the synchronous video-based discussion of the eight groups. While watching the videos, he filled out the observation form and took notes of what he observed during the group discussions.

Validation

To validate the content analysis of the online discussions, all the transcripts, extracted from both recitations, were each coded three times by the researcher. To minimize the exhaustion content analysis requires and also to avoid misinterpretations of the messages, the researcher left some time between each coding session for reflection upon the data. At the end of the three coding sessions, the codes were compared for any discrepancies in the results. To corroborate the results of the coding analysis done individually by the researcher, the judgment of two external coders was employed. These coders received training on how to use the coding scheme before they were assigned part of the data to analyze. The external coders were allotted ten days to become familiar with the transcripts and work on the content analysis. The coders did not discuss, nor have knowledge of the other's coding until completion of the coding process. Finally, the researcher and the external coders compared, via Skype®, their coding analysis results, discussed and reached agreements on their findings.

Results

Levels of Cognitive Engagement

The first sub-question inquired into the levels of cognitive engagement reached by fully online students in text-based and video-based discussions.

In text-based Recitation 1. A total of 407 messages, extracted from the eight group, text-based discussions in Recitation 1, were coded using the coding scheme of Van der Meijden (2005). Based on the overall results of the coding frequency and the total percentage of words, it can be stated that students exhibited high-levels of cognitive engagement. Figure 3.1 provides an overview

of the coding frequency results of the eight group discussions. As can be seen from the figures, 34% of the total postings fell into the category of high-level cognitive engagement and 18% into the category of low-level of cognitive engagement. The results of the word distribution analysis, of each coding category, are shown in Figure 3.2. The eight group discussions resulted in a total of 22,127 words, of which 69% belonged to contributions falling under the category of high-level of cognitive engagement. In short, this means that messages coded as high-level of cognitive engagement contained a larger number of words than those coded as low-levels of cognitive engagement.

Further analyses on the cognitive dimension show that the most frequent codes were *answering with elaboration, using arguments or by asking a counter-question.* (*CHG2, 38.60%); followed by *providing an example related to/based on a previous answer or idea* (*CHG2 EXPL, 18.20%), and *accepting contribution of another participant with elaboration* (*ACCEPT+, 8.70%), See Figure 3.3. Interestingly, those contributions under the categories of *asking questions that require an explanation* (*CHV2, 0.30%) and *not accepting contribution of another participant with elaboration* (*REJECT+, 0.70%) scored the lowest. The implication of this is that students refrain from questioning or contradicting their group mates' opinions or ideas. In other words, there was insufficient argumentation in all discussions.

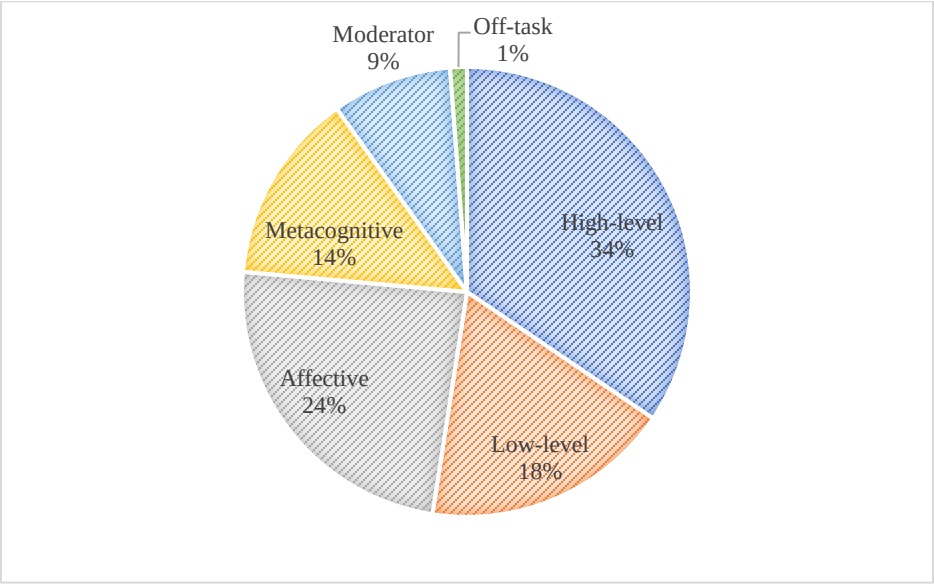

Figure 3. 1. Coding frequency results of the eight text-based groups discussions.

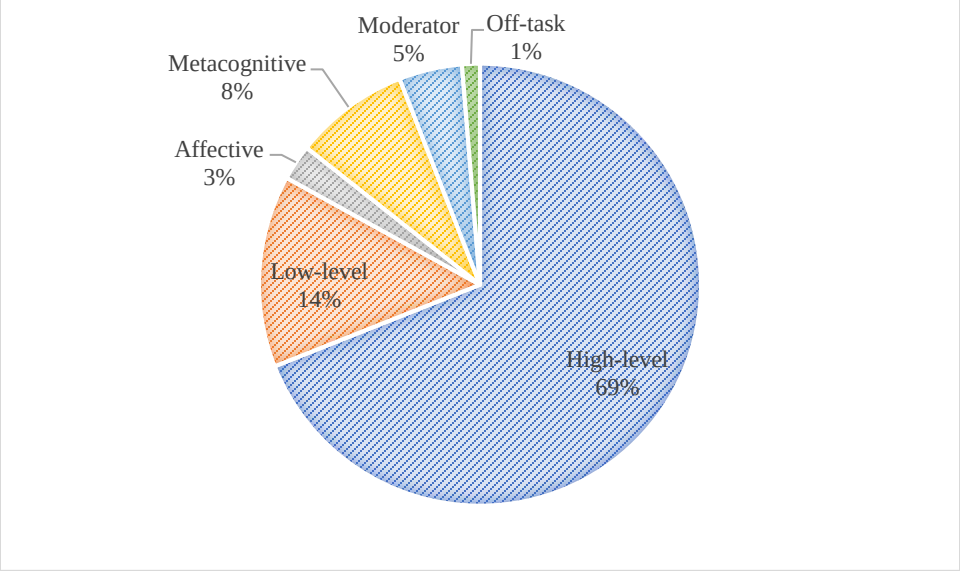

Figure 3.2. Word distribution results of the eight text-based groups discussions.

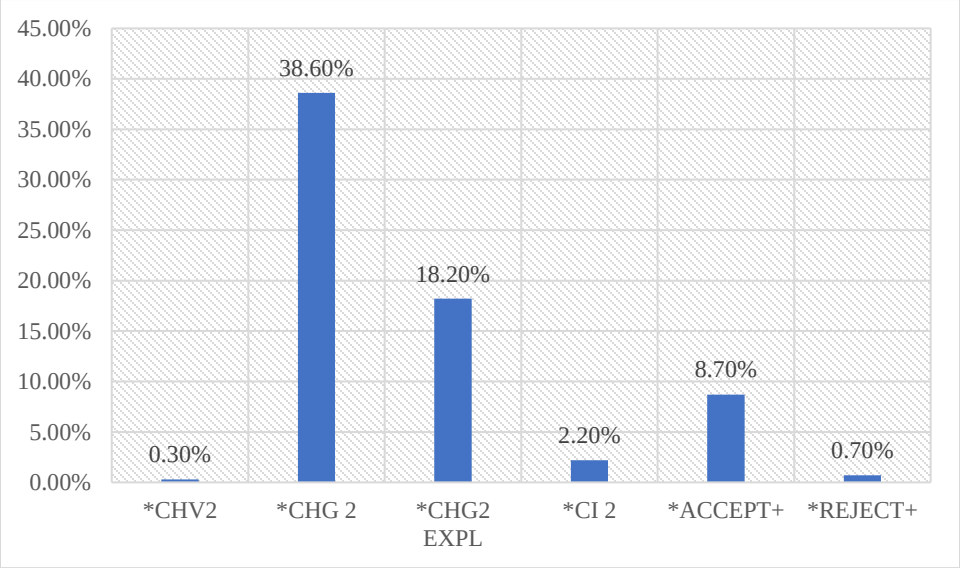

Figure 3.3. Results of the analysis of the cognitive dimension.

In video-based Recitation 2. The results of the video-based discussions, Recitation 2, were very different from those obtained in Recitation 1 and were clearly influenced by the immediacy and synchronicity of the medium which resembled face-to-face encounters.

A total of 337 messages were extracted from the eight video-based group discussions: these were coded using the same coding scheme used in Recitation 1. Group members' self-introductions at the beginning of the videos were considered irrelevant to the discussion, and thus, they were not coded. The results of the coding frequency analysis showed that 58% of the total percentage of contributions fell into the category of "high-level of cognitive engagement", and 22% in the category of "low-level of cognitive engagement" (see Figure 3.4). Further, the results of the word distribution analysis showed that messages at high-level of cognitive engagement accounted for 77% of the total number of words in the eight group discussions. This implies that messages at high-level of cognitive engagement contained a larger number of words than those at low-levels.

Further analysis of the cognitive dimension (see Figure 3.6.) showed that most messages at high-level of cognitive engagement fell into the categories of *answering with elaboration, using*

arguments or by asking a counter-question (*CHG2, 29.4%); followed by the categories of accepting contribution of another participant with elaboration (*ACCEPT+, 8.90%) and giving information with elaboration (*CI2, 8.0%). Moreover, in contrast to Recitation1, the discussions in Recitation 2 contained a slightly larger percentage of messages under the category of *not accepting contribution of another participant with elaboration* (*REJECT+, 5.6%), and *asking questions that require an explanation* (*CHV2, 3.30%). It can be therefore stated that there was more argumentation in Recitation 2; however, the frequencies of these codes could still be considered rather low.

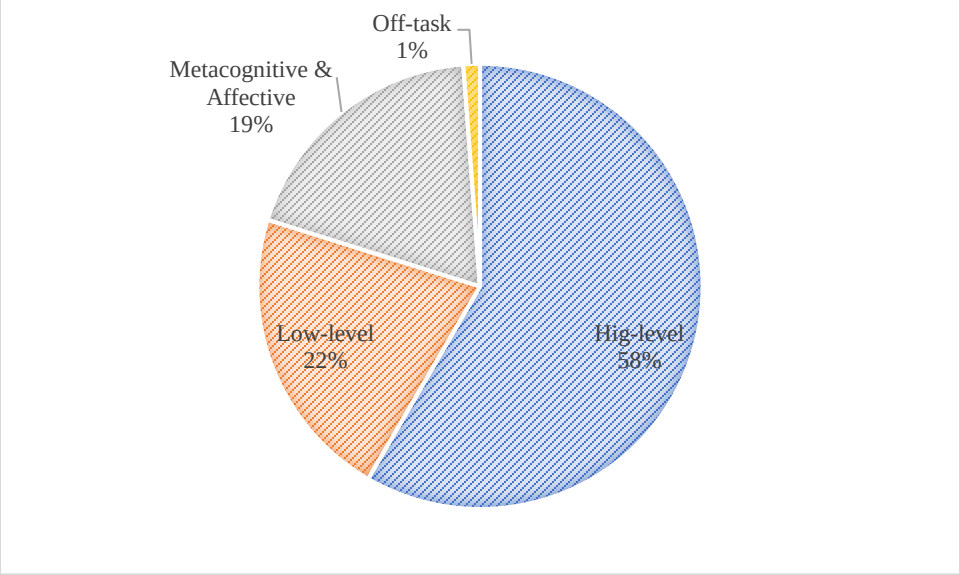

Figure 3.4. Coding frequency results of the eight video-based groups discussions.

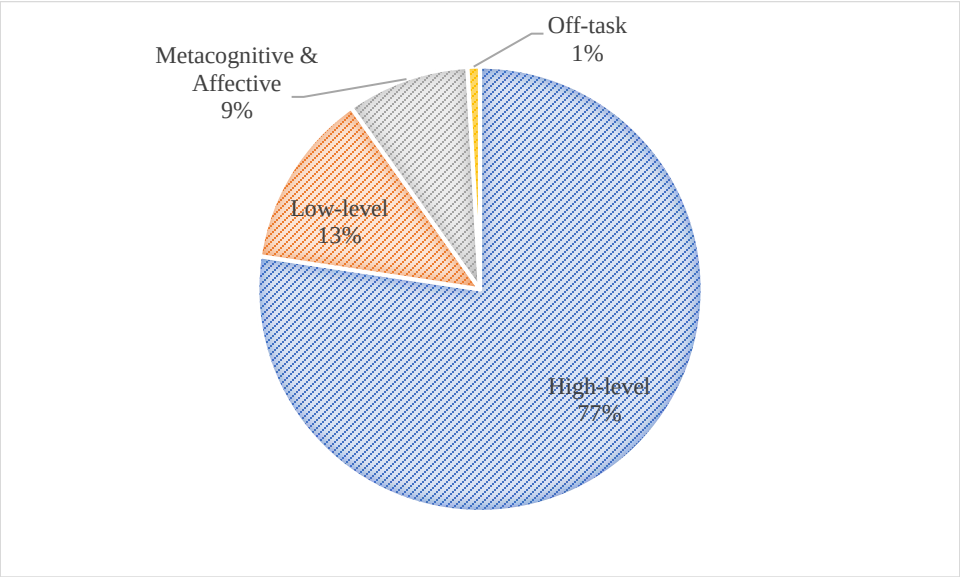

Figure 3.5. Word distribution results of the eight video-based groups discussions.

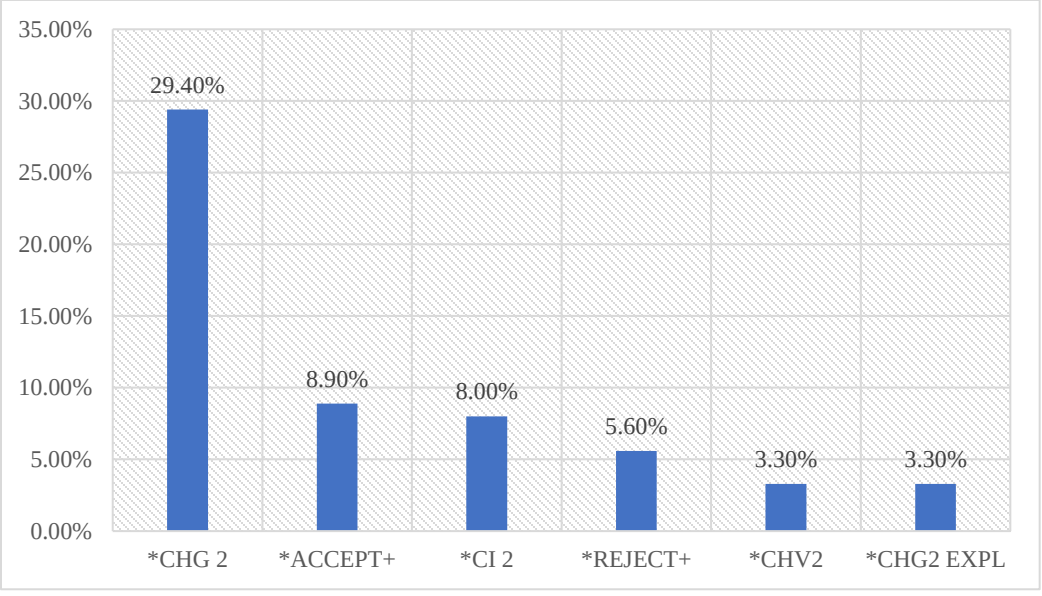

Figure 3.6. Results of the analysis of the cognitive dimension.

Patterns of Knowledge Contribution

The second sub-question asked the patterns of knowledge contribution in both text-based and video-based discussions.

Patterns of knowledge contribution during text-based Recitation 1. The interactions and contributions of each group member were tracked. This was made possible by using a function on Piazza called "Post history bar" which displays the sequence in which each message is posted and the contributor's name, in chronological order. Analysis of the post history bar corresponding to each group, three patterns of knowledge contribution were revealed. These patterns were labeled as *individualistic*, *leader-centric*, and *democratic* to reflect their characteristics and facilitate distinction between them.

Figure 3.7 gives an overview of the process and the three patterns of knowledge contribution. As explained in the methodology section, in Recitation 1, each group was given three semi-structured questions based on course readings. Each group member had to do the reading individually and then share their individual points of views with their group mates. Then, as a group, they were required to discuss their different points of view and so create a wrap-up report reflecting the group answers.

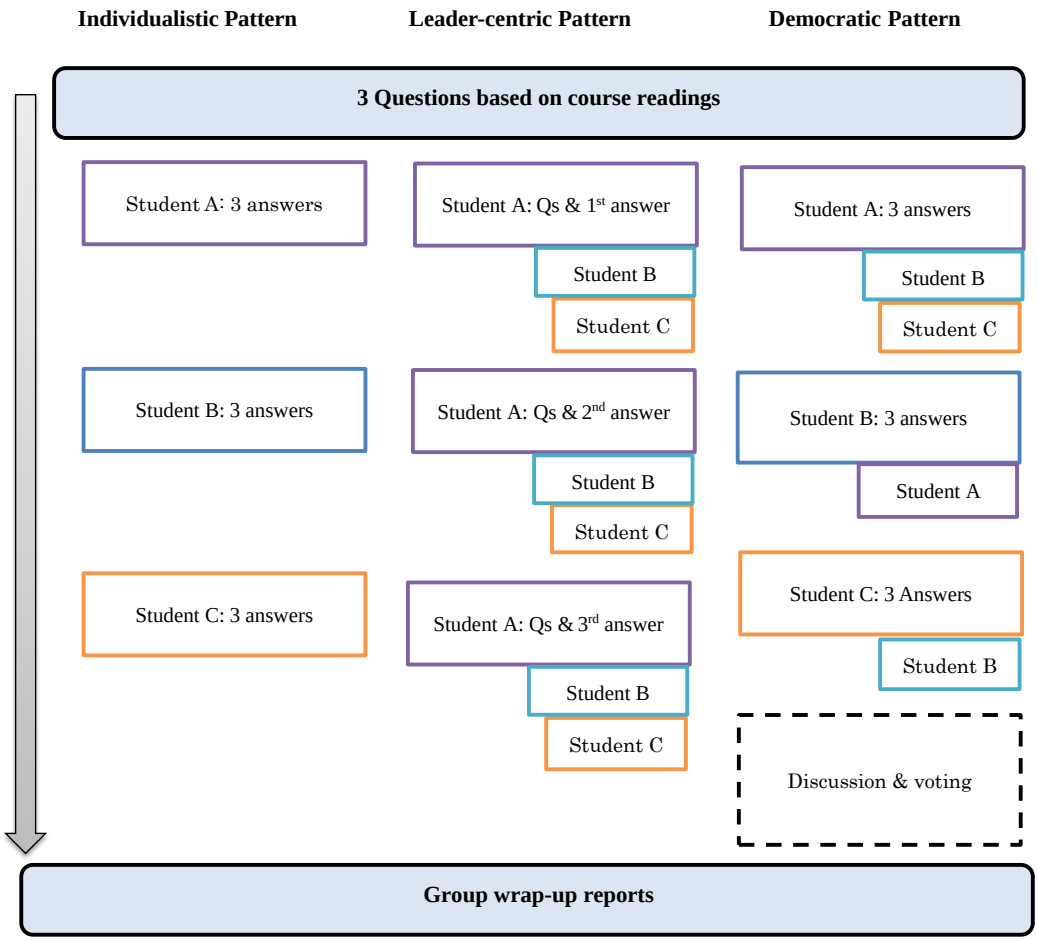

Figure 3.7. Three patterns of knowledge contribution found in Recitation 1.

Individualistic pattern. This pattern was followed by five groups (3, 4, 5, 6 and 7). In this pattern, little interaction was observed among team members. Each member merely posted their own answers and opinions corresponding to each question without discussion with their counterparts. Towards the end of the discussion period, one or two members of the team gathered all members' answers, edited them and posted the final group answer in the forum. The results of the content analysis of this pattern showed that the majority of the messages were categorized as *answering with elaboration* (*CHG 2) which included an example that supported the main idea (*CHG2 EXPL). Messages that posed questions and required further explanation (*CHV2) and

messages that accepted a contribution of another participant and required further elaboration (*ACCEPT+) came only from those students who wrapped up the group's opinions. Interestingly, messages that rejected or contradicted members' opinions (*REJECT+; REJECT -) were not found.

There was not much in the way of interaction and engagement among group members in those groups which followed the individualistic pattern. Further, there were very few comments that showed reinforcement or encouragement among individual members. The majority of the members greeted the group as a whole ("Hi to all of you," "Hi group mates" or "Hi everyone") before sharing their answers or ideas ("here are my answers" or "here are my thoughts"). They did not engage in discussion; instead, focusing more on elaborating their individual answers and providing examples to back up their opinions. Despite there being a sense of cooperation among group members, there was no sense of real collaboration.

Leader-centric pattern. This pattern was followed by two groups (Group 1 and 2). In this pattern, one of the team members assumed a leadership role. This person, which here is referred to as the leader, initiated the discussion by posting the questions one by one. First, he/she posted Question 1 and shared his/her answer to be discussed with the whole team. After each member provided their viewpoints, they moved on to successive questions following exactly the same procedure. This pattern, which looked well-organized, involved more participation and interaction among team members compared to the individualistic pattern. Nevertheless, the results of the content analysis showed that the majority of the group members tended to accept and back up the contributions made by the leader. In contrast to the individualistic pattern, the results of the coding analysis showed that there were fewer messages under the category of *answering with elaboration* (*CHG2), but more messages under the categories of *providing an example to back up an answer or idea* (*CHG2 EXPL) and *accepting the contribution of another participant with elaboration*

(*ACCEPT+). Messages which asked questions requiring explanation (*CHV2) and those showing disagreement and requested further explanation (*REJECT+) remained very low and were posted mainly by the group leader.

It is important to mention that the leaders, during the process of discussion, were instrumental in encouraging all their group mates to provide answers to the questions. They showed vulnerability in making comments such as "my opinion may be shallow" to ask for other group members' support. In both groups, members kept their comments friendly and respectful. There was a sense of group collaboration in elaborating on the leader's ideas.

Democratic pattern. This pattern shared some characteristics of both the first and second patterns and was followed by only one group (Group 8). First, a team member posted three answers and ideas corresponding to the three questions. The other team members either commented on or build upon the first student's ideas. Subsequently, another team member posted his/her three answers or ideas and the rest of the team either added or built on the second student's answers. The rest of the team members followed a similar pattern. However, towards the end of the activity, all team members discussed and voted for the best answers: something not observed in the individualistic and leader-centric pattern, and then one of the members edited the team's wrap-up report. The content analysis of the team which followed this pattern shared some similarities with both the individualistic and leader-centric patterns. Most students posted messages that belonged to categories Answering with elaboration (*CHG2) and provided an example to back a previous answer/idea (*GHG2 EXPL). However, in contrast to the leader-centric pattern, the number of messages in the category of *accepting contribution of another participant with elaboration* (*ACCEPT+) was smaller, and messages in the category of *not accepting contribution of another participant with elaboration* (*REJECT+) came from more than two group members. In contrast

to the first two patterns, the democratic pattern showed a fairer distribution of contributions at a high level of cognitive engagement.

The democratic pattern group was very active. Most members collaborated and showed interest in the discussion. They shared ideas not only with the group as a whole but also among individual members. Group members started by addressing their comments to the entire group (e.g. “Hello Group 8!”, “Hi everyone”), but as time passed, they started addressing comments to more specific members (e.g. “Hi Nie!”, “Hey Rey!”). It is worthy of note that this was the only group whose members encouraged each other by using emoticons, memes and GIFs (Graphics Interchange Format).

Patterns of knowledge contribution during video-based Recitation 2. Three main patterns of interactions and knowledge contribution were observed with regards to the video-based discussions. However, these patterns were different from those found in Recitation 1. In Recitation 2 the moderator played a crucial role in the construction of these patterns of knowledge contribution. For this reason, they will be referred to as “moderation patterns” from this point onwards in order to highlight their characteristics. Figure 3.8 gives an overview and visual representation of the three patterns of knowledge contribution found. For Recitation 2, as explained in the methodology section, each group was given four sets of semi-structured questions based on course readings. Similarly to the activity in Recitation 1, each group member had to complete the readings individually and discuss their individual points views with their group mates synchronously during a video-based discussion. On completion of the group discussion, one or two students synthesized the group answers and submitted them as the group’s conclusion.

Strict moderation pattern. In the first pattern, the moderator had a strong influence over the way group members made their contributions. Firstly, the moderator read the first set of questions and assigned each group member, in turn, to provide their individual answers; the moderator then restated the answer in order to confirm his/her understanding before adding further comments on the given answer or asking further questions. On concluding discussing the initial set of questions with the first member, the moderator moved to the next group member and followed a similar process. The moderator also summarized the group members' answers at the conclusion of each discussion phase. This one-to-one pattern of discussion was observed during the entire video. Little interaction or argumentation was observed among group members because answers and opinions were mediated almost exclusively by the moderator.

The coding analysis results of the discussions in this moderation pattern showed that the majority of messages fell into the categories of *answering with elaboration* (*CHG2); and *giving information, an idea or thought, with elaboration* (*CI 2). These were followed by messages under the subcategories of *evaluating the content, summarizing/concluding* (CIE), *referring to earlier remark/information* (CIT); and *accepting contribution of another participant with elaboration* (*ACCEPT+).

Mild moderation pattern. In the second pattern, the moderator read the first set of questions and then invited someone to start the discussion (e.g. "Who wants to start?", "Anyone?"). The effect of this was that the order in which each group member added their contributions was not decided by the moderators, in contrast to moderation pattern one. Group members were able to determine whose turn it was next by calling a member's names (e.g. "How about you Jimmy?", "What do you think Dianna?) or by asking if anyone in the group wanted to go next (e.g. "How about you guys?", "Anyone else?"). In this pattern, moderators were not the ones responsible for

summarizing groups' answers and opinions after every set of questions were discussed; instead, different members in each group were assigned to summarize the group's ideas.

The content analysis of moderation pattern two showed that most messages fell into the two categories of *answering with elaboration* (*CHG 2) and *accepting contribution of another participant with elaboration* (*ACCEPT+). These were followed, in frequency, by the coding categories of *evaluating the content (summarizing/concluding)* (CIE) and *not accepting contribution of another participant with elaboration* (*REJECT+). This pattern of moderation showed more interaction and argumentation among group members in comparison to moderation pattern one.

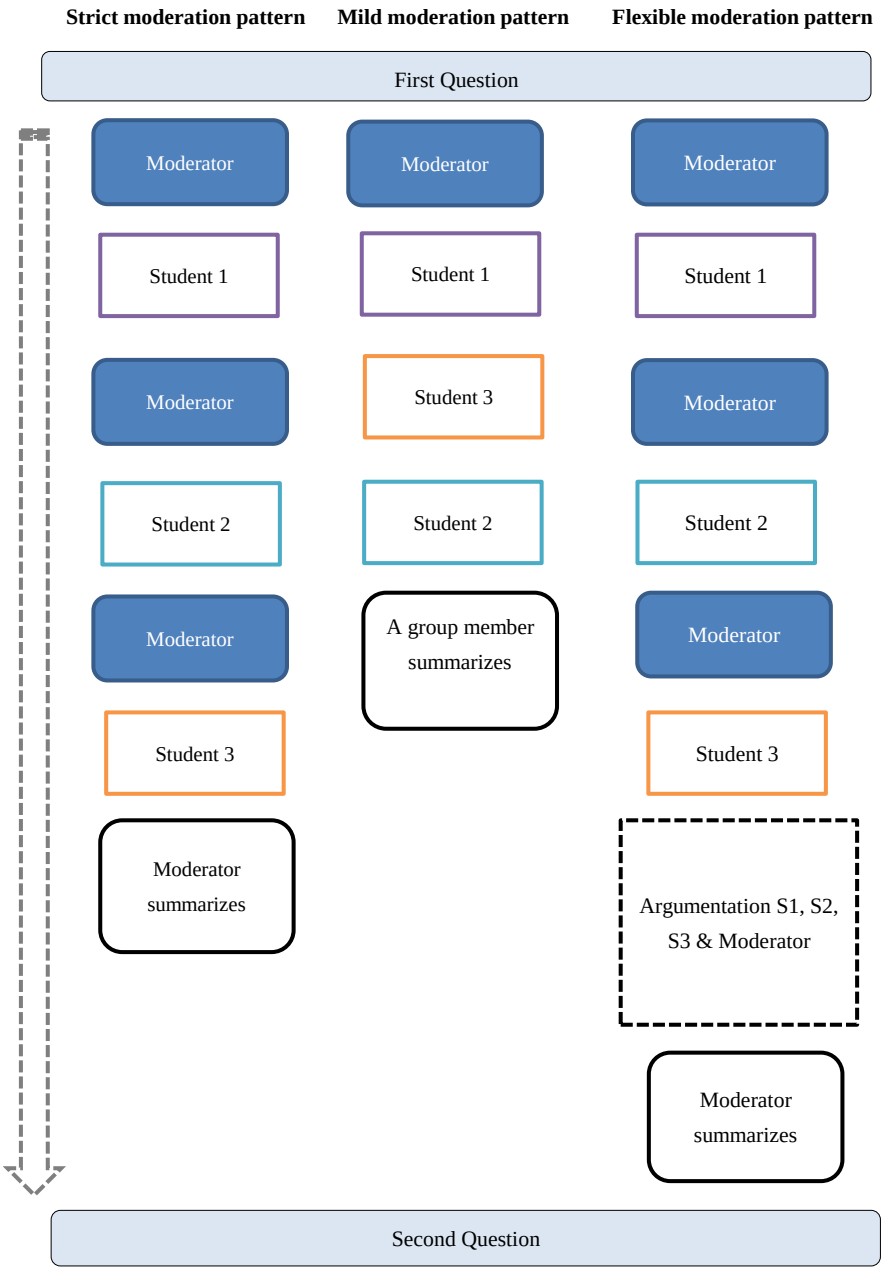

Figure 3.8. Three patterns of moderation found in Recitation 2.

Flexible moderation pattern. In the final pattern, the moderator started by reading the first set of questions and then assigned turns to each group member to share their answers and opinions. After the sharing of individual contributions, the moderator allowed some time for free discussion. During this time there was no specific order of participation as group members jumped into the

discussion reacting to the other members' opinions, showing agreement or disagreement in their comments. The first set of questions having been discussed, the moderator summarized the group's comments and then moved on to discuss the next set of questions. The third and fourth sets of questions followed the same group dynamics.

The content analysis of the flexible moderation pattern revealed that most of the messages belonged to the categories of *answering with elaboration* (*CHG2) followed by *not accepting contribution of another participant with elaboration* (*REJECT+) and *giving information, an idea or thought, with elaboration* (*CI2). In contrast to groups that followed the strict and mild moderation patterns, the single group that followed the flexible moderation pattern showed a higher frequency of codes at high levels of cognitive engagement in their discussion. Argumentation was observed as members questioned each other's opinions and showed agreement and disagreement in a more natural way when compared to the first two moderation patterns previously explained.

Other factors that influenced the levels of cognitive engagement. It is worth mentioning that there were other factors that contributed to higher levels of cognitive engagement in Recitation 2.

Firstly, Recitation 2 resembled face-to-face encounters, since it was synchronous communication which allowed multiple information cues (words spoken, tone of voice, body language, etc.) and prompt feedback. Secondly, the time limit of the activity was a factor that also encouraged students to stay focused on the task: every group had only 30 minutes to exchange and discuss their ideas with their group mates in their videos. Students had limited time for socializing or making small talk while video recording their discussion sessions. Thirdly, the majority of the groups did not submit the raw version of their video discussion; Group 3 being the exception. There were preparations and rehearsals off camera to some extent before recording of the video-based

discussions. Several postings found in the group chats on Piazza back up these assumptions. Below is an example.

> "Hello girls! May I suggest that we do a test run tonight? (Hello Rox! that is, if you are available tonight, Phil time since you are the host and should be the one to invite us :)"
>
> A female student, Group 2

A couple of groups used Piazza exclusively to make arrangements and share their opinions prior to the video-based sessions, while others moved onto other virtual platforms such as Facebook and Google hangouts and created private groups. Unfortunately, due to privacy issues, neither the instructor or the researcher had access to any of that external source of data. Below, however, is an example of a student sending an invitation to another student to join a private group on Facebook.

> "We're conversing thru Facebook messenger too and would be awesome if you could hop in and join the conversation. I created a thread there, my profile is […] please check your filtered messages to see our messages and kindly accept the invitation."
>
> A male student, group 6

Lastly, it was noticed that many of the students had a script of their answers while doing their video recordings. Their eye movement and tone of voices indicated that they were reading their opinions. Some of them even shared these scripts with their group mates on Piazza after completing the activity. Finally, Recitation 2 was scheduled after Recitation 1 which meant that all groups had some experience of working together. It is likely, therefore, that previous interaction during Recitation 1 had some impact on students' behavior in Recitation 2, making them feel more comfortable in communicating and interacting with their group mates.

Although the tasks of both recitations were aimed at involving students at high-levels of cognitive engagement through requiring decision-making and consensus among members, there were different factors that led to the formation of different patterns of knowledge contribution and influenced students' levels of cognitive engagement. Among these factors were: the degree of participation, interaction and engagement of group members during the discussion, the group dynamics, the role that each member undertook to accomplish the task, the kind of discussion moderation, the synchronicity and asynchronicity in the communication, and the affordances of the virtual platforms.

Quality of Group Wrap-up Discussion Reports

The third research question was concerned with the results of the group's discussions. As previously explained, in Recitation 1, students had to create a group wrap-up report and submit it as the final product of their text-based discussions.

To answer this question, all the group wrap-up were evaluated based on the rubric table for wrap report. This rubric table, as aforementioned, evaluates the organization, quality of content, grammar and spelling, interest level and timeliness. It also inquires about the evaluator's opinions on the students' understanding of the topic, their critical thinking and uniqueness of their contribution. The researcher and two external collaborators evaluated the group-wrap up reports separately before getting together to compare their results and share their comments and feedbacks. Having done that, the researcher drew conclusions on the quality of the group wrap-up reports.

Overall, the results showed that the style of these written reports was heavily influenced by the patterns of knowledge contribution that each of the groups followed. Moreover, key group members who gathered and edited the group ideas, the management skills of leaders in the groups, and the intervention of more than three group members in the editing process of the reports were

crucial in defining the quality of the group wrap-up reports. A more detail description of the characteristics of these reports is presented below.

Wrap-up reports of the groups that followed the individualistic pattern. Five groups out of the eight followed the individualistic pattern. Their wrap-up reports showed good organization and provided enough detail to allow the reader to understand the content. Based on the rubric table for wrap report, the average score of the 5 groups was 12.4 points out of a possible 20. Three of these reports demonstrated a good variety of vocabulary and included vivid supporting detail. It is worthy of note that the quality of the wrap-up reports relied heavily on the member who reviewed and put the ideas of the group together. This member, referred to as "the editor" hereafter, was not necessarily an active member who had previously contributed with his/her ideas during the discussion period. In some groups, the editor was a group member who just waited for others to post their individual ideas before editing the group wrap-up report. In other groups, it was a member who showed up late for the discussion and felt guilty for not contributing with any ideas to the discussion itself and as some sort of penance he/she offered to do the wrapping-up by him/herself. Consequently, the quality of the wrap-up reports of groups that followed the individualistic pattern relied heavily on how skillful the editors were in organizing, blending and combining the ideas posted by all group members.

A unique characteristic of the group wrap-up reports was the lack of flow between ideas in each paragraph. Most editors tried as much as possible not to reject a single contribution from any of their group members and forcibly incorporated all of them in the wrap-up report. To that end, it was difficult for editors to make smooth transitions between students' messages that showed opposite arguments or ideas. It was observed that some reports had sentences that were out of place and some paragraphs included large and unedited comments previously made by a single group

member during the discussion period. This suggests that many editors simply copied and pasted all their group mates comments and then edited them. As a result, groups that followed the individualistic pattern produced overly long group wrap-up reports.

Wrap-up reports of the groups that followed the leader-centric pattern. Overall, the wrap-up reports of the two groups that followed the leader-centric pattern demonstrated good organization with events logically order with a sharp sense of beginning and end. They contained an average of 785 words providing supporting details specific to the subject. Furthermore, enough details were presented to allow the reader to clearly understand the content and make judgments about it. Based on the rubric table for wrap report, the average score was 14 points out of 20 points, which was slightly higher than the average score of the reports that followed the individualistic pattern.

The management skills of the members who took the leadership role in these groups were crucial in defining the quality of the wrap-up reports. In both groups, the leaders provided an outline of the actions that required taking charge and encouraging all members to revise the paper and edit it together. Before submitting the final draft for the instructor to see, leaders in both groups posted similar directions to all their group mates such as “Please feel free to make further adjustments/ include any additional info” (Leader in group 1), and “You can edit it if you have something more fitting to say or if you want to add anything” (Leader in group 2). It was also noticed that it was mainly two members of each group who worked on editing the wrap-up reports under the supervision and approval of the leader. They combined the group leader’s ideas with those of the other group members to complete the final group wrap-up report.

Wrap-up report of the group that followed the democratic pattern. The wrap-up report of the single group that followed this pattern showed very good organization. It was concise, clear and well-argued. It comprised 275 words, of which 8.4% were academic. Interestingly, no grammar or punctuations mistakes were found. Overall, its points were logically ordered with a sharp sense of beginning and end and although it fell short of providing more specific examples to illustrate some of its ideas and its vocabulary was a bit stiff and unimaginative, it became a clear example of a synthesis of the entire group members' ideas.

The final version of the group's wrap-up report did not depend on a single editor or a leader's management skills; it was more a result of the collaboration of at least five group members who worked together to narrow down the comments posted during the discussion to come up with a clearer understanding of each member's thoughts. This suggestion came from a male member who posted "Let's keep our answers concise but meaningful. Giving 4-6 sentences is ideal." Besides synthesizing their ideas, it was noticed that two group members encouraged their team by using emoticons and memes during the editing of the wrap-up report.

Comparison of the Design of the Current Study with That of Previous Studies

The fourth sub-question sought to learn how the design of activity influence students' levels of cognitive engagement.

To answer this question, the type of task and the content analysis results of the current study were compared with those of four previous studies, which had used the same coding scheme (Sayamon, 2013; Shukor, et al., 2011; Shukor, et al., 2014; Van der Meijden, 2005). Overall, the results of these comparisons revealed that students' level of cognitive engagement were indeed strongly associated with the type task engaged and its design, the degree of interdependence among group members the task required, and the type of knowledge (practical or theoretical) required for

it to be accomplished.

In the current study, as previously explained, students had to answer semi-structured questions based on course readings. Initially, they answered them individually and then, they had to produce a group wrap-up report in Recitation 1, and a summary of the group members' answers in Recitation 2. The results of the coding analysis of the cognitive dimension showed that in both activities, most students provided at least one long answer at a high-level of cognitive engagement (*CHG2). Students who committed to the discussion tended to back up their answers by providing additional examples (*CHG2 EXPL) and elaborated further comments on their group mates' ideas (*ACCEPT+).

These results were slightly different from those obtained by Sayamon (2013), who investigated the use of web boards for enhancing the ethic and knowledge construction of 35 fully online undergraduate students in Thailand. The activity lasted eight weeks, but students worked for only two hours every week on the activity, giving 16 hours in total. Students were required to work on different tasks: Knowing each other, checking pros and cons, analyzing for improvement, reflecting on ethics action, identifying the ethics project and presenting their results. At the end of the activity, a total of 465 messages were analyzed and coded. The results of the analysis showed that messages at a high-level of elaboration were at 32.69%. In the cognitive dimension, the most frequent code was *answering with elaboration* (*CHG2), followed by *giving information, an idea or thought, with elaboration* (*CI2).

In one study by Shukor et al. (2011), the participants were given a case study on the issue "portal versus website for discussion; and content management system versus learning management system". The discussion was voluntary and open to all students, to better understand the students' behavior in an unconditional task. A total of 38 messages were collected and coded. Overall, students' contribution at the higher-level remained considerably lower than expected.

Results of the content analysis showed that the discussion evolved exclusively in the area of *answering without explanation* (CHG1). Even though there were students who managed to provided opinions with further elaboration (*CI2); most of the information given was retrieved directly from the internet or built on other student's previously shared contributions.

In another study, Shukor et al. (2014) analyzed the levels of cognitive engagement of 20 students enrolled in the subject Web-based Multimedia Development at a university in southern Malaysia. Five groups, consisting of four members each, were given two weeks to solve five different technical problems (e.g. Problem: Problems in website design) through text-based discussions boards. According to the authors, students were not assigned any particular role within groups in order to allow collaboration to occur as naturally as possible. The instructor did, however, provide a framework to the group discussions by inviting participation and giving clues. A total of 55 messages (which include 105 segments) were analyzed and coded after the activity ended. The results showed that the highest percentage was accumulated at the code *giving information without elaboration* (CI1). The second largest code was *giving information, an idea or thought, with elaboration* (*CI2). However, the authors reported that on many occasions the participants pasted information directly from internet resources without further elaboration of their own ideas.

Finally, a study by Van der Meijden (2005) compared the collaboration between children under two sets of conditions: face-to-face and text-based. The study took place in the Netherlands and involved 84 six graders who ranged in age from 11 to 12 years old. In both conditions, the students were placed into dyads (20 students in the face-to-face condition and 22 students in the text-based condition) to solve 15 mathematical problems requiring formal reasoning and discussions. The coding analysis results showed that in both face-to-face and text-based conditions, the frequency of high-levels of elaboration was found to be very low. Most of the student's contributions fell into two main categories: *answering without elaboration* (CHG1), and *accepting*

a contribution of another participant without elaboration (ACCEPT-). According to the authors, students did not appear to develop interactional styles as a natural consequence of participating in collaborative learning activities. Table 3.3. below provides a summary of the comparison amongst the studies described above.

Table 3.3
Summary of the Comparisons of the Studies

Study	Current study	Sayamon (2013)	Shukor et al. (2011)	Shukor, et al. (2014)	Van der Meijden (2005).
Type of Task	- Answering semi-structured questions	- Knowing each other, - Checking pros and cons - Analyzing for improvement, - Reflecting on ethics action, - Identifying the ethics project - Presenting their results	- Holding an open discussion on the issue: portal versus website for discussion; and Content management system versus learning management system.	-Solving 5 technical problems	- Solving 15 mathematical problems
Results of the Content Analysis	*CHG2	*CHG2	CHG1	CI1	CHG1
	*CHG2 EXPL	*CI2	*CI2	*CI2	ACCEPT-
	*ACCEPT+	CIE			

* Indicates high-level cognitive engagement

After comparing the types of tasks and the content analysis results of the current study with those of previous empirical studies, which used the same coding scheme, three types of tasks became apparent: planning tasks (generating solutions), intellective tasks (solving problems with a correct answer), and decision-making tasks (dealing with tasks for which the preferred or agreed upon answer is the correct one). The names of these types of tasks were adopted from McGraths' (1984) tasks circle and ordered based on the successively increasing degrees of interdependence required by the activity.

In the studies by Shukor et al. (2011), Shukor et al. (2014) and Van der Meijden (2005), the tasks belong to the first two categories, planning tasks and intellective tasks respectively. These tasks did not require consensus among group members; but rather possible technical solutions and correct mathematical answers. That is probably why most students simply provided individual ideas and solutions without elaborating further on them. On the other hand, both in the current study and in Sayamon's of 2013, the results in the decision-making category are compatible. That is, they both required students to look for consensus within the group, and thus create some degree of interdependence among members. Moreover, both studies used semi-structured questions, based on course readings, that had no single correct answer. Students had to discuss subjective concepts and needed to share their different perspectives, attitudes, and opinions with those of the other group members. In addition, the participants in both studies were fully online students enrolled in Open Universities who relied on virtual platforms as their main medium of communication with professors and other students. Thus the mode of delivery of the course has likely influenced students in both the current study and in Sayamon's study to take their ideas to a higher level of cognitive engagement in comparison to the other studies.

Further findings. Interestingly, the comparison of the coding results among studies also revealed that in all the studies, without exception, the least frequent codes found were *asking questions that require an explanation* (*CHV2) and *not accepting a contribution of another participant with elaboration* (*REJECT+). In the current study, combined they made up only 1% of the total number of messages in Recitation 1 and 8.9% in Recitation 2. In the same way, Van der Meijden (2005) said that the frequency of these two codes was low in both face-to-face and text-based conditions. Further, Shukor et al. (2011) reported that messages coded as CHV2 were only dominated by the instructor who moderated the group discussions; and the percentage of messages

under the code REJECT+ was very low. Similarly, Shukor et al. (2014) reported that the same two codes (*CHV2 and REJECT+) remained at low percentages. Moreover, they noticed that even though some of the students' asked questions that required explanation (CHV2), the other group members provided simple answers (CHG 1) without elaborating their ideas further. Finally, even more drastically, in Sayamon (2013) it was observed that these two codes were not to be found. This finding suggests that there was not enough arguing, questioning, contradicting or justification of ideas in each of the discussion. In other words, there was a lack of argumentation and negotiation. This is could be one of the reasons why participants were unable to take the discussions to a higher level of cognitive engagement. Negotiation and resolutions of conflict of view or interests required the transmission of maximally rich information, including not only facts but also values, expectations, emotions, commitments and the like. Consequently, simply agreeing with, or to, other's ideas might be insufficient interaction for individuals and groups to reach a high level of knowledge construction.

Discussion

Study One started by focusing on measuring the levels of cognitive engagement in eight groups, comprising fully online students, in text-based and video-based discussions (Recitation 1 and Recitation 2 respectively). To further understand the factors that affect cognitive engagement in virtual collaboration, it then explored the patterns of knowledge contribution of both discussion formats and analyzed the quality of the results gained from the text-based discussions (group wrap-up reports). Finally, it compared results with those of previous studies that had employed the same coding scheme to learn more about how different tasks influenced students' cognitive engagement.

In all, the results of this investigation showed that, firstly, making judgments exclusively

based on the coding frequency was insufficient since every unit of meaning coded was of different length. Secondly, the type and design of the task assigned strongly influenced student's levels of cognitive engagement. Thirdly, as for Recitation 2, the style of moderation has a great impact on the patterns of knowledge contribution during the discussions. Finally, aside from the editors' writing skills, leaders' management skills and teamwork, other factors such as feedback, communication and interaction among group members influenced the quality of group wrap-up reports. Each of these findings are expanded upon and discussed below.

Cognitive Engagement Measured by Frequency and Length of the Messages

The results of the coding frequency of Recitation 1 showed that only 34% of the total messages belong to the category high-level of cognitive engagement. Overall, these findings mirror those of previous studies, which suggest that the majority of students tend to remain at superficial levels of cognitive engagement in asynchronous text-based discussions. However, in this study, it was noted that making judgments exclusively based on the coding frequency alone was not sufficient since every unit of meaning coded was of a different length. Thus, further analysis of the word distribution was called for. The results of this further analysis revealed that 69% of the total number of words belong to messages coded as high-level of cognitive engagement. This means that even though messages at the high-level of cognitive engagement were found to be less frequent in all discussions, they were actually lengthier than those at low-level of cognitive engagement.

Similarly, the results of the coding frequency analysis of Recitation 2 revealed that 58% of the total messages belonged to the category of high-level of cognitive engagement. However, the results of the word distribution analysis indicated that students' messages at a high-level of cognitive engagement accounted for 77% of the total number of words contained in the eight group discussions. This again shows that in both recitations students invested more time and energy in

crafting ideas that required more cognitive processing. These findings support claims of Van der Meijden (2005), who stated that the unit of analysis can take many forms (message/note, meaningful event, etc.); however, the procedure used to segment transcripts is rarely described at length in empirical studies. Instead, the coding reliability tends to be reported but the reliability of the segmentation process itself tends to be forgotten and goes unreported. Findings obtained in this study also agree with Casimiro (2016), who said that the quantity of posts is not always related to the quality of students' responses, and making careless judgments based exclusively on the coding frequency may be misleading.

Overall, the results of the content analysis suggest that the coding frequency alone is not enough to truly reflect the cognitive engagement of students in virtual discussions. Unfortunately, previous studies (e.g. Casimiro, 2016; Perkins & Murphy,2006; Shukor et al., 2011; Sayamon, 2013) based their judgments mainly on the frequency and number of the messages without exploring further the number of words/sentence that composed each message. Simply put, they treated every unit of analysis as being equal, without taking into consideration the amount of time and effort each student invested in explaining their ideas. Consequently, a much more systematic approach of content analysis should perform at least two types of analysis: for coding complete ideas to learn a student's level of cognitive engagement, based on coding frequencies; and to break down those complete ideas into smaller units such as full sentences, phrases, and words. Although possibly more time consuming, this approach would provide a better understanding of the level of cognitive engagement that students can reach in virtual discussions.

The Relation Between Task Design and Cognitive Engagement

The comparisons of the results of the current study with previous studies, that used the same coding scheme, support previous claims that a student's level of cognitive engagement is strongly

associated with the type of task assigned together with its design (Hollingshead, McGrath, & O'Connor, 1993), as well as whether or not it is a compulsory activity (Guan, Tsai, & Hwang, 2006; Perkins & Murphy, 2006). The level of interdependence among group members required to complete the activity is also of importance, as is and whether the tasks require practical or theoretical knowledge.

Comparison with the study of Sayamon (2013). Although different coding patterns were registered in this current study (*CHG2, *CHG2 EXPL, *ACCEPT+) to those of Sayamon's study (*CHG2, *CI2), students in both studies reached high-levels of cognitive engagement. Reasons leading to this outcome can be summarized as follows: both activities involved decision-making, which according to Hollingshead, McGrath and O'Connor (1993), require students not only to provide an individual answer but also to look for consensus within their groups, which requires some degree of *interdependence*. Secondly, there was not one simple single answer/solution to each question/task as students had to discuss subjective and theoretical concepts (e.g. online privacy, ethics, etc.). Students were forced to settle, not only their different perspectives, attitudes, opinions, and beliefs but also any conflict of interest arising. Thirdly, the activity was part of the course requirements, which could, in itself, have provided a strongly extrinsic motivation for the majority of students to complete the tasks. It is also worth highlighting that in both studies, the participants were fully online students from open universities (Philippines and Thailand). This means that they mainly relied on virtual forums as the medium of communication with their group mates and professors. They had only rare opportunities to meet face-to-face and discuss further the tasks as in a blended learning environment.

Comparison with the studies of Shukor et al. (2011) and Shukor, et al. (2014). The activities designed by Shukor et al. (2011), Shukor et al. (2014) shared common traits; they all required students to solve a series of problems. According to Hollingshead, McGrath, and O'Conner (1993), these types of activities fall into the category of *generate tasks* which do not require any degree of consensus or interdependence amongst members in a group. This is because, quite simply, the task objective is mainly to generate as many solutions as possible to address the problem. Furthermore, the problems given to students in both studies were technical, which required specific skill types or knowledge, in this case, computing/programming skills. This may explain why most students in both activities provided simple answers (CHG1) and shared information but without further elaboration (CI1). Students mainly shared possible solutions to the problems along with helpful information found on the web. Other factors almost certainly also affected the results of both studies: in the first study, the activities were not part of the course requirements and the discussions were open to any student who wanted to join. It is, therefore, likely that students did not consider it worth their time reflecting on the problems and engaging in discussions with unknown students and as a result, ended up copying and pasting information from the web without engaging in any discussions. Furthermore, the activity itself did not require students to share their own views on the problem, since they were dealing with mainly technical problems, which required technical knowledge more than theoretical.

Comparison with the study of Van der Meijden (2005). In contrast to the studies by Shukor et al. (2011), Shukor et al. (2014), in Van der Meijden's study, the participants were required to find a correct answer to math problems, which might involve some degree of group interdependence. However, the results showed that the most students provided their answers but without further explanations (CHG1). They also tended to accept contributions of other members,

but without elaboration (ACCEPT-). Hollingshead, McGrath, and O'Conner (1993) call these type of tasks i intellective tasks which required group members to find a demonstrably correct answer. Consequently, "any member who knows the right answer should have little difficulty convincing others to adopt the correct solution" (p.310). Based on the coding results, it is most likely that in Van der Meijden's study, the participants shared their answers, confirmed the right answer and moved on to solving the next math problem. There was very little need for further discussion once the right answer was found.

Cooperative and Collaborative Approaches to Complete the Same Task

Studying Recitation 1, most members simply contributed their ideas without committing to the process of developing the group's final product. Despite students' messages being highly focused on the tasks, and thus meeting the criterion of in-depth thinking, their participation and interaction rate during the discussion period was very low. Zhu (2006) observed a similar pattern in a study on cognitive engagement with 71 undergraduate students. He also noted that the virtual platform served as space for storing individual reflections rather than a space for holding a discussion. Hathorn and Ingram (2002) claim that this kind of group online behavior does not lead to collaboration, but rather to cooperation. According to Paulus (2005), cooperation itself does not foster dialogue among group members because, in cooperation, individuals work together in a group with each one solving a portion of the problem by dividing up their work before combining it into a final product. Further, greater importance is given to meeting the requirements of the task and completing it than to exchanging ideas with group mates to construct new knowledge. Based on these characteristics, it can be said that groups which followed the individualistic pattern adopted a cooperative approach to accomplish the task.

Groups following the leader centric-pattern had, by necessity, a hierarchical structure among their members. They had a leader who led most or part of the discussion and other members who contributed with further comments or examples based on the comments initially posted by the leader. This pattern resembles a pattern called "the star type of interaction" found by Zhu (2006) in the same study mentioned above. This type of interaction is characterized by a single point of centrality which implies no or little interpersonal relations among other members of the network. Group members' responses go to the person who holds a central position in the communication network and through whom the remaining students are connected.

Similar to groups in the individualistic pattern, groups that followed that of the leader-centric gave more importance to completing the task than they did to questioning or contradicting their leaders' ideas in order to come up with new ideas. Instead, they collaborated to improve the leader's ideas and accomplished the task.

Finally, the single group that followed the democratic pattern, which contained the largest number of messages at a high level of cognitive engagement, was a good example of group collaboration. All members contributed answers and engaged in discussion and negotiation. In doing so they displayed a flat leadership structure, members putting greater emphasis on the process of learning than on merely completing the task and so coming up with a synthesis of most members' contributions. Ingram and Hathorn (2004) call this process "real collaboration" because the final product is truly a group product in which it is difficult or impossible to identify each member's individual contribution. The characteristics of the democratic pattern share similar traits to those labeled "learning teams" by Graham and Misanchuk (2004), whose primary goal is individual learning and not the quality of the final product. In this way, members might see the task as an opportunity to acquire new knowledge or gain a new skill.

The Influence of the Moderator on the Patterns of Knowledge Contribution

In examining Recitation 2, the patterns of knowledge contribution are seen to have been influenced by the way the moderator arbitrated discussions. In the strict moderation pattern, the moderator had control over the flow of the discussion, there was no sense of real group discussion where all group members negotiate meaning, take sides on issues or reaching agreement. Students mainly shared their answers and ideas corresponding to each question with the moderator who provided them with a degree of feedback. The moderator had more opportunity to engage in high-levels of cognitive engagement than did the rest of the group.

Conversely, the mild moderation pattern led to a group dynamic where every group member had more opportunity to share ideas directly with others. Every group member also had an opportunity to summarize ideas after the whole group had discussed a set of questions. The moderator took the role of a facilitator as he/she became more engaged in managing the team than contributing ideas to the discussion. Although there was more interaction among group members, there was no real sense of negotiation dealing with different points of view. The majority of students avoided contradicting each other's opinions; instead, showing agreement and building on other members' opinions. According to Casimiro (2016), this type of behavior is a way of preventing conflict and preserving healthy relationships among group members as once intellectual conflicts occur among members, they tend to shy away and disengage from the discussion.

The flexible moderation pattern proved to be the closest to a real discussion. Students adopted firm positions on certain issues and engaged in argumentation. In this pattern, the moderator not only mediated the discussions but also took part. It was observed that after each member had shared their answers/thoughts, there was a time for free discussion, during which no specific order of contribution was established. Students were willing to reject the contribution of other participants and provided further explanations to back up their own opinions. Furthermore,

they provided further ideas to support their claims. It is worthwhile mentioning that this type of discussion was observed in only one group (Group 3). This group was originally composed of three male and three female students, but, unexpectedly, only the three male members joined the video-based discussion. Interestingly, they were the oldest students in the entire class, in their late 40's and early 50's. This finding supports previous remarks of Zhu (2006) which claim that a student's academic maturity is a factor that influences students' degree of engagement in online discussions. In the current study, age and experience seem to be factors influencing students' contributions to the video-based discussions. It is probable that mature students felt more comfortable challenging other's opinions than did younger students; however, caution must be taken since, with such a small sample size, it may well not apply to all mature students.

The Quality of the Group Wrap-up Report and Cognitive Engagement

As mentioned previously, the quality of the wrap-up reports was not influenced solely by the type of tasks and the patterns of knowledge contribution; but also by the editor's writing skills, leadership management skills and the degree of group collaboration. It is difficult, therefore, to make judgments on student levels of cognitive engagement by simply looking at "the final product" because it may not represent the level of cognitive engagement of individual members. Even if we were to do that, Woolley, Aggarwal, and Malone (2015) claim that it is not "the average individual intelligence of each member" that can predict performance of a team, but the "collective intelligence" of the group. Therefore, it is worth exploring further what lies beneath the collaborative process of writing a group wrap-up report in order to understand other factors that may enhance or hinder students' cognitive engagement at the group level.

In the present study, it was noticed that the absence of feedback, communication, interaction and argumentation were the main factors affecting a group's final product. In the case of those

groups which followed the individualistic pattern, not all of the editors requested feedback or approval from other members before submitting the final version of the report. Feedback from peers, at this stage, is crucial to enhance the outcomes because it engages students in critical thinking and in making judgments about their own work (Demirbilek, 2015). Without feedback, the editors did not see what had to be done to achieve improvement in their writing.

The lack of feedback from peers is most likely to be due to the lack of communication and interaction among group members. "Collectively intelligent groups tend to communicate more and participate more equally" (Woolley, Aggarwal, & Malone, 2015, p. 422). Moreover, the lack of interaction caused a feeling of unfamiliarity between group members, and thus, editors to feel uncomfortable in contradicting anyone's ideas and to try, as far as possible, to incorporate them all in the final report.

The benefits of feedback were evident in the two groups that followed the leader-centric pattern, Group 1 and Group 2. The group leaders provided guidance to other members during the editing of the wrap-up report encouraging group members to revise the group wrap-up report and make changes as necessary, ensuring enough details were given to provide a clear understanding of content. The results were the wrap-up reports of these groups had better organization and transitions between ideas than those of groups following the individualistic pattern.

This brings us to the next factor, gender. Interestingly, the two groups that followed the leader-centric pattern were comprised exclusively of women. According to Woolley, Aggarwal, and Malone (2015), a stronger predictor of collective intelligence is "social perceptiveness" which can be measured by the Reading the Mind in the Eyes test (a test that measures people's ability to judge others' emotions from looking only at pictures of their eyes). They also add that, women tend to score statistically higher than men. Thus, the proportion of women may be an indicator of having a large number of people who are "high in social perceptiveness". These claims are in line with

Engel, Woolley, Jing, Chabris, and Malone (2014) who further suggest that "teams comprised of members with a broader range of ability for perceiving subtle interpersonal cues will be better equipped to develop higher levels of collective intelligence, especially in less rich, online chat-based environments" (p.16). If true, then the two groups comprised of women in the present study had a high "collective intelligence". However, the content analysis of these two groups showed that most members in Group 1 and Group 2 backed up answers or ideas and accepted the contribution of other participants and elaborated on them. In other words, the leaders' ideas were the ones highlighted, while the other group members accommodated their thoughts to back up those ideas of the leader. Consequently, it could be implied that although "high-social perceptiveness" may be a predictor of successful group collaborative work, it may not be a predictor of high-level of cognitive engagement since members try to avoid arguments or debates.

Finally, we come to argumentation and teamwork. The content analysis of the group that followed the democratic pattern showed that there was a slight degree of argumentation in their conversations. At least two members contradicted each other's ideas and elaborated on their respective counter opinions. Moreover, they did not depend on a single editor or the management skills of a leader; instead, it was the result of the skills and work of at least five group members. These students chose the most relevant contributions made during the discussion period and narrowed them down to produce a synthesis of the group ideas. Additionally, more importance was given to the process of learning from one another and keeping ideas concise and meaningful. Despite being, probably, the group that engaged at the highest levels of cognitive engagement, this was not reflected in the final group wrap-up report because little importance was paid to its length or to its depth of detail. Again, the final product did not reflect the level of cognitive engagement at either the individual nor the group level.

The Lack of Argumentation in the Discussions

Finally, it is noteworthy that in both Recitation 1 and Recitation 2, the frequency of the contributions under the categories of *asking questions that require an explanation* (*CHV2) and *not accepting contribution of another participant with elaboration* (*REJECT+) was very low. The findings observed in this study mirror those of Casimiro (2016) and Chou (2002) who noticed that students avoided disagreeing or challenging each other's views even on controversial issues; and Shukor, Harun, and Tasir (2014) and Sayamon (2013) who reported that these codes were mainly dominated by the instructor or non-registered during the online discussions. The low percentage, or even absence, of these two codes throughout the discussions is a matter of great concern because it reveals too little argumentation. According to Howard (1996), students reach high levels of cognitive engagement by arguing, justifying, explaining and providing evidence in their discussions. Andrews (2009) supports this idea and claims that argumentation plays an important role in people's professional lives because "it is a means of resolving difference, a way of exploring an idea to its logical conclusion, a means by which a range of views can be expressed, arrayed, clarified and then form the basis for a decision, based on the best available evidence" (p.3). Jain (2017), entrepreneur and philanthropist founder of Moon Express, claims that individuals need to become intellectually curious; and thus, they should question things that have been taken for granted. Even though students may not end up completely agreeing with the way forward in a particular issue; through argumentation, they have an opportunity to express their views, challenge existing beliefs and make a difference to the outcomes.

The lack of argumentation in the discussions is definitely another factor that affects students' cognitive engagement and prevents the group from taking the discussion to the next level, such as through the discovery of new ideas or resolution of differences. According to Bonk, Wisher and Lee (2004), students tend to be "too nice" to one another in virtual discussions because they have

minimal face-to-face interactions, and Casimiro (2016) thinks that they do it to preserve good relations among members; and thus, avoid engaging in conflicting exchanges of ideas. Furthermore, this student behavior could also be attributed to the formality and politeness that shape the frameworks of social interaction in educational settings as instructors usually establish some netiquette guidelines for students to conduct themselves in a respectful manner. The groups' main priority could be another possibility. On the one hand, some groups may prioritize completing the task and moving forward through group members agreeing on a member's suggestion. This is because it is easier to build on someone else's ideas than by contradicting, questioning and coming up with other ideas, which may require more time and extra mental effort. On the other hand, groups may prioritize constructing new knowledge and learning from other members, thus, challenging each other's ideas and finding satisfaction in showing how much they know about a specific topic.

Other reasons could be related to the students' perceptions of sociability and social presence during virtual interactions. Therefore, this far from simple issue will be brought up and further discussed in Chapter 6, the general discussion section.

CHAPTER 4

Study Two: Social Presence, Sociability, and Immersion

The following chapter starts by introducing the objectives and the sub-questions that will help address the second main research question. It explains the methodology employed to collect the data from in-depth interviews with eight fully online students from Study One. It then reports the content analysis results of the students' answers on their perceptions of social presence, sociability, and immersion; before describing the influence of these three factors on students' performance. Lastly, it concludes with a discussion of the main findings.

Objectives

The objectives of Study Two were, first, to examine students' perceptions of *social presence*, *sociability* and *immersion* after the completion of the two group collaborative tasks (Recitation 1 and 2) in Study One; and second, to explore the influence of social presence, sociability and immersion on perceived performance, based on students' interview responses and experiences.

The following sub-questions were addressed:

a) To what extent is social presence perceived in the virtual learning environment?
b) How sociable is the virtual learning environment as perceived by students?
c) How immersive is the virtual learning environment as perceived by students?
d) What is the influence of social presence, sociability, and immersion on perceived performance?

Methodology

Study Two is a qualitative content analysis study taking a directed approach in examining, through in-depth interviews, students' perceptions of social presence, sociability and immersion in virtual collaboration, based on concepts and existing theory of the same three concepts described in the literature review section.

Context

This study was conducted in the same context as that of the online course in Study One, MMS 141: Principles of Programming, the aim of which was to teach introductory programming and basic computer science knowledge to fully online students. The online course lasted 10 Weeks, from January to March 2017. The in-depth interviews were conducted after the completion of Recitation 2. All students who were enrolled in the course and became part of Study One were invited without exception. Table 4.1 shows the chronology of the activities of this study.

Table 4.1
Timetable of the Activities of the Study

Date	Activity
Feb 4th	- Meeting with the course instructor via Skype. - Discussing the questions for the activity with the instructor (Bits Chapters 1 and 2) - Designing the guidelines for the activity.
Feb 5th	- Explaining the study to students via Piazza.
Feb 7th -16th	**Recitation 1:** Text-based online discussion via Piazza. Material: Bits Chapter 1
Feb 18th	- Group wrap-up report submission via Piazza
Feb 21st- 27th	**Recitation 2:** Video-based online discussion preparation and recording. Material: Bits Chapter 2

March 10th	-	YouTube live group discussion video submission.
Feb 27th	-	Recruiting participants for in-depth interviews
March 11th onwards	-	Conducting in-depth interviews via Skype.
April onwards	-	Analyzing the data

Participants

Of the 43 students enrolled in the online course, eight students, five male and three female, responded voluntarily to the in-depth interview invitation. They ranged in age from 18 to 50 years old. All interviewees had previously participated in Recitations 1 and 2 from the first study. Seven students were of Pilipino nationality, the other, a male student, was of a different nationality but had been living in the Philippines for several years. All students belonged to the same open university and were still enrolled in the same course at the time of the interviews. Table 4.2. shows a description of the eight participants. No real names were used for ethical and privacy reasons. Instead, pseudonyms were created using a single letter chosen from their real names preceded by the word "student" and a hyphen (-).

Table 4.2
List of the Eight Participants of Study Two

Response ID	**Age**	**Gender**	**Occupation**
Student-A	18 -20	F	Full-time Local Student
Student-Q	21- 30	F	Part-time (Working) Local Student
Student-G	21- 30	F	Part-time (Working) Local Student
Student-D	41- 50	M	Part-time (Working) Local Student
Student-J	21- 30	M	Part-time (Working) Local Student
Student-K	21- 30	M	Full-time Local Student
Student-M	21- 30	M	Part-time (Working) Local Student
Student-V	21- 30	M	Full-time Local Student

Instruments

Questionnaire for in-depth interviews. The questionnaire for in-depth interviews was designed to explore the participants' perception of social presence, sociability and immersion (see Appendix F). The questionnaire included a series of semi-structured questions regarding the participants' experiences when interacting and socializing with their group mates and the impact of these experiences on their attitudes towards discussions. Further, it inquired into their sense of immersion, time perception, emotions while working individually and with their group mates in both Recitations.

The first section inquired about students' psychological sensation associated with Social presence and consisted of two main questions. The second section inquired about the perceptions of Sociability. The questions were grouped into five categories based on Gao et al.'s (2010) Sociability framework: Social Climate, Purpose and Benefits, People, Interaction richness and Self-representation. Each category consisted, on average, of two main questions. The third section inquired about participants' perceptions of immersion. These questions were developed based on a review of the literature of immersion and related areas such as flow, cognitive absorption, and presence. They were categorized into four categories: Attention, emotional engagement, multi-sensory environment and physical world detachment. Each category again contained two main questions.

To make sure that the questions were actually addressing the three concepts in question (Social presence, Sociability and Immersion), the questionnaire was shared with the professor in charge of the online course in the current study (MMS 141), as well as with a former professor of the Open University in Malaysia, and an associate professor at Tsinghua University (one of the authors who developed the sociability framework described in Chapter II) for revisions. The three external collaborators provided feedback on the questionnaire items and provided advice to the

researcher on their refinement. After the revision of the questionnaire, the researcher came up with a second version of the instrument which was the one used in the current study.

Procedures and Data Collection

Obtaining consent of the participants. An invitational video was created by the researcher to be approved and posted on Piazza by the instructor of the course. The video, which lasted about 1 min and 31 seconds, showed the researcher briefly introducing himself, explaining the reasons for the in-depth interviews, and extending an invitation to all students to participate in the research activities. In addition to the invitation video, a short poll was posted below the video to be answered by those who were interested in participating or wanted further details concerning the study.

Before sharing further details of the study, with those who eventually became participants, the researcher and the course instructor explicitly reiterated that joining or not joining the in-depth interviews would have no affect on grades and that no bonus points would be given. Instead, volunteers would receive gifts of gratitude from Japan. Moreover, the researcher assured participants that their anonymity and personal information would be protected and that all data collected would be used exclusively for research purposes. Furthermore, they were informed that they would be furnished with a copy of the final report of the results upon request.

Scheduling the in-depth interviews. The interviews were arranged individually with each participant via email. None of the participants' private email addresses were requested, instead, they were contacted first through email addresses provided by their educational institution. Since participants were located in various areas of the Philippines, the interviews were conducted via a

VoIP system, Skype. Individual's Skype ID was shared with the researcher only upon their explicit consent.

Conducting the in-depth interviews. All interviews were conducted, via Skype, from the researcher's office and home. Prior to each interview, the researcher introduced himself formally and provided some background to the study before requesting permission to record the session. Once the participant understood the conditions and gave approval, the interviews started.

Interviews were semi-structured and designed to prompt interviewees concerning issues on social presence, sociability, and immersion. For many of the participants, this was the first time that they had talked of these experiences and therefore, particular care was taken to phrase questions in such a way that they did not "put words into the interviewee's mouth" or in any way influenced their responses. Each interview lasted an average of 30 minutes and except for a few internet connection issues there were no major difficulties. At the conclusion of the interviews, the interviewees were informed that the interview transcripts would be sent to them for revisions.

Data Analysis

In-depth interview responses. The data obtained from the in-depth interviews were analyzed using the Content Analysis method. The recorded interviews were first transcribed and then filed as Word documents. Qualitative analysis software (QDA Miner 5) was used to code the transcriptions of each interview. The codes were sorted into three large clusters a) social presence, b) immersion (attention, emotional engagement, multi-sensory environment and physical world detachment), and c) sociability (social climate, benefits and reciprocity, people, interaction richness, and self-representation).

Validity

Each interview transcript was compared to the interview recording twice, by the researcher and the course instructor. The interview transcripts were then sent to the interviewees, via e-mail, for further revisions and possible corrections. Subsequently, triangulation was used to draw inferences from previously published research in similar settings and discussions with experts in the fields of Education, Psychology and Education Technology.

Results

Students' Perceptions of Social Presence

The first research question concerned the extent to which social presence was perceived in the virtual learning environment.

During Recitation 1, social presence was hardly perceived at all on the virtual platform, Piazza. The participants reported feelings of anxiety, detachment, and uncertainty while interacting with their group mates. Despite the 49 students enrolled in the course having previously created a self-introduction with pictures on Piazza, as part of the course requirements, most perceived their group mates' comments as being "mechanical" and "computer generated", especially when they were formal and grammatically correct.

Based on the analysis of all responses, the foremost reason for not perceiving social presence in Recitation 1 was the absence of a mental representation of their physical appearance, body language, and voice. Student-D, who was the eldest of all participants, commented that it was difficult for him to find the discussion "meaningful and personal" because he did not have a mental representation of his group mates. Student-A opined that "knowing the way a person speaks helps in the interaction process." She further exemplified this by using Facebook (a popular Social

Networking Service, SNS, at the time of the interviews) as an example. When using Facebook she claimed that she could visualize her friends speaking and laughing which helped her to get "a hint of her friends' emotions and expressions when reading their messages". However, on Piazza she could not visualize anyone or hear anyone's voice while typing her messages; neither could she figure out her counterparts' feelings when reading their postings. In the same way, student-G felt as if she were interacting with some sort of "computer-generated" entity. She argued that if she had known them in person before interacting with them on Piazza, she would have felt their "presence" on the virtual platform. She further commented that interacting via Facebook with people that she had previously met face-to-face was "actually like seeing them." These comments were supported by student-V who, after reflecting on his experience as an online student, stated: "the online world is somehow similar to the physical world in that human beings need to visualize their counterparts to interact comfortably with them." In short, face-to-face encounters with their group mates prior to Recitation 1 were considered necessary in order for the participants to confirm that they were dealing with "human beings" and could, therefore, generate a mental representation of their counterparts in order to perceive social presence in the virtual environment.

Conversely, in Recitation 2, social presence was highly perceived after the participants held video-based discussions on Google Hangouts and Skype. The majority of participants held that the interaction was closest to physical face-to-face conversations in a physical classroom environment. All participants reported feeling more comfortable because they were able to see their group mates who "came to life virtually". As student-G put it, "I was finally getting to know the people I was dealing with and see that they were actually real people too". Seeing their group mates' expressions and hearing their tone of voice made the participants, not only more open and relaxed in expressing themselves, but also able to connect emotionally with their group mates at a more personal level. Indeed, student-A stated that Recitation 2 made her "use [her] emotions more extensively than

when just reading and typing" and student-K added that "after the video-based discussion the relationship between group members [became] much closer." It is apparent from this that social presence helps to increase trust and aids participants to form better interpersonal relationships with their group mates.

Interestingly, it was only after Recitation 2 that participants were able to perceive social presence while communicating with others through text on Piazza. Student-J said that he was able to imagine how his group mates answered his questions and got a sense of them speaking while reading their words. This was because their personality "had got imprinted" in his head. In the same way, according to student-M, "after interacting with his group mates through video-calls", he was able to see their faces and hear their voices in his mind. Moreover, he was able to understand clearly what they wrote in their messages and actually feel their presence in those messages. Overall, the answers given by the participants before and after Recitation 2 helped in understanding how important was having a mental representation of their counterparts' physical appearances, body language and particularly their voices, in perceiving social presence in a text-based discussion. Their experiences further provided evidence that video-based communication was as effective as physical face-to-face meetings in increasing social presence in virtual spaces.

Students' Perceptions of Sociability

The content analysis of the interviewees revealed that the *social climate* (referred to as "the social atmosphere suitable and comfortable for social interactions" in the present study) was the most important factor influencing sociability in both recitations. In Recitation 1, it was mainly perceived as being formal: according to the majority of interviewees, the virtual environment of Piazza was rather formal in comparison to other virtual platforms, such as Facebook. The participants stated that Piazza was functional as a virtual space for task-based and learning-oriented

activities but not for socializing. As student-G put it "I needed to get myself involved with my group mates because it was something that I had to do; otherwise my grades would be affected." Some of the participants perceived the social climate on Piazza to be similar to that of a physical classroom. One female participant, student-Q, said that she could even "feel the pressure from classmates and instructors" in a similar way to a physical classroom. The majority of the participants highlighted the formality perceived in the environment which prevented them from using emoticons, emojis or GIFs during the discussions. The thought was that they were not suitable for use on virtual platforms employed for academic tasks. Furthermore, five of the interviewees reported that they tried to be very formal and thorough in their comments; and at the same time, tried to avoid being too frank and straightforward in order to avoid hurting anyone's feelings. Consequently, they were conscious of their tone and word choice when replying to someone's messages.

In stark contrast, the social climate in Recitation 2 was perceived to be welcoming, friendly and several degrees less formal. Most of the participants agreed that the video-based discussions were helpful in building rapport and developing close relationships with their group mates. Student-A remarked that although at the outset she and her group mates felt shy, they all started to get along after telling jokes and laughing together. Similarly, four more interviewees reported feeling more open and comfortable in sharing their opinions while observing their group mates being funny and friendly than when using text-based discussions. It is worth mentioning that student-M was of the opinion that besides enjoying video-based discussions with his group mates, the activity itself made him more confident of engaging in activities of the same nature in future courses. It is also important to note that all interviewees, without exception, were able to expand their social network by building friendships with their group mates subsequent to Recitation 2. They all created private

groups on other virtual spaces, mainly Facebook, to keep in touch with one another and work together on other school-related tasks.

Although the social climate in Recitation 2 was perceived to be more relaxed compared to Recitation 1, there was also a certain degree of formality in the environment. Two male students, student-J, and student-G commented that they sensed a sort of "barrier of formality", especially at the beginning of their group discussions. Although this may not be of surprise, what was interesting about their comments was that they alleged the degree of formality, in general, was more highly perceived in video-based interactions than in face-to-face communication. They also remarked that although this "barrier of formality" did not interfere negatively with the social interactions while holding the video-based discussion, it made them think twice about what they wanted to say. In other words, they attempted to be careful with their choice of words and became indirect or evasive when they had contradicting opinions with their group mates.

Students' Perception of Immersion

The analysis of the participants' answers revealed three levels of immersion, namely: *attention*, *emotional engagement*, and *physical world detachment*. These names were given based on the levels of immersion described in the Immersion section of Chapter II. However, it should be noted that the degree to which immersion took place varied and was experienced differently in each recitation.

Attention. The eight participants were asked to what extent the activity held their attention. The overall response was that in both recitations the topics under discussion were of sufficient interest to hold their attention. The discussion topics, especially the one regarding online privacy, were considered to be important and relevant in their academic field of programming; especially

by those participants who call themselves "tech-savvy." Further, these topics were considered to be significant not only for "the younger generation but for "anyone out there" who engaged in social media on a daily basis. In a nutshell, it was the importance of the discussion topics and their relevance to both personal and professional lives that held the attention of the participants.

Emotional engagement. The interviewees were also asked about the degree to which they felt emotionally engaged during the group discussions. For Recitation 1, the majority of the participants explicitly stated that they did not feel emotionally attached to their group mates. As explained above, the absence of *social presence* and the formality of the written language were two factors that prevented the participants from developing any feelings towards their group mates. Nevertheless, they reported feeling emotionally engaged with the topic of discussion. Some of the interviewees felt overwhelmed, while others felt challenged and motivated. For instance, student-A admitted to being overwhelmed by the questions and feeling anxious about not knowing much about the topics under discussion, necessitating the watching of videos on YouTube about the topics in order to gain a better understanding. On the other hand, student-D felt very confident in discussing the topics because he had previously taken courses in related fields. Student-G felt very motivated after realizing "how smartly [her] group mates answered the questions." This caused her to push herself to come up with "better answers" because she did not want to post anything "below average." Conversely, student-J reported to not feeling challenged at all but to feeling "very engaged with the topics" because he considered himself a "tech-savvy person." In the same way, Student-M recalled feeling motivated during the discussions because he considered them to be "relatively easy" and in addition, he enjoyed expressing his opinions freely.

As for Recitation 2, the students' reported experiencing different feelings at different stages during the discussion. Prior to the video-based discussion, most interviewees admitted to having

felt anxious, awkward, reluctant and shy to meet their group mates. During the collaborative activity, there were some technical issues with the internet connection, web-cameras, and room lighting which further made them feel very uncomfortable. Student-D mentioned that due to some of the technical issues he had the feeling of not interacting with his group mates. In the same way, student-J felt uneasy because of the unstable setup of his internet connection; and student-G commented on feeling uncomfortable when she could hardly see a group mate's face because of the poor room lighting. However, after overcoming those difficulties, most interviewees reported feeling more comfortable within their group. After seeing each other via Google Hangouts or Skype, they started building friendships. They felt motivated by the way their group mates helped each other and tried their best during the activity. Most of the participants acknowledged implicitly and explicitly their group mates' work. It was during Recitation 2 when they felt "the teamwork" because of feeling more engaged as they realized that their opinions were heard in real time. They also felt as if "the team" was "moving towards" and "building a common goal" while becoming much closer after working together on both recitations.

Physical world detachment. Finally, the interviewees were asked whether they had been focused to a point where they had the feeling of being transported to a different place or detached from the physical world. In Recitation 1 the experiences varied. Five of the interviewees reported not having had any feelings of being transported to a different place. Two participants claimed to not having any sensations of being transported because it was clear to them that they were dealing solely with text. Student-M, on the other hand, had no feelings of being transported unless he kept thinking deeply about the topic of discussion. A similar comment came from student-G who did not feel transported or detached, but focused because Piazza was a virtual space where she had to "put her mind to work."

Nevertheless, three students reported experiencing sensations of being detached from the physical world. A young female student, student-A, recalled that at times she did not notice what was happening around her, but this only happened when her brain was focused on her emotions and on what she was going to say while composing her text messages. A similar experience was reported by two young male students who shared similar experiences. According to student-V, he felt as if he was transported to another dimension while holding text-based discussions with his group mates. From time to time, he felt as if his body was in one place but his "mind and heart" were in another place. He claimed that he actually tried "to put himself in his counterparts' situations" and imagined himself "being by their sides" so that the conversation could go on smoothly. He added that although he had a physical disability, he wanted to show he was "as capable" and "normal" as any other student in his group. Student-K also recalled an occasion when he felt detached from the physical world. According to him, that only happened when he "got engaged in deep conversations that both [he and his counterpart] enjoyed" causing them to exchange text-messages "every second". He remembered staring at his phone without noticing what was happening around him in the real world environment.

In the case of Recitation 2, four of the interviewees recalled experiencing a feeling of being transported to a different place while interacting with their group mates. Student-A remembered having "a series of experiences" when she dove into the discussions and felt highly concentrated on explaining her ideas to such an extent that she did not notice the environment around her. Students-D and V also felt as if they were "physically separated" and "entering the virtual world" while holding video-based discussions. According to student-D, "It was a feeling as if there were no barriers between the online and physical setup." Student-Q shared similar experiences, but she pointed out that in order to feel so it was necessary for her to see "the background,": the place where her counterparts were located, through her video camera. Similarly, student-G experienced

a feeling of being transported; however, that feeling "was different from time to time." In general, it was a similar sensation to "visiting someone's house." She attributed these experiences to "the power of the mind" which made "human beings travel to different dimensions." Conversely, student-J did not feel any detachment from the physical world. For him, it was "more like peeping through a different window," but he was still aware of "being physically present in his room."

The Influence of Social Presence, Sociability, and Immersion on Performance

Social presence and performance. The analysis of the data revealed that students' performance was influenced by social presence in both positive and negative ways.

In Recitation 1, the absence of social presence in the virtual environment, contrary to expectations, seemed to have a positive influence on performance. To begin with, the participants were able to focus their attention on the ideas that their counterparts were trying to convey in their messages. As student-A explained, "when discussing, through text-based, your brain focuses immediately on the subject matter instead of focusing on other things that are not clearly related to what you are supposed to be discussing." Similarly, student-G stated said "once you go inside Piazza, it is like a book. You have to focus! you have to put yourself out there!" Another benefit was that they tended to visualize the idea or situation described in the comments and not the person who posted it. Student-M reported "I tried to imagine how it would be, not someone's face. The situation is what I see." Also, student-D made similar comments, saying, "I read the message based on the message, not based on the person's character [or] the person's style." Furthermore, Recitation 1 was considered to be more "mentally challenging" than Recitation 2 because, as student-G put it, they had to "look for the right information, filter it and explain it in a way that it was clear for everyone to understand." Above all, they had to be more conscious of their word

choice and the way they replied to someone's comment in order to avoid hurting someone's feelings.

As for the negative effects, the lack of social presence negatively affected the reciprocity and response time of the interaction among team members. Student-A reported that on her team there was not much interaction during the text-based discussion. She had the feeling of replying to a robot, especially when she read postings that were too formal and "every sentence was grammatically correct". Similarly, student-D found it difficult to become engaged because he perceived the discussion as being "impersonal" and was not able to get to know his group mates well. As a result, it was difficult for him and his group mates "to come together as a team" and finalize the group wrap-up report. Student-G shared similar opinions, she also claimed that it was difficult to become engaged in the discussion because she felt as if she were interacting with "computer-generated people." Another participant, Student-J, took time to become "really engaged" because all of what he saw was "text" and he felt as if there was no urgency in replying to it.

Regarding Recitation 2, social presence also influenced both positively and negatively students' performance. Most participants felt more engaged and productive, in comparison to Recitation1, because they were able to accomplish things faster and build closer relationships with their group mates. Student-J reported that he and his group were able to complete "a lot more" in a 30-minute video call than a whole week of posting and replying to comments on Piazza. In the same vein, student-A said that her group was able "to pitch ideas much faster" compared to posting opinions on Piazza and waiting for replies. Moreover, student-D thought that the video-based discussions were "more meaningful, interactive and personal" than the text-based discussions because they were the closest thing to "a face-to-face meet up;" they could also make sense of "all sorts of underlining messages" that their group mates could not properly convey through text-based communication.

Despite this positivity, social presence also negatively influences participant's performance to some degree. As student-A explained, she got "easily distracted" because her mind wandered while listening to her group mates' opinions. A similar experience was shared by student-Q who claimed that during Recitation 2, her attention was focused on her "knowing how her group mates felt about the discussion" and trying to understand their feelings through the way they spoke. Moreover, some participants reported feeling very uncomfortable or awkward when there was "dead air," a long period of time when no one spoke as they did not know if they had to wait for someone to speak or if it was indeed their turn to speak.

Sociability and performance. The manner in which sociability, particularly the social climate, was perceived by participants had differing impacts on the students' perceived performance. Piazza was considered a virtual space suitable for working on school-related tasks and learning, but not for putting one at ease and socializing with others. As a consequence, the participants described the atmosphere and social interactions, using Piazza, as being rather stiff, formal and academic in comparison to other virtual platforms such as Facebook when used for socializing. Generally speaking, when the participants opened Piazza, they felt responsible for putting their minds to work and completing tasks; and some even felt pressure from their instructor and classmates, just as if they were in a physical classroom. This social environment, or lack of it, caused a formality, creating a straightforward approach and a specific style in their writing. They tried to be open and honest but were inclined to be very polite and careful with what they said and how they said it to avoid hurting anyone's feelings. As one of the participants put it, Recitation 1 "taught me how to communicate formally with others." In addition, most of the participants were of the opinion that interacting with others through text messages alone, made them feel connected and more productive while helping and "pulling each other together" to submit their work by the

given deadline. They also acquired new knowledge, which they would not have working by themselves. As student-V asserted, “I learned more from reading my group mates’ posting than from doing the course readings myself.” These were the main benefits of the formality perceived in the virtual environment.

Interestingly, there was a common trait among participants in that they all felt socially responsible for helping others. As student-D stated, “I felt responsible for acquiring new knowledge not only for myself but also for the support of others.” In the same vein, student-V commented “when my classmates are having a hard time understanding a topic, I [help them out] but without showing them the answer”. Student-Q also said that many people were willing to help out or explain something she did not understand; however, she felt bad when she could not make any contribution or when she did not know how to explain something properly to others.

Turning now to Recitation 2, the social climate was perceived as more friendly, relaxed and welcoming, in comparison to recitation 1. Most interviewees were able to build close friendships with their teammates and become more engaged with one another because they had a clear representation of with whom they were interacting. This also encouraged them to participate more actively, not only because their interactions happened in real-time, but also because they noticed that their comments were taken into account and their group mates were emotionally reacting to them. Some participants reported having learned more about the topics by listening to the discussions than by simply reading only the postings.

Furthermore, all participants said that they were able to build friendship with group mates. In fact, for most of them, it was “the biggest takeaway” from Recitation 2. They subsequently became friends on Facebook, where they talked about different topics at a more personal level, such as personal problems, school, work, hobbies, vacation plans and the like. Most participants explained that whilst it was not easy to connect with people they did not know, the combination of

both text-based and video-based communication was helpful in building closer relationships with their group mates and imbuing them with more confidence in joining future video-discussions. Leaving aside the social climate, there were also a couple of sociability factors that affected students' performance. Namely the number of members and their characteristics.

First, with regards to the number of group members, the participants said that working with a small group of people made the conversations more "personal" and "interactive" than if they had worked with a large group. However, some participants agreed on the possibility that a larger number of group members was feasible but only if the discussions were text-based. They considered that this could bring "more input" into the discussion making it more productive, and at the same time affording the opportunity of expanding their social network even more. When considering the video-based discussions, all interviewees agreed that it would be difficult to handle a discussion with many more than six members and any more than ten members would prove impossible especially as they would have to find a suitable time for everyone to meet in real time. They also considered the limitations of the technology, such as their internet connection and the number of users that Google Hangouts or Skype could handle. Their conclusion: a range of five to ten members was the most suitable number of members that could work effectively and productively.

The diversity among group members also had an impact on students' performance. Members of each group came from different professional backgrounds and had different interests, knowledge, and experiences. Some participants said that their group mates were very different from one another. The only reason that brought them together was the completion of the task. As two interviewees put it, "the only common goal was just finishing [the] video recitation" and "[we] shared the same goal which was finishing the recitations."

On the other hand, two other participants saw “beauty” in those differences. Student-G considered that the differences actually caused an interest in knowing more about her group mates and that attempting to understand their way of thinking was helpful in getting to know them better. Similarly, student-Q stated that having group mates who came from different backgrounds and had unique experiences and knowledge were the main factors that contributed to accomplishing the tasks. Interestingly, among these differences, group members also found things in common which bonded them together. For instance, sharing similar points of view, age, background, and reasons for enrolling in an open university. According to the participants, having similar experiences with their group mates was very helpful in understanding each other’s attitudes and personalities at a deeper level. This mutual understanding was helpful in bonding a disparate group together as a team, and that, had a positive impact on the enhancement of group performance.

Immersion and performance. In Recitation 1, the majority of the participants reported focussing more on understanding “the subject matter” of the messages than on the person who posted them and were, therefore, able to think deeply about the messages and create a mental representation of the situation or problem described in those messages. This mental activity might well have had a positive effect on the degree of cognitive engagement involved in the comments shared on Piazza. To confirm this assumption, a closer look will be taken into the content analysis of the discussions in Study One. Despite the majority reporting otherwise, three out of the eight interviewees reported having a series of world detachment experiences throughout Recitation 1. These participants were the only ones who became emotionally engaged while exchanging messages synchronously with others. They attempted to convey their emotions through their messages and made a conscious effort to put themselves in their group mates’ place, so that the flow of the conversations would go smoothly. Based on analysis of subsequent comments, made

by these participants to being emotionally engaged with their counterparts while trying to help them, creating a group empathy, it can be concluded that they invested more time and put in extra effort to thoroughly understand their group mates' messages.

Recitation 2, played a key role in the perception of immersion. More than half the participants reported experiencing a sense of being transported to their group mate's locations. These experiences were variously described as "being physically separated" or as if they were together and "there [were] no barriers between the online and physical setup." Others reported it as being similar to "visiting someone's house" or "peeping through someone's window." This feeling of being transported made virtual interactions appear closer to real face-to-face discussions, which helped students understand more about their group mates' personalities and to build closer relationships, both academic and personal. Consequently, it could be said that these transportation experiences had a direct impact on the social climate, influencing it either positively or negatively, and on the perception of social presence in subsequent text-based interactions; and therefore, they indirectly influenced perceived performance.

Summary

Overall, the main findings indicate that social presence influences sociability as it contributes to building the social climate within virtual group collaboration. Moreover, social presence and sociability can positively impact students' satisfaction with their performance; however, they may equally bear negatively on students' levels of cognitive engagement, as high levels of social presence become distracting and formality and politeness in the social climate influence the way students' express their ideas. As for immersion, similar constructs to those mentioned in the literature review were found, namely: *attention, emotional engagement,* and

physical world detachment; but not *multi-sensory stimulation,* which may be limited to 3D virtual worlds. Furthermore, this study highlights three factors closely related to experiencing high levels of immersion in virtual collaboration, namely: creating a mental visualization of the situation or the discussion topic, focusing on explaining one's opinions and one's emotions while composing a message, and empathizing with one's counterparts. *Empathy* in virtual collaborative environments is the one factor that deserves further research as one of the reasons is that by making emotional connections with others, students are likely to become less susceptible to generating counterarguments, thus affecting negatively the quality of their discussions.

Discussion

The purpose of Study Two was to examine perceptions of social presence, immersion, and sociability in the virtual collaboration of eight students from Study One. Based on a theoretical framework and the content analysis of the participants' responses and further comments, five general conclusions emerged from this study.

Mental Models are Important in the Perception of Social Presence

When looking at social presence the findings of the current study indicate that students' mental representations of their group mates' physical appearances, body language, and particularly voice intonation, play a crucial role in their perception of social presence in virtual environments. Without such influences, students tended to focus on reading the content of the messages and formulating thoughts without directly thinking about their counterparts. These findings supports those of Samuel (2016), who investigated in similar settings the perceptions of social presence of four faculty members with online teaching experience. According to him, the instructors'

perceptions of social presence were the result of "face-to-face contact" and, thus, he came to the conclusion that social presence "could only be established through physical interactions" (p.4). He also added that without "physical interactions," participants perceived the virtual environment as "a box" rather than as real people. However, findings in the present study support the possibility of building social presence exclusively from video-based interactions; therefore, it may not be necessary for students to meet each other in person, as long as they can clearly visualize each other's facial expressions and listen to each other's voice intonations. This claim is supported by McLellan (1999) who previously found that "audio" helped to establish social presence in virtual environments by reflecting the emotions of the instructor to the students. Moreover, he claimed that audio could help establish the formality in the environment and the friendliness of the instructors. Furthermore, Gunawardena (1995) says that the capacity of the medium to transmit information about facial expressions, direction of gaze, dress, posture, and non-verbal cues contribute to the degree of perceived social presence. In addition, Tu and McIsaac (2002) claim that, besides the medium of communication, social presence depends on the users' perceptions. Finally, the findings of this study are supported by the claims of Biocca and Harms (2002) who state that in order for humans to build awareness of others they need to pay attention to "bodily cues". From an evolutionary psychological perspective, they claim that human beings have a need to predict the future behavior of others; and thus, it is necessary for them to develop and use mental models to communicate, especially in mediated interactions. In the same way, Barret (2017) says that "predictions are primal" and that they help in making sense of the world in a quick and efficient the way. She further adds that the human brain makes predictions and constructs new experiences based on past experiences. From these claims, it can be implied that the creating mental representations of others is not only necessary in understanding the kind of person on the other end, but also in predicting his/her future behavior, which facilitates social interactions.

Surprisingly, the majority of studies on social presence reviewed in Chapter 2 have mainly focused on the perceptions of social presence, either the awareness of being interactive with a real person (Gunawardena & Zittle, 1997; Heeter, 1992; Kreijns, et al., 2004; Short, Williams, & Christie, 1976) or as the feeling of being socially and emotionally connected with another entity (Garrison, Anderson & Archer, 1999; Lombard & Ditton, 2006; Tu & McIsaac, 2015). However, they have all failed to explain how this sense of awareness and feeling of being socially connected with another human, in fact, emerges. For instance, Walther (1992) claimed that communicators were able to develop individuating impressions of others through the accumulation of Computer-Mediated Communication messages. In the present study, students created mental models/representations of their group mates through the exchange of text, voice and video with others during Recitation 2. These mental models allowed them to perceive social presence in subsequent text-based discussions. These psychological models acted as mediators in facilitating communication among students and helping them build social relationships with others. In order to reinforce these claims, future research should look into the ways bodily impressions of others are (re)created in students' minds and how students use impressions or imagery to create social presence.

Social Presence is Key to Creating Social Climate

As previously mentioned, video-based discussion played a crucial role in developing social presence as it allowed students to show their human side by expressing their emotions more extensively due mainly to it being the closest form of communication to that of a physical world face-to-face meeting. During Recitation 1, the majority of students tended to formulate thoughts without thinking much about their group mates. However, after seeing each other's faces via web-cameras, students were convinced that they were dealing with "real people" and not computer-

generated entities. This was, probably, the first time many of them truly felt safe in interacting with their group mates. Once psychological safety was established in the environment, after overcoming anxiety, shyness, and nervousness of the first video-based encounters, students began to feel comfortable and open to the exchange ideas with their group mates.

These findings are consistent with Maslow's hierarchy of needs which shows that safety is one of the fundamental human needs that must be met before building a relationship with others (Maslow, 1943). They are also a match to the claims made by Caspi and Blau (2008) and Gunawardena and Zittle (1997) who found, through quantitative research, that social presence enhances group interactions, open communication, socio-emotional experience and group identification among members which, in turn, contributes to the overall group performance satisfaction. Thus, social presence contributes to sociability, as it humanizes the social climate, making it more suitable and comfortable for social interactions. This is in line with the ideas of Leh (2001) who reports that when a virtual environment lacks social presence, the participants see it as impersonal and, in turn, the volume of information shared with others decreases. Finally, findings further support the ideas of Gao et al. (2010) who suggest that social climate is the most important factor that contributes to the users' perception of sociability of social software which, above all else, needs to provide adequate security.

The Virtual Platform Influences the Degree of Formality and Politeness

It is worth mentioning that formality and politeness were two factors that influenced the perceptions of the social climate in each virtual platform, with the degree of formality being more highly perceived in Recitation 1 than in Recitation 2. This perception of formality was closely related to the emotions and mental representations that Piazza triggered in student's minds. Whenever students accessed the virtual platform Piazza, they felt as if they were inside a physical

classroom. It was seen as a virtual space for engaging with learning and school-related tasks but not for socializing. This sense of being in a classroom had a strong influence on students' attitudes and the way they communicated with the instructor and their group mates. They used formal and objective language in their writing and most avoided using emoticons when sharing their ideas. These findings support the ideas of Stromer-Galley and Martey (2009), who claim that physical spaces carry social information based on the physical properties of the space and the spatial knowledge that participants develop about them. This knowledge, developed from social meaning and spatial experiences, allows individuals to create mental models of spaces that go on to inform subsequent behavior. In the same way, visual settings can trigger schemas related to individuals' understanding and experiences gained from the offline world. These schemas contribute to shaping social norms and frameworks for interaction that users attach to the virtual world.

Although the social climate on Google Hangouts, employed in Recitation 2, was less formal than in Recitation 1; politeness was still present. Politeness caused students to be more mindful of their message word choice. It caused them think twice before contradicting someone's ideas and also influenced the way they expressed their opinions; whether they be indirect, ambiguous or evasive. These findings are consistent with Casimiro (2016), who suggested that learning communities tend to be supportive of discourse, but only to a certain extent. When intellectual conflicts occur among members, members tend to shy away from engaging in critical discourse. Politeness becomes a way of preventing conflict and preserving healthy relationships among group members. The level of politeness, here, could be attributed to the students' cultural backgrounds and the use of a second language, in this case English. Therefore, language and students' cultural backgrounds will be further explored and discussed in the final chapter.

High levels of Social Presence Does Not Necessarily Mean High Levels of Cognitive Engagement

High levels of social presence in virtual environments have been previously associated with better performance, however, this was found to be not always the case. In the current study the results revealed that even though social presence was highly perceived in Recitation 2, almost resembling physical face-to-face interactions, the participants felt themselves become easily distracted as their minds "wandered around" while listening to their group mates' opinions. Moreover, they tried to understand how their group mates felt about the discussion by paying attention to the intonation of their voices and facial expressions, especially after a period of "dead air" in the discussions. This indicates systems that reproduce high-levels of social presence (e.g. 3D worlds, Virtual Reality, etc.) bring other elements into play that affect students' attention negatively and prevent them from reaching higher-order thinking.

These findings back up previous claims of Ferran and Watts (2008) who carried out a quasi-experimental study to compare how individuals process information differently via face-to-face communication and video-mediated communication (VCM). They found that VCM increases the demand of cognitive workload in comparison to face-to-face communication, even when the systems in use are high bandwidth and high quality. The reason being that VCM users have to deal with different communication challenges such as "difficult audio localization, turn-taking and conversation pacing, changes in cue salience, asymmetrical personal distance, and heightened self-awareness" (p.1567). Moreover, it was found that participants who attended videoconferences were more influenced by the likability of the speaker (the extent to how much they liked the speaker) than by the quality of the arguments presented by him or her. These arguments may explain why some participants, in the present study, reported getting easily distracted while holding video-based discussions.

Contrary to expectations, the absence of social presence during Recitation 1 was of benefit to the participants, forcing them to "stick to answering the questions" given by the instructor, focusing on "the information" and thinking about the "the situation" as described by each posting. They were not required to deal with the extra mental-burden of imagining how the person who posted it looked. Furthermore, they were forced to concentrate on crafting their messages because of the need to be more precise in their comments and responses to others. These findings are in line with previous empirical studies that argue the asynchronous nature of virtual discussions allows students to promote creative thinking, reflective writing and critical thinking (Agosto, Copeland, & Zach, 2013; McConnell, 2000; So, 2008; Suthers, 2006). Certainly, the depth of cognitive engagement reached by each individual was determined by their level of interest, previous knowledge, and experience with the discussion topics, as well as how much effort they made to understand them. Future studies should consider the positive and negative effects of social presence on students' performance, especially if the task requires students to engage in high levels of concentration.

The Feeling of Transportation and Physical World Detachment

The feeling of being transported to another place in Recitation 2 and feeling detached from the physical world in Recitation 1 seem to be different and yet closely related. The feeling of being transported was strongly perceived during the video-based discussions. Students felt as if they were sharing the same physical space with their group mates while holding conversations with them and being able to see each other's locations (e.g. a room, an office) through their cameras. Thus, in Recitation 2, the visual richness provided by video largely contributed to sensations of the participants being transported. This finding matches those observed by Brown and Cairns (2004), who found that the level of immersion is correlated to the number of attentional sources and the

degree of each attentional type. This is because more effort is required to pay attention to sight and sound simultaneously. Furthermore, it is in agreement with Jennett et al. (2008) who claimed that increasing the pace of the interactions with the computer interface, along with a sense of progress and emotional involvement with the tasks, create a high degree of immersion. Conversely, the feeling of being detached from the physical world seems to go beyond transportation and requires extra effort. Students who felt detached from the physical world were those who focused on explaining their ideas and who became emotionally engaged with the topic of discussion while interacting with their group mates in real time. Moreover, this feeling of world detachment was not exclusive to Recitation 2; as previously mentioned, three students actually experienced it during Recitation 1. However, in the case of text-based discussions, this sensation was experienced only by those who thought deeply about the topic of discussion, while simultaneously recreating mental representations of the situation explicitly described in posted messages, and while attempting to empathize with their group mates who they had yet to meet through the video-based recitation. Empathy made these students curious to learn more about the others, to build some sort of connection with them. This helped to reduce communication barriers during the conversations and to make the interactions be more comfortable. Empathy towards others may be closely related to the sense of social responsibility described by some of the participants as understanding others' needs and concerns requires extra mental effort. According to Alda (2017), an award-winning actor and writer, empathy is "not having compassion or feeling sympathy for someone, it is knowing what their point of view is, what they are feeling and what they are thinking". Simply put, it is understanding "where they are coming from". Empathy is not only to connect to others' experiences, but also to understanding "what they really need" and, therefore, to know how they can be helped.

Remarkably, the immersive experience in Recitation 1 resembles a phenomenon called *narrative transportation*, which refers to the experience of being consumed by the world of a

narrative. According to Green and Fitzgerald (2017), this happens when "a person's mental systems and capacities become concentrated on events occurring in the story, causing individuals to lose track of time and lack awareness of the surrounding environment" (p.2). While being in this psychological state, individuals may also feel strong emotions towards the characters of the story and experience different intensities of identification with the characters as a result of the narrative.

Empathy in virtual collaborative environments is a factor that definitely deserves further research and discussion. One reason is the claim that when individuals experience a narrative through the perspective of a character, an emotional connection with the character is built (Green & Fitzgerald, 2017); and through this connection, they become less susceptible to the generation of counterarguments and more inclined to accept the perceptions and beliefs of that character. If this is true, then it is more likely that more empathetic students tend to agree with others' ideas and hesitate to express their opinions critically, especially if these are not in line with those of the group.

CHAPTER 5

Study Three: Relationships Amongst Social Presence, Sociability and Immersion

This chapter first, introduces the objectives and two sub-questions that will aid in addressing the third main research question. The chapter itself has been divided into four parts: first, a description of the methodology used to collect and analyzed the survey data for Study Three, second a presentation of the correlation analysis results amongst social presence, sociability and immersion at the construct level, third a detailing of the significant relationships amongst social presence, sociability, and immersion at the dimensional (factor) level and finally, the chapter concludes with a discussion of the main findings.

Objectives

Study Three examined the relationships amongst social presence, sociability, and immersion through a quantitative correlational analysis. To achieve this objective, data were collected from a large group of people with experience of virtual collaboration by using three revised and revalidated instruments: The Social presence and Sociability scales by Kreijns et al. (2005); and the Immersion Questionnaire by Jennet et al. (2008). Findings of Study Three were interpreted in relation to the literature review on social presence, sociability and immersion. Moreover, the findings of Study Three will be used in interpreting the findings in Studies One and Two to help explain the influence of social presence, sociability and immersion on cognitive engagement in Chapter VI, by answering the following points:

a) What are the underlying dimensions of Social presence, Sociability and Immersion?

b) Are there any significant correlations amongst social presence, sociability and immersion at the construct and dimensional level?

Methodology

Participants

The initial data were collected from a fully online course (Course A) and blended online course (Blended course) offered by an Open University in the Philippines; and another online course (Course B) offered by an Open University in Malaysia. In addition, students from residential universities and working adults who had experience with virtual collaboration were invited to the survey. From their responses, they were mainly located in four countries: Japan, Korea, the Philippines and the USA. Table 5.1. shows the breakdown of the respondents by type of course, country, gender, occupation and age. Due to the diversity in the sample, they will be hereafter referred to as “participants”.

A total of 111 responses were collected initially; however, 9 responses were found to be incomplete and were eliminated, resulting in a total of 102 valid responses. A breakdown of the participants, shown in the table below, reveals: 30 participants (23 male, 7 female) from Course A, average age 28.8 years, the majority of whom were full-time employees taking classes online, 14 students (5 male, 8 female, 1 other) from Course B, average age 29.5 years, most of whom reported as working full time while taking online courses, 31 participants (16 male, 15 female) from the Blended Course, mostly full-time employees, average age 34.8 years, and finally, 27 responses (9

male, 18 female) were collected from the open survey, of which 9 were full-time students, eight were full-time workers, and nine were part-time-workers and students.

Table 5. 1
Demographic Profile of Survey Respondents

Course	Country	Gender			Occupation
		M	F	Other	
Online Course A	Philippines	23	7	0	-Full-time working & student (N=26) -Part-time & Student (N=2) -Full-time student (N=2)
Online Course B	Malaysia	5	8	1	-Full-time working &student (N=11) -Part-time & Student N=3
Blended Course	Philippines	16	15	0	-Full-time working (31)
Open Survey (General Public)	Various countries (Japan, Korea, the Philippines & the USA)	9	18	0	- Full-time student (N=9) -Full-time working (N=8) - Part-time working & student (N=9) -Between jobs (N=1)

Instrument

The instrument used in the current study was an online survey concerning virtual collaboration created with Google Forms® (See Appendix G). The online survey aimed at collecting users' perceptions of social presence, sociability and immersion in virtual collaboration. It included the Social presence and Sociability scales previously validated by Kreijns et al. (2004), and the Immersion questionnaire designed and validated by Jennet et al. (2008). For a more detailed description of the original scales and questionnaire, please refer to the Measurement Tools section in Chapter II.

The online survey consisted of five sections under the following headings: a) background, b) virtual platform, c) Social presence, d) Sociability, and e) Immersion. The first two sections of the online survey (a and b) consisted of multiple choice questions asking about users' age, gender, occupation, the main virtual platform they used to virtually collaborate with others, and the device(s) they used most frequently to access such virtual platforms. In the other three sections (c, d and e), the participants were asked to use a five-point Likert scale, (with 1 indicating "Not at all" and 5 indicating total agreement with the statement "To a very large extent") to evaluate their perceptions of Social presence, Sociability and immersion in virtual collaboration.

Validity

The instruments adopted in the present study have been previously validated by researchers. The Social Presence Scale and the Sociability Scale were formerly refined and validated through Multitrait-Multimethod Matrix (MTMM) by Kreijns et al. (2004). As for the Immersion Questionnaire, it was previously validated through a series of Factor Analysis by Jennett et al. (2008). However, as some of the items from the original versions required rewording, to better fit the focus of the present study, Cronbach's alpha was run to measure their internal consistency.

Subsequently, the researcher personally consulted with professors and an expert in the field of immersion (a member of Jennett's team and one of the original designers of the Immersion Questionnaire) who provided first-hand feedback and suggestions on the refined versions of the three instruments. After the process of refinement, the instruments were considered to be consistent and reliable enough for the purpose of the present study. Lastly, triangulation was used to validate the results and draw inferences from previous findings in similar settings.

Procedures and Data Collection

Obtaining consent from the participants. As the online Course A and the Blended learning course were offered by the same Open University in the Philippines the researcher followed the protocol for external research of the educational institution in getting approval for the conducting of the study. This process was the same procedure as the one described in Study One. Upon approval being received from the educational institution, the researcher, together with the course instructor, informed all students about the purpose of the research and issued an invitation to the survey on the course's Learning Management System (Piazza). Both then sent the link of the online survey via e-mail to those students who expressed an interest in taking part in the study. In addition to the explanation provided by the course instructor, the survey included a cover letter explaining clearly the purpose of the study and specifying explicitly that clicking either Yes or No would be considered a voluntary and binding agreement. It also requested permission from all participants to use the data obtained on the understanding that it was solely for the purpose of research.

For the Online Course B, the process of obtaining consent from the participants was slightly different. First, an invitation was extended via e-mail directly to an instructor in charge of an online course offered by an Open University in Malaysia. The e-mail included a soft copy of a letter with a brief description of the intended research. The letter clearly specified that the online survey would be completely anonymous, thus, ensuring the confidentiality of the students. It also stated that all participants could withdraw from the survey at anytime if they chose. It was agreed that the instructor would distribute the survey via e-mail exclusively among students who were enrolled in his course. The instructor's decision was made upon receiving verbal approval from his superiors and revising the survey items himself to be sure that none of the items compromised any of his students' privacy nor the educational institution.

The open survey involved a cover letter informing all respondents as to the purpose of the study and the nature of the survey. It also clearly specified that the data collected would be kept confidential and secure; preventing any unauthorized access. It requested permission from all respondents to use the data obtained exclusively for research purposes and by only the researcher or authorized collaborators. Moreover, it specified explicitly that clicking Yes or No would be considered a voluntary agreement. Although there were no foreseeable physical harm to the respondents, they were advised to stop taking the survey at anytime if they felt at all at risk. The online survey was then distributed, over a period of two months, on different social media platforms, but mainly Facebook, LINE, WhatsApp, Skype and Messenger. The link was shared among students and working adults located in Japan, Korea, the Philippines and the U.S.A.

Data Analyses

All data analyses were performed using the Statistical Package for the Social Sciences, Version 24 (SPSS, 2016). Firstly series of FA was conducted to examine the associations, if any, between variables in each instrument and to determine how well these variables held together and represented the underlying constructs (Social presence, Sociability and Immersion). Secondly, Cronbach's Alpha was employed to ensure each construct consistently measured the themes under study. Finally, as the data collected with the instruments were ordinal in nature, each variable, except for the demographic section, was measured on a 5-point scale; Spearman's rho correlations analysis (a non-parametric equivalent of Pearson correlation) was then run to explore the correlations among all constructs and their dimensions.

Results

Underlying Dimensions of Social Presence, Sociability and Immersion

The first sub-question inquired into the underlying dimensions of social presence, sociability and immersion constructs. The Social Presence Scale produced two-dimensions: *awareness of collaborators as real-people* and *semblance to face-to-face conversation*, the Sociability Scale resulted in a one-dimensional scale with nine items and the Immersion Questionnaire formed three dimensions: *focus on tasks*, *emotional involvement*, and *detachment from the physical world*. A description of the refinement procedure employed for the questionnaire and each of the scales follows below.

Refinement of the social presence scale. The original social presence scale by Kreijns et al. (2004) contained five items; however, one extra item was added "6. ASYNCHRONOUS TEXT-BASED discussions on this online platform are SIMILAR to face-to-face conversations". This item, which was based on the literature review, attempted to explore whether or not the participants perceived the text-based interactions similarly to face-to-face interactions while communicating asynchronously.

A principal component Factor Analysis (FA) was run on the six items from the social presence scale. The KMO value was .54, which is just above miserable; however, Bartlett's test of sphericity with an associated p-value of <0.01 indicated that FA could proceed. The initial factor analysis, using principal components extraction, no rotation, produced two factors with eigenvalues greater than 1.0. Because the initial factor analysis produced one clean factor and another messy with two overlapping factors, a second analysis was conducted forcing the items into two factors. Another Factor Analysis, this time, Oblimin with Kaiser normalization, was then performed on the

six items to garner the factor loadings. The results showed that the two-factor solution explained 71.37% of the total variance: the first factor explained 48.70% of the total variance, and the second factor explained an additional 22.66% of the variance. Lastly, based upon theory and the items phrasing, the two dimensions were titled *Awareness of collaborators as real-people* and *semblance to face-to-face conversation*. Due to space constraints, they have been shortened to Awareness and Semblance in Table 5.2 below.

Reliability. Both factors in the social presence Scale have a high internal consistency: Factor 1 (Cronbach's alpha=.78) and Factor 2 (Cronbach's alpha=.87). A common rule of thumb is that when a set of items has an alpha level of .70 or higher, it is considered acceptably reliable. Table 5.2 shows the refined social presence scale.

Table 5. 2
Revised Version of the Social Presence Scale

		Social presence	
		Awareness	*Semblance*
1.	When I had REAL-TIME TEXT-BASED discussions on this online platform, I had my group mates in my mind's eye.	**.86**	
2.	When I had ASYNCHRONOUS (Not Real-Time) TEXT-BASED discussions on this online platform, I had my group mates in my mind's eye.	**.82**	
3.	When I had REAL-TIME TEXT-BASED discussions on this online platform, I felt that I was dealing with very REAL people and NOT with computer-generated people.	**.75**	
4.	When I had ASYNCHRONOUS TEXT-BASED discussions on this online platform, I felt that I was dealing with very REAL people and NOT with computer-generated people.	**.60**	
5.	ASYNCHRONOUS TEXT-BASED discussions on this online platform are SIMILAR to face-to-face conversations.		**.95**
6.	REAL-TIME TEXT-BASED discussions on this online platform are SIMILAR to face-to-face conversations.		**.90**

Note: Factor loadings >.40 are in boldfaced. The Social Presence Scale. Adapted from "Determining Sociability, Social Space, and Social Presence in (A)synchronous Collaborative Groups" by Kreijns et al., 2004, *Journal of Cyberpsychology & Behavior, 7*,2, p. 160.

Refinement of the sociability scale. The original version of the Sociability Scale designed by Kreijns et al. (2004) included ten items. A principal component FA, not rotation, was performed on the ten items with the expectation of obtaining all factor loadings as a single factor, vis, Sociability. Surprisingly, the results showed that only nine of the items loaded strongly on a single factor, sociability, which explained about 57.35% of the total variance and had a rotated eigenvalue of 5.7. Each of the items was strongly correlated with each other (factor loadings greater than .70); however, one of the items (item 2, "2. I felt LONELY in this online learning environment") did not load strongly on sociability. It had an eigenvalue no greater than 1.0 and explained only 10% of the total variance in the full set of items which was too weak to be included in the refined version of the scale. Because the initial analysis had produced a clean factor; a subsequent factor analysis was performed forcing the items into one factor. The results showed that the sociability factor remained unchanged, and a unitary family factor emerged with strong loadings. The results of this analysis are shown in Table 5.3 below.

Reliability. Subsequent to the factor analysis being completed, a reliability analysis was performed on the internal consistency of the items produced by the second FA. Conceptually, the idea is for all the scale items to measure a single underlying construct. The results of the reliability analysis revealed the nine sociability items formed a reliable scale with a high internal consistency (Cronbach's ά =.92), and the alpha did not improve with the removal of any of the items. Interestingly, the alpha would report substantially lower should item 2 be added (Cronbach's ά =.87).

Table 5. 3
Revised Version of the Sociability Scale

		Sociability
		Sociability
1.	This online learning environment enabled me to develop good work relationships with my group mates.	**.88**
2.	This online learning environment enabled me to identify myself with the team.	**.86**
3.	This online learning environment enabled us to develop into a well-performing team.	**.84**
4.	This online learning environment enabled me to build friendships with my group mates.	**.84**
5.	This online learning environment enabled me to easily contact my group mates.	**.78**
6.	This online learning environment left me with a good impression of my group mates.	**.77**
7.	This online learning environment allowed for some non-task-related conversations.	**.74**
8.	I felt comfortable with this online learning environment.	**.71**
9.	This online learning environment allowed spontaneous informal conversations.	**.70**

Note: Factor loadings >.40 are in boldfaced. The Sociability Scale. Adapted from "Determining Sociability, Social Space, and Social Presence in (A)synchronous Collaborative Groups" by Kreijns et al., 2004, *Journal of Cyberpsychology & Behavior, 7*,2, p. 160.

Refinement of the immersion questionnaire. The Immersion Questionnaire designed by Jennet et al. (2008) was originally composed of 31 items. However, as previously explained in the measurement tools section in Chapter II, three of the items were eliminated because they were only applicable to video games (e.g. *To what extent did you enjoy the graphics and the imagery?*) leaving a total of 28 and some of the items were reworded in order to fit the purpose of the current study. Consequently, although it was previously proven to be reliable, revalidation of the questionnaire was necessary.

A principal component FA, Oblimin with Kaiser normalization, was performed on the 28 items of the refined immersion scale to obtain the factor loadings. The data was first checked for sampling adequacy, which showed that the overall KMO value was 0.82 and individual values ranged from 0.49 to. 0.82. Bartlett's test of sphericity was also found to be highly significant

($p<.01$). The data was, therefore, deemed fit for factor analysis. The initial factor analysis produced seven factors with eigenvalues greater than 1.0. These factors explained 69.34% of the total variance in the items. However, the component correlation matrix revealed that the correlation between these factors was not greater than .300, indicating that the questionnaire appeared to be measuring different factors and therefore, was to be treated as an orthogonal matrix.

Another series of factor analysis was done switching the rotation to Varimax. As expected, the Varimax rotation provided a far more interpretable solution than the direct Oblimin rotation. Of the seven factors, three factors were judged to be relevant based on the variance explained, the eigenvalue size and the scree plot method. These factors selected accounted for 50.80% of the total variance. The first factor explained 29.8%; 13.7%, and 7.1% of the variance respectively. A subsequent factor analysis was performed forcing the items into three factors. One of the items, "To what extent did you find the online discussion easy?" was not clearly grouped to any of the corresponding sub-constructs; and thus, it was dropped in the final analysis. Finally, the analysis was then rerun with 27 items and resulted in three factors with strong loadings as shown in Table 5.4. Those items that loaded on two factors were assigned by the researcher to only one factor based on their highest loadings.

Reliability. Next, a reliability analysis was performed to examine the internal consistency of the three factors produced by the second FA. This reliability analysis revealed that the first formed a reliable scale (Cronbach's $\alpha = .93$) and the alpha would not improve with the removal of any of the items. The second factor (Cronbach's $\alpha = .75$); and the third factor (Cronbach's $\alpha = .71$) also produced a scale with an acceptable level of internal consistency. The three produced factors were seen to have common themes based on the questions they contained, and as such were given the tags: *focus on tasks*, *emotional involvement,* and *detachment from the physical world*.

Table 5. 4

Revised Version of the Immersion Questionnaire

		Immersion		
		Focus on task	*Emotional involvement*	*Detachment from the Physical world*
1.	To what extent did you feel motivated while discussing?	**.81**		
2.	Would you like to join the online discussion again?	**.80**		
3.	Did you feel that you tried your best during the online discussion?	**.80**		
4.	To what extent did you feel focused on the online discussion?	**.76**		
5.	How well do you think you performed in the online discussion?	**.76**		
6.	How much effort did you put into the online discussion?	**.73**		
7.	To what extent did the online discussion hold your attention?	**.73**		
8.	To what extent did you feel that the online discussion was something you were experiencing, rather than something you were just doing?	**.72**		
9.	How much would you say you enjoyed the online discussion?	**.72**		
10.	To what extent were you interested in seeing how the discussion would progress?	**.69**		.40
11.	To what extent did you feel like you were making progress towards the end of the online discussion?	**.66**		
12.	To what extent did you feel that you were interacting with the online environment during the discussion?	**.64**		
13.	AT ANY POINT did you find yourself becoming so involved that you were unaware you were even using the keyboard?		**.69**	
14.	To what extent did you feel as though you were separated from your real-world environment?		**.67**	.46
15.	Were you anxious about whether or not you would win or lose the discussion?		**.67**	
16.	Were there any times during the online discussion in which you just wanted to give up?	-.40	**.62**	
17.	To what extent did you forget about your life concerns while having discussions?		**.61**	

18. Were you disappointed when the online discussion was over?	**.47**		
19. AT ANY POINT did you find yourself become so involved that you wanted to speak to your group mates face-to-face?	**.45**		
20. How much did you want "to win" the online discussion?	**.43**		
21. To what extent did you feel emotionally drained by the online discussion?	**.42**		
22. To what extent did you lose track of time while having discussions?		**.63**	
23. To what extent were you aware of yourself and your surroundings while having discussions?		**.61**	
24. To what extent did you notice events taking place around you while having discussions?		**.58**	
25. To what extent were you consciously aware of being in the real world while discussing?		**.56**	
26. To what extent did you find the online discussion challenging?		**.56**	
27. To what extent was your sense of being in the online environment stronger than your sense of being in the real world?	.49	**.50**	

Note: Factor loadings >.40 are in boldfaced. The Immersion Questionnaire. Adapted from "Measuring and Defining the Experience of Immersion in Games" by Jennet et al., 2008, *International Journal of Human-computer studies, 66*, p. 659.

Correlations Amongst Social Presence, Sociability and Immersion

The second sub-question inquired as to whether there was a significant positive correlation amongst social presence, sociability and immersion at the construct and dimensional levels. Overall, the results of the correlational analyses showed positive and statistically significant correlations among the three variables at the construct level; similarly, the results revealed that most variables were both positively and significantly correlated with regard to each other with the exception of *emotional involvement,* which only correlated with *detachment from the physical world*. The following is a detailed description of the correlational results.

Correlations at the construct level. To examine the relationships among social presence, sociability and immersion factors, Spearman's rho bivariate correlation analysis (2 tailed) was applied on the aggregate scores of the Social Presence Scale, Sociability Scale and the Immersion Questionnaire.

Table 5. 5
Spearman's rho bi-variate Correlation Coefficients between the Social Presence Scale, Sociability Scale and Immersion questionnaire

Measure	1	2	3
1. Social presence	—		
2. Sociability	.30**	—	
3. Immersion	.41**	.61**	—

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

As can be seen in Table 5.5 above, there is a positive correlation between social presence and sociability. Statistically significant as the results are, the size of the correlation was moderate (r_s =.30, p<.01). On the other hand, there was a positive, strong, and statistically significant correlation between sociability and immersion (r_s =.61, p < .01). With regards to the relationship between immersion and social presence, it was positive, moderate, and statistically significant (r_s =.41, p < .01). As all the r values reported were positive and p < .01, it can be stated, with certainty, that there are positive correlations amongst the three variables. A visualization of the correlational results is shown in Figure 5.1.

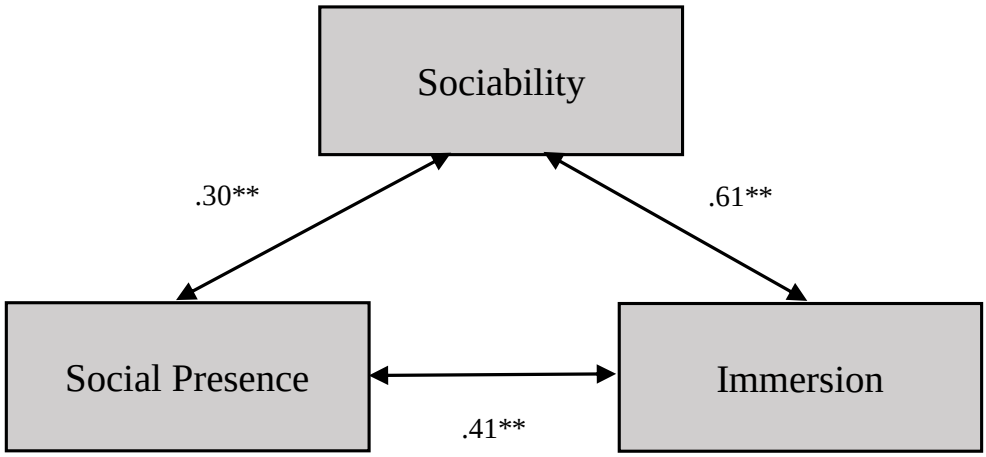

Figure 5. 1. Correlations among Social presence, Sociability and Immersion.

Correlations at the Dimensional Level. A series of Spearman's rho correlations was conducted to determine the relationships, if any, between the three immersion dimensions – *focus on tasks, emotional involvement* and *detachment from the physical world* –, and the social presence dimensions - *awareness of collaborators as real-people* and *semblance to face-to-face conversation*, and sociability. In addition, the relationships between the social presence dimensions – *awareness of collaborators as real-people* and *semblance to face-to-face conversation* – and sociability were explored. Table 5.6 below shows the full range of the results.

Immersion and social presence dimensions. The results revealed positive, moderate and statistically significant correlations between *focus on task* and *awareness of collaborators as real-people* (*rs*=.37, p<.01) and also between *focus on task* and *semblance to face-to-face conversation* (*rs*=.43, p<.01). Similarly, there were positive, moderate, relationships between *detachment from physical world* and *awareness of collaborators as real-people* (*rs*=.35, p<.01) and between *detachment from the physical world* and *semblance to face-to-face conversation* (*rs*=30., p<.01).

Interestingly, there was no significant correlation between *emotional involvement* and any of the social presence dimensions.

Table 5. 6

Spearman's rho bi-variate Correlation Coefficients amongst Immersion (focus, emotional engagement and physical world detachment), Social Presence (awareness of collaborators as real-people and semblance to face-to-face conversation) and Sociability

Measures	1	2	3	4	5	6
1. Focus on task	—					
2. Emotional involvement	.10	—				
3. Detachment from the Physical world	.43**	.31**	—			
4. Awareness of collaborators as real-people	.37**	-.07	.35**	—		
5. Semblance to face-to-face conversation	.43**	.16	.30**	.36**	—	
6. Sociability	.71**	.17	.36**	.27**	.29**	—

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

Immersion and sociability dimensions. There was a strong, positive correlation between *focus on task* and sociability, which was statistically significant (*rs* =.71, p<.01); and a moderate, positive correlation between *detachment from the physical world* and sociability (*rs* =.36, p<.01). Interestingly, no significant relationship was found between *emotional involvement* and sociability (*rs* =.17, n.s.).

Intercorrelations amongst immersion dimensions. Finally, the internal relationships among the three immersion factors were explored. The correlation between *focus on tasks* and *detachment from the physical world* (*rs* =.43, p < .001) and also between *emotional involvement* and *detachment from the physical world* (*rs* =.31, p < .001) resulted in positive, moderate, and

statistically significant returns. However, *focus on task* and *emotional involvement* were shown to be unrelated (*rs* = .10, n. s.).

Social presence and sociability dimensions. A significant positive relationship between *awareness of collaborators as real-people* and *semblance to face-to-face conversation* (*rs*=.36, p<.01) is readily apparent. There are also positive correlations between *awareness of collaborators as real-people* and sociability (*rs*=.27, p<.01); and *semblance to face-to-face conversation* and Sociability (*rs*=.29, p<.01), both results being statistically significant.

Summary

As expounded in the introduction, the objective of Study Three was to examine the relationships amongst social presence, sociability and immersion. Initially, a series of Factor Analysis (FA) and reliability analysis (Cronbach's Alpha) was conducted in order to revalidate the three instruments – the Social Presence Scale, Sociability Scale and Immersion Questionnaire – that made up the online survey.

Spearman's rho correlations were then run to explore the relationships between social presence, sociability and immersion at the construct level. The results indicated positive and significant correlation among social presence, sociability and immersion, implying the values on the three variables move in the same direction: as scores on one of these variables go up, the scores on the other variables also rise. The social presence-sociability and the social presence-immersion correlations results proved to be moderate, suggesting the two factors might actually be measuring separate concepts. These results are consistent with previous results obtained by Kreijns et al. (2004) who claimed that each scale indeed measures separate phenomenon.

On the other hand, the sociability-immersion correlation showed relatively strong correlation, suggesting that the two factors may, in fact, be measuring the same concept. When Spearman's rho correlation analysis was carried at the factor level the results showed that the two social presence factors – *awareness of collaborators as real-people* and *semblance to face-to-face conversation* – were positively related to both sociability and immersion. The scale of these relationships was considered moderate, *semblance to face-to-face conversation* and Immersion being the most associated factors among them. From the three factors that constitute the immersion construct, only *focus on task* and *detachment from the physical world* were significantly related to sociability. Unexpectedly, the correlation between *emotional involvement* and sociability was insignificant. An overview of the correlation amongst all the factors is shown in Figure 5.2 below.

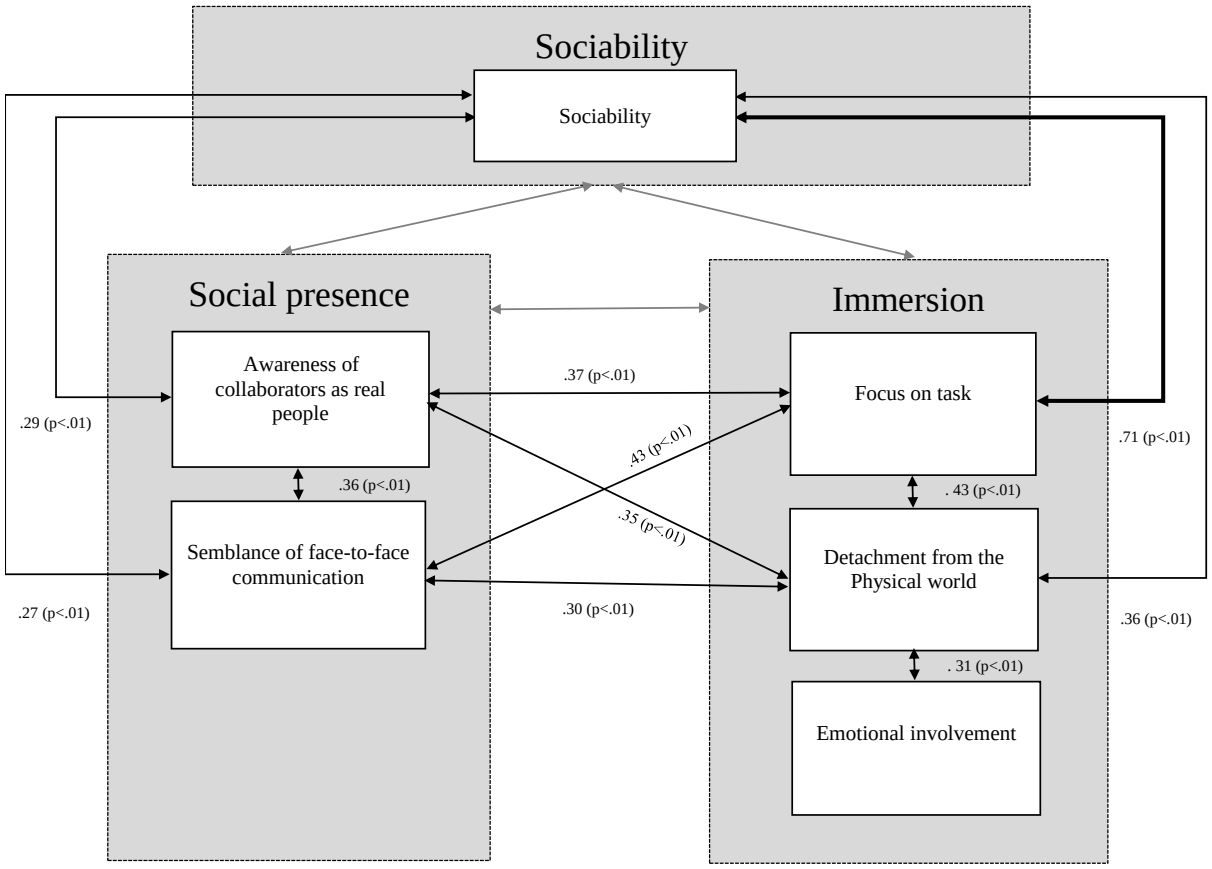

Figure 5. 2. Correlation amongst Social presence, Sociability and Immersion dimensions.

Discussion

The Sociability-Immersion Relationship

The most remarkable finding was a high degree of association between *focused on task* and sociability. The results suggest that users' motivation, effort, focus and enjoyment are closely associated to users' perceptions of group work relationships, team identification and feeling comfortable with other group members, in the online environment. The results demonstrate the importance of sociability within collaboration in becoming focused on the tasks, and reaching a certain degree of immersion. They are in agreement with Csikszentmihalyi (1990) who says that individuals depend on the affection and approval of others to perform well. In his words, he says "relationships with others can make individuals extremely happy when they go well or extremely depressed when they don't work out" (p.166). He further adds that external goals, external stimulation, external feedback are crucial in keeping ones' attention directed on a certain task. When this external input is lacking, the human mind begins to wander and thoughts become chaotic, falling into a state called "psychic entropy" in which thoughts can not flow and are stuck in the same state due to negativity or anxiety.

The results also support previous claims of Kreijns, et al. (2004) who say that a "sound social space" is vital for a group of individuals to perform well in a virtual environment. Here sound social space, may be loosely defined as "when the group structures manifest themselves through strong relationships, group cohesiveness, trust and respect, feelings of belonging, satisfaction and sense of community" (p.234). The results also support findings reported by Gao et al. (2010) in a study on users' perceptions of sociability of social software. They found that "social climate" was the most important social factor influencing users' attitudes towards the use of social software (i.e. e-mail, instant messaging, Social Networking Systems, etc.). Both, Kreijns and Gao

et al. agree that virtual spaces need to provide an adequate, safe and friendly environment for open communication in which members feel treated sympathetically by their fellows.

Findings in the current study also fall in line with the theory on affective learning. According to Russo and Benson (2005), an important indicator of success in distance learning is *affective learning* which represents the attitudes students develop towards the topics, tasks, course and instructor. They examined quantitatively the relationship between perceptions of presence in online classes to affective and cognitive learning outcomes. They found that a student's feelings of connection, and especially, perceptions of presence or immediacy of teachers and other students have the potential to influence affective and cognitive learning. These feelings of connection with others, when positive, encourage students to become involved intellectually with both the material and other students, and to increase the likelihood of students completing the online course.

The Social Presence-Immersion Relationship

Although social presence and immersion had moderate correlations, the results indicate that both variables, at the construct level, are positive and statistically significant. This suggests that as social presence increases, immersion follows in tandem. This concurs well with Witmer and Singer (1998) who claim that perceiving oneself directly interacting with other entities in a virtual environment increases the sense of immersion. Further, Tu (2000) claims that in order to perceive social presence in virtual settings, it is necessary to maintain a high degree of social interaction, meaning a user needs to exchange a number of messages, which carry explicit and implicit ideas, as well as personal information of the users. If there is a high degree of social interaction, there is a high degree of exchange of information, and as a result, there is a high degree of perception of social presence. This mutual and constant exchange of messages make it possible for the user to create mental models of others, who are involved in those interactions and, in turn, perceive their

social presence. The more social presence is perceived by users, the more immersion is perceived in the virtual environment by the same users.

The social presence-immersion-focus on task relationship. Further analysis revealed that at the dimensional level, the two social presence dimensions – *awareness of collaborators as real people* and *semblance of face-to-face communication* – were correlated to only two immersion dimensions – *focus on task* and *detachment from the physical world*. This is in line with the findings of Witmer and Singer (1998) who say that "how sharply users' focuses on the virtual environment, partially determines the extent they will become involved in that environment" (p.226). When it comes to virtual discussions and collaboration, it is the degree of social interactions that trigger users' attention and also may keep them focused as they received continuous responses and feedback from other group members. This behavior can be connected to users' social status and social reinforcements. According to Meshi, Morawetz and Heekeren (2013), individuals want to be seen positively by others thereby receiving social approval. Thus, responding to someone's postings on social media, either by liking or commenting on a comment, has a social impact on the user's reputation.

Moreover, Mauricio Delgado, an associate professor of psychology at Rutgers University, (American Marketing Association, 2015) says that replying to someone on social media alerts is related to a reward-seeking behavior and other positive social reinforcements, such as being smiled, complimented or recognized. Further, he claims that these social stimuli activate similar areas in the human brain which are commonly activated by food and water. Consequently, social media alerts or phone buzzing become a prediction of a possible social reinforcement which triggers interest in the users' to go read the message.

The social presence-detachment from the physical world relationship. Regarding the relationship between social presence construct and the feeling of *detachment from the physical world*: the combination of continuous communication, attention and focus on the virtual platform causes individuals to become aware of their own existence (self-social presence) in the virtual space as they also become aware that they are being perceived by others. This may contribute to creating a conceptual space, or virtual reality, in the users' minds leading to a feeling of being located in, or transported to, another place. One may wonder – How is this feeling of existing in a conceptual space related to social presence? – Malpas (1997) says that in order for any creature to have a concept of space, first, it must be capable of locating itself in relation to other elements in its environment. Even though virtual spaces are just *conceptual spaces* (refer to Chapter 2 for further details), it is still necessary for a creature to have a sense of spatial orientation and extension in relation to other elements existent in that environment. The reason a creature needs points of references in an environment is that conceptual spaces are connected to its bodily sensory, motor and cognitive capacities. Thus, building on Malpas' ideas, it can be suggested that social presence not only becomes crucial for users to perceive and to be perceived by others but also to maintain a sense of self-existence, and generate a sense of orientation and extension in the conceptual space built in users' minds. This conceptual space becomes a mental/virtual scenario acting like a platform where conversations with others can be held. This mental process requires a high degree of cognitive activity, which in turn, may trigger a feeling of detachment from the physical world. This suggested feeling of *detachment from the physical world* can be triggered by becoming increasingly focused on the task. However, it has been observed that only *emotional involvement* is related to *detachment from the physical world* and probably indirectly associated with *focused on task*. Emotional involvement, as it causes an increase in *detachment from the physical world*.

The results support ideas of Witmer and Singer (1998) who say that strong identification with a book, movie or video game character, results in an individual putting themselves in the characters place (i.e. empathy) to the point where they become immersed in the character's world. These claims are in line with those of Nakamura and Csikszentmihalyi (2014) who argue that a feeling of being challenged is crucial to have an immersive experience. Furthermore, they back up Brown and Cairns (2004) who say, in a study with video game immersion, that video game players have a sense of detachment, of being cut off from reality, once their emotions become directly affected by the video game. Thus, overall, previous empirical studies tend to support the relationships established between the aforementioned factors.

The Relationships Among Immersion Dimensions

Unexpectedly, and as mentioned above, the results of the current study did not show any direct correlations between *focus on tasks* and *emotional involvement.* The survey items in the *emotional involvement* construct overall inquired into: feeling anxious about whether a discussion would be won or lost, a feeling of giving up, forgetting about one's life concerns, a feeling of disappointment when the virtual discussion was over, and feeling emotionally drained by the discussion. One possible explanation is that the items did not truly measure the user's emotional engagement in relation to virtual collaborations since the original version of the survey was designed for measuring immersive experiences in video games. In marked contrast to video games, collaborative tasks encourage interdependence among groups members; whereas video games are more likely to encourage challenge and competition among users and video game characters, rather than this cooperation or collaboration. Possible, also, is that in virtual collaborative learning environments, there may be two separate ways for users to feel detached from the physical world: either a) focusing merely on the tasks or topic of discussion or b) getting involved emotionally

engaged with other users. There may, of course, be other explanations; therefore, this point will be brought up for further discussion in the next chapter. Findings from the in-depth interview with the students in Study Two might help to provide a clear answer.

The Social Presence-Sociability Relationship

The correlations between social presence and sociability were positive and statistically significant; but, surprisingly, they were not as strong as expected. These results contrast with those of Kreijin et al. (2004) whose correlation analysis results showed a strong correlation between social presence and sociability ($r=.63$, $p<.01$). However, Kreijin's team applied Pearson's bivariate correlation (2-tailed) analysis; whereas the current study uses Spearman's rho correlation analysis since the data was ordinal in nature. To err on the safe side, Pearson's correlations were run to ascertain the relations, if any, between the summed scores of the two variables. The results in no way affected the conclusions drawn from the first correlational results. Both Pearson correlation ($r=.33$, $p<.01$) and Spearman ($r_S=.30$, $p<.01$) analysis yielded similar interpretations. The similarity of both types of correlation analyses results are consistent with those claims of Norman (2010) and Murray (2013) who compared Pearson and Spearman's rho analyses on Likert scale data. According to both authors, parametric tests and non-parametric tests did not affect the final results in their corresponding studies. However, Hauke and Kossowzki (2011) advised on not over interpreting Spearman's rho correlation coefficient as a significant measure of the strength of the relationship between two variables. In effect, what the results from the Spearman's rho correlation indicate is the degree of association between the variables (i.e. whether the two variables are independent or not); whereas those of Pearson correlation indicates the strength of the linear relationship between the variables. Consequently, the present findings suggest that Social presence

and Sociability are two constructs which, although they are different in nature, are moderately correlated to each other and, indeed, associated with immersion at different levels.

The discrepancy between the results in the current study and those of Kreijin et al. (2004) can be ascribed to three main reasons.

First, the original versions of the social presence and sociability scales contain five and ten items respectively; while in the current study, the revised versions of the two scales include six and nine items respectively. Furthermore, the number of cases (valid responses) in both studies differed: Kerijin et al. collected only 79 cases; whereas in the current study, 102 cases were gathered, meaning differences in scale items and number of cases may have impacted the results.

Second, different platforms were used as virtual collaborative spaces in each study. The study done by Kreijin et al. employed a platform called eRom (a web-based collaboration software) as the Learning Management System (LMS); whilst in the current study, answers from the survey showed that most respondents used Moodle (17.4%), Facebook (15.7%), WhatsApp, (12.2%) Messenger (15.7%) and others (27.8%). According to Tu and McIsaac (2015), the degree of social presence is based on the characteristics of the medium and the perceptions of its users. It is worth mentioning that eRom was only available on desktop computers, while most of the virtual platforms reported by users in the current study are available on mobile devices. The difference in the devices may also have affected levels of interactions, immediacy and reciprocity in the responses among users having an impact on their perceptions of social presence.

Furthermore, Gao et al. (2010) found that social interactions of social software applications are supported by at least six sociability factors (refer to Figure 2.2. in Chapter II). Among them, the number of users (referred as in Gao's study as *People*) is critical to making an online community viable. These factors are also related to the number of incentives and benefits that each virtual platform brings to its users in meeting their socializing/networking needs, which in return,

stimulate others to voluntarily use the system and join discussions. In short, the characteristics and benefits of the virtual platforms, along with the number of users, and with their popularity and reputation, may have directly, or indirectly, influenced perceptions of social presence in the respondents.

Third, in the study of Kreijin et al. (2004), the respondents were from three distance courses at the Open University of The Netherlands, while in the current study, one group of respondents was from the Philippines, another from Malaysia and the other group was composed of respondents from various different countries (for more details on the demographics refer to Table 5.1). Consequently, it is difficult to categorize them as a single sample. Respondents are products of differing cultural backgrounds, familiarity with technology and virtual collaboration, etc., besides having different tendencies when responding to questionnaires which may be also influenced by culture.

There is empirical evidence that cultural background affects the perceptions of social presence and sociability in virtual settings. As previously mentioned in the literature review of Chapter 2, Gao and Rau (2011) and later Herold (2012) found that the perceptions of online sociability vary depending on the users' cultural backgrounds. Gao and Rau (2011) compared the impact of culture on online sociability between German and Chinese users. They found that contrary to Chinese students, German students have a stronger tendency to use social media with the aim of supplementing their relationships with existing contacts in the real world. Moreover, they were more concerned about privacy, formality and reservation. Chinese students, on the other hand, were more concerned about immediacy and effective communication than German students. For them, real-time communication was more important than asynchronous communication. Gao and Rau suggested that one explanation could be that in Chinese culture there is an emphasis on attending to one another and demanding a particular harmonious interdependence. Moreover,

Herold (2012) reported that a large number of Chinese students referred to online spaces as being unreal and stress-free environments and therefore did not perceive their actions on virtual spaces as having any impact on their real lives at university.

Given that previous findings by Gao and Rau (2011) and Herold (2012) can not be generalized since their focus was mainly on Chinese and German students, they certainly provide some insights into the difference in users' cultural predisposition of virtual spaces. It is likely, therefore, that the cultural background of the respondents was yet another factor that impacted the degree of perceptions of social presence and sociability, and possibly that of immersion, in the current study.

CHAPTER 6

A New Theoretical Framework for Virtual Collaboration

This chapter presents a summary of the three empirical studies from Chapters 3, 4 and 5 before providing an interpretation of the overall findings. It presents a new theoretical framework of social presence, sociability and immersion in virtual collaborative spaces, leading finally to discussions of the concept of social presence, the paradox of social climate, and the role of immersion in virtual collaboration.

Overview of the Three Empirical Studies

The foremost objective of the current study is the development of a framework that explains cognitive engagement in virtual collaboration. To achieve this objective, the study collected both qualitative and quantitative data from the three separate, yet interrelated studies that explore the influence of social presence, sociability and immersion on cognitive engagement in virtual collaboration. Study One analyzed the levels of cognitive engagement of fully online students undertaking virtual collaboration. Study Two explored students' perceptions of social presence, sociability and immersion in the virtual collaborative environment. Study Three examined statistical relationships amongst these three factors. Each of the studies' objectives, methodologies and key findings are summarized as follows:

Study One: cognitive engagement. Study One explored the levels of cognitive engagement of eight groups of fully online students in synchronous and asynchronous discussions

in virtual collaboration. It was a qualitative descriptive analysis that took a naturalistic approach to analyze text-based and video-based discussions, based on the cognitive engagement categories developed by Van der Meijden (2005). It explored the patterns of knowledge contribution by the students in these discussions and analyzed the quality of the discussion wrap-up reports based on specific rubrics.

The overall results of the coding frequency and the word distribution analysis of Recitation 1 (text-based discussion on Piazza) and Recitation 2 (video-based discussion on Google Hangouts®/ Skype®) indicated that groups did in fact engage at high levels of cognitive engagement.

In both types of recitations, the majority of students provided long and elaborate answers (*CHG 2; *CHG2 EXPL) on semi-structured questions based on course readings. In order to see how the task impacted students' cognitive engagement, these results were then compared with those of previous studies, which had used the same coding scheme (Sayamon, 2013; Shukor, et al. 2011; Shukor, et al. 2014; Van der Meijden, 2005). This was achieved by looking at the types of tasks and frequency of codes in the cognitive dimension reported in each study. The results of these comparisons revealed that students' level of cognitive engagement was indeed strongly associated with the type of task set (planning, intellective and decision-making tasks), its design, the degree of interdependence among group members that the task required, and the type of knowledge (*practical* or *theoretical*) which was required for the task to be accomplished.

The tasks of the present study fell into the category of decision-making, which required students not only to provide an individual answer but also to look for consensus within their groups requiring some degree of interdependence. Moreover, there was not one definitive answer/solution to each question as students were required to discuss subjective and theoretical concepts, such as online privacy. Despite the fact that all eight groups were given the same activity, each group took

a different and individual path to accomplish the task, causing the formation of different patterns of knowledge contribution.

In Recitation 1, three main patterns of knowledge contribution were found. Based on unique characteristics, these patterns were labeled as: *individualistic* (*CHG 2; *CHG2 EXPL), *leader-centric* (*CHG2; *CHG2 EXPL; *ACCEPT+) and *democratic* (*CHG2; *CHG2 EXPL*; ACCEPT; *REJECT+). These patterns were mainly the result of the level of interaction among group members, students' engagement in the activity and argumentation in the discussions, together with the management skills of members who provided leadership in the groups.

In Recitation 2, contrary to Recitation 1, the moderator became integral in the construction of the patterns of knowledge contribution. Three patterns of moderation were identified and named; *strict, mild* and *flexible*, and were a reflection of the degree of control exercised by the moderators over the group members' interactions, and their involvement throughout the discussions.

Although both recitations differed in nature, the first being text-based and the second video-based, the groups that showed the largest number of codes at high levels of cognitive engagement (the *democratic* and the *flexible moderation* patterns) shared common traits:

a) Firstly, they showed higher degrees of argumentation (i.e. questioning and contradicting counterparts' ideas and proving further explanations).
b) Secondly, group members engaged in decision-making involving the participation of at least three members of the group.
c) Lastly, members of the groups were more committed to the process of collaborating and learning from one another than to merely completing the task.

Finally, the results of the analysis of the group-wrap up reports showed that the style of these reports, and the way they were composed, were heavily influenced by the patterns of

knowledge contribution that each of the groups followed. Furthermore, key group members who gathered and edited the group ideas (the "editors"), the management skills of leaders in the groups, and the intervention of more than three group members in the editing process of the reports were crucial in defining their quality.

Study One concluded that making judgments on students' levels of cognitive engagement in virtual collaboration, based exclusively on the coding frequency results was insufficient since every unit of meaning coded was of different length. A more systematic approach to content analysis, exploring the frequency of codes and word distribution, was required. Furthermore, Study One backed up previous claims that students' level of cognitive engagement is strongly influenced by the type and design of the task assigned and the type of contributions made by group members during the process. Moreover, it found out that, aside from the editors' writing skills, leaders' management skills and teamwork, other factors such as feedback, communication and interaction among group members had a direct influence on the quality of group wrap-up reports. Finally, it claimed that the insufficient argumentation in all discussions was definitely another factor affecting students' cognitive engagement and prevented groups from taking discussions to the "next level", for example, the discovery of new ideas or resolution of group members' differences.

Study Two: Social presence, sociability and immersion. Study Two was a qualitative content analysis study that took a directed approach in examining the experiences and perceptions of social presence, sociability and immersion in virtual collaboration of eight participants from Study One through in-depth-interviews. The questions posed were designed based on the sociability framework of Gao et al. (2010) and a review of the literature of immersion and related areas such as Flow, cognitive absorption, and presence in virtual spaces.

Social presence. Firstly, participants' perceptions of Social presence were explored. In Recitation 1, students perceived the virtual environment of Piazza as being formal and academic, similar to a physical classroom, causing most participants to feel more focused on understanding the written ideas of their counterparts. The students further reported feeling pressured to provide thorough answers, at least of the same quality, or even higher, than those of other group members. Participants' emotional involvement was with the content of the discussion and not with the people with whom they discussed it. In Study One, most of the students provided answers with further elaboration (*CHG 2; *CHG2 EXPL) that showed high-levels of cognitive engagement, due in no small part to these factors which likely contributed to the quality of students' answers.

Although students became cognitively engaged with the activity on Piazza, the absence of social presence affected the degree of communication within the groups. In Recitation 1, it created feelings of detachment towards others and that influenced the degree of interaction among group members. In addition, the social climate on Piazza was mainly perceived as being formal and academic, as already stated, similar to a physical classroom. This caused participants to become conscious of their tone and word choice when replying to messages and to try to avoid hurting anyone's feelings by being too direct. This sense of formality also caused participants to refrain from using emoticons, emojis or GIFs during their discussions as they thought it was improper to use them on academic tasks.

The absence of social presence in Recitation 1 explained why in Study One, the majority of the groups (five out eight) followed the *individualistic* pattern of knowledge contribution. As previously explained in Chapter III, groups that followed this type of pattern preferred to provide individual elaborate answers rather than engage in discussions with other group members. Without the influence of social presence, students tended to focus on reading the content of the messages and formulating thoughts, without interacting to any significant degree with their counterparts.

Thus, Piazza, in fact, served as virtual space for storing individual reflections rather than a virtual platform for discussion and collaboration.

The lack of social presence can also explain the emergence of group leaders in those groups that followed the *leader-centric* pattern. Leaders exuded a strong social presence, as they actively interacted with every member in their group while leading the discussions and encouraging others to contribute. However, the strong social presence of a single member created a point of centrality within a group's interaction as members were only able to remain connected by sending responses through the leader.

Conversely, the experiences of the participants in Recitation 2 were different to those in Recitation 1. To start with, social presence was highly perceived during the video-based discussions, on Google Hangouts and Skype, as this method of communication was closest to that of face-to-face interactions. Compared to the first recitation, students felt that they were more productive in Recitation 2 as they were able to "pitch ideas" faster. However, most participants reported being easily distracted, as they had to deal with different communication challenges, such as: turn-taking, conversation pacing, awkward periods of silence (dead air) making them feel uncomfortable, not to mention the technical problems. In addition, they became distracted as they tried to figure out how their group mates felt about the discussion through the way they spoke. These issues are likely to have increased students' cognitive workload demands and influence students' performance during the video-based discussions.

Despite the distractions aforementioned, the results of the content analysis of Recitation 2 in Study One showed that students managed to engage at a high level of cognitive engagement. These results can be attributed to the preparations and rehearsals off camera that students held before recording and uploading the final version of their video-discussions. Some students had prepared a script of their answers before doing their video recordings. Moreover, the time limit of

the activity (30 minutes) was another factor that encouraged students to stay on task and avoid making off-topic comments while video recording their discussion sessions.

The virtual environment in Recitation 2 was perceived to be more welcoming and friendly than in Recitation 1. Most participants felt comfortable interacting with their peers because they could see each other faces and understand what kind of people they were dealing with. Seeing their group mates' facial expressions and hearing their voices caused the participants to become more open and relaxed when expressing themselves. All of this was helpful in students feeling psychologically safe when interacting with their group mates which, in turn, helped to increase the perception of social presence, and made the *social climate* more comfortable for social interactions subsequently in text-based Piazza.

Sociability. Although the social climate on Google Hangouts in Recitation 2 was less formal than on Piazza in Recitation 1, politeness was still present. Politeness caused students to be more mindful of their word choice in their messages. They thought twice before contradicting someone's ideas and were also influenced in the way they expressed their opinions, whether they be indirect, ambiguous or evasive; thus, politeness becomes a way of preventing conflict and preserving healthy relationships among group members. However, it also influenced the patterns of knowledge contribution, and thus, the levels of cognitive engagement. This was clearly observed in the *leader centric-pattern* in Study One where group members avoided questioning or contradicting leaders' ideas. Instead, they attempted to structure their thoughts to support or build on the leader's ideas. In fact, the overall results of Study One revealed that there was insufficient argumentation in almost all group discussions and the combination of formality and politeness was a factor that definitely influenced students' cognitive engagement. During the interviews, some students referred to these factors as a "barrier of formality" which made them not only careful of their word choice but also

caused them to be indirect or evasive when having contradicting opinions to those of their group mates.

Immersion. The immersive experience that participants described in Recitation 1 was found to be similar to a phenomenon called *narrative transportation*, which refers to the experience of being consumed by the world of a narrative causing individuals to lose track of time and lack awareness of the surrounding environment.

During Recitation 1, some participants recalled feeling immersed while holding text-based discussions. However, this immersive experience was different from that of Recitation 2. Three participants recalled having a series of physical world detachment experiences while communicating with their peers. According to them, these sensations were triggered when they felt engrossed emotionally while composing a message and also when they were engaged in deep conversations about topics they enjoyed when they made efforts to empathize with their counterparts so that they could hold a smooth conversation. This feeling of empathy could be associated with the feeling of being socially responsible for helping others, as some of the participants said that failing to do so made them feel bad about themselves.

Differently, the feeling of immersion in the video-based discussions (Recitation 2) was described by the participants as a feeling of being transported to their group mates' location as if they were visiting someone's house or peeping through someone's window. Most participants felt transported when they looked at their counterparts' background through their video cameras. The perception of immersion was, therefore, mainly attributed to the visual characteristics of the medium of communication and the mental effort required paying attention to sight and sound simultaneously. In addition to this, the increased pace of the user interactions, along with emotional

involvement, with both the task and other users, were always likely to create a high degree of immersion in Recitation 2.

Study Two concluded that Social presence influences sociability as it contributes to stabilizing physiological safety and building social climate within virtual group collaboration. In addition, social presence and sociability can positively impact students' satisfaction with their performance; however, they may equally negatively influence students' level of cognitive engagement as high degrees of social presence become distracting and formality and politeness of the social climate influence the way students express their ideas. In the case of immersion, similar constructs to those mentioned in the literature review were found, namely: *attention*, *emotional engagement*, and *physical world detachment*. It was further found that participants had two different, yet closely related immersive experiences; in Recitation 1, this was described as a detachment from the physical world, while in Recitation 2, it was a feeling of being transported to another place.

Study Three: relationships amongst social presence, sociability and immersion. Finally, Study Three examined the relationships between immersion, social presence and sociability factors by analyzing survey data of 102 users (53 male, 48 female and 1 other) who had experienced collaboration in virtual space. The data were collected from a cross section of academia and the private sector, namely a fully online course and blended online course, offered by an Open University in the Philippines, an online course offered by an Open University in Malaysia, and an external group of students from residential universities and working adults who had experience with virtual collaboration.

To measure the perceptions of social presence, sociability and immersion in virtual spaces, a single online survey, comprising of three instruments, was used. These were: the Social Presence

and Sociability scales refined by Kreijns et al. (2004) and the Immersion Questionnaire developed by Jennet et al. (2008). Although the three instruments had been previously validated by their respective authors, the present study utilized a series of Factor Analysis (FA) and reliability analysis (Cronbach's Alpha) to revalidate them. Following this, a series of Spearman's rho correlations analysis were run to explore the relationships among the three aforementioned constructs.

Overall, the results showed that social presence and sociability are two constructs which, although different in nature, are moderately correlated to each other, and indeed, associated with immersion at different levels (refer to Figure 5.2. in Chapter V for further reference).

At the *construct level*, the results showed a positive, moderate correlation between social presence and sociability (rs =.30, p<.01); results that were supported by findings from Study Two, mentioned earlier, as the participants' perceptions of social presence in the virtual environment increased, the perceptions of group interaction, open communication, socio-emotional experience and group identification among members increased in tandem. This was surely just observed after the holding of the video-based discussion, as it helped participants create mental models of their group mates which, in turn, helped them to perceive their social presence. In short, social presence influenced social climate in Piazza which, in this study, made students feel more comfortable in interacting with others in successive conversations. In fact, it was only after seeing each other via Google Hangouts or Skype that they started building friendships with others.

The results also showed a positive, strong, and statistically significant correlation between sociability and immersion (rs =.61, p < .01) at the construct level. Further analysis at the dimensional level revealed a strong correlation between *sociability* and *focus on tasks* (rs=.71, p<.01). The results back up findings in Study Two; as previously explained, most of the participants were of the opinion that interacting with others made them feel connected and more productive which helped to "pull them together" to submit their work by the given deadline. They also claimed

to have acquired new knowledge, which they would not have gained working by themselves. Furthermore, some participants reported feeling socially responsible for helping others, and thus, had to acquire new knowledge not only for themselves but also for the support of others.

As for immersion, the dimension *detachment from the physical world* resulted in being moderately correlated with social presence (rs =.41, $p < .01$) as well as with Sociability (r_s=.36, $p<.01$). These findings are a match with findings in Study Two; the feelings of detachment from the physical world in Recitation 1 and the feelings of transportation in Recitation 2 caused participants to feel physically closer to their group mates. This helped students in trying to understand their group mates' personalities and in building closer relationships. Consequently, these transportation experiences contributed to the perception of social presence in both types of recitations and could explain the relationship found between *detachment from the physical world* and *emotional involvement* (rs =.31, $p < .01$), because only those students who felt fully immersed claimed to have put themselves in their counterparts' situations, focused them on their emotions and on what they were going to say while composing text messages, and become engaged in deep conversations they found enjoyable.

Interestingly, neither social presence nor sociability was directly related to *emotional involvement* (r_s = .10, n. s.). One possible explanation given in the previous chapter was that the items of the online survey were not able to give a true measure of the user's emotional engagement in relation to virtual collaborations because the original version of the immersion survey was designed for measuring immersive experiences in video games. However, findings of Study Two provided a clearer explanation. The majority of the participants in Study Two reported to not feeling emotionally attached to their group mates during Recitation 1; as explained earlier, the absence of social presence and the formality of the written language were two factors that prevented the participants from developing any feelings towards their peers. Instead, they reported feeling

emotionally engaged with the topic of discussion as some of the participants felt overwhelmed and challenged, while others felt motivated. This supported the idea that in virtual collaborative learning environments, there may be two separate ways to perceive immersion: either focusing on the tasks and becoming emotionally engaged with topic of discussion or getting emotionally involved with other users.

Study Three concluded that indeed, the three variables – social presence, sociability and immersion – are positively and statistically significantly correlated among one another at the construct level. On the other hand, at the dimensional level, most variables were both positively and significantly correlated with regard to each other, with the exception of *emotional involvement* which only correlated with *detachment from the physical world*.

Interpretation of the Findings.

This study suggests that it is possible to engage students at high levels of cognitive engagement but this is dependent on a number of variables. Cognitive engagement in virtual collaboration is influenced initially by the type of collaborative task set as this can trigger either low or high levels of cognitive engagement, together with associated patterns of knowledge contribution, and since every task differs in characteristics, the type of knowledge and the degree of interdependence among members required for its completion will vary.

However, although the same type of task may be given to various groups of students, it is the degree of interaction among group members that either enhances or hinders the construction of further patterns of knowledge contribution in the collaboration. The quality of these patterns is heavily influenced by social presence, sociability and immersion; which not only have a marked impact the degree of interaction but also on the degree of argumentation within group discussions. The degree of argumentation may be also affected by the attitude of the students; those focused

solely on the final product, in effect on completing the task, do so at the expense of discussion, displaying a finish at all costs' attitude. Others, through the learning process of collaboration, gain insight into the thought processes of their peers and enrich their personal development through argumentation, yet a third group may be said to value both forms.

The findings of the present study are in line with Vygotsky's Sociocultural theory that claims that higher mental functions originate in social activity. These functions first originate in the interpersonal plane and then transform in the intra-personal plane through social activities to which the individual is exposed in the course of their entire life (Johnson, 2004). Findings in Study One demonstrate that the large majority of students backed up their answers by elaborating on previous life experiences they had had. These became the basis in constructing new knowledge and providing answers at the individual level. However, higher levels of cognitive engagement lay beneath the collaborative process within groups. This process involved communication, interaction, and most importantly, argumentation. That is, questioning and rejecting of ideas, with elaboration, as previously stated, became key in constructing new knowledge and coming up with a new product, for example, the synthesis of the group's ideas.

The study further supports Vygotsky's Zone of Proximal Development (ZPD) which refers to ‘‘the distance between the actual developmental level, as determined by independent problem solving, and the level of potential development, as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, as cited in Johnson, 2004, p.109). Participants in Study Two reported to feeling socially responsible for supporting others in their learning within the virtual platform: students helped each other when they were having a hard time understanding a topic. Furthermore, they felt encouraged to talk more when their inputs were acknowledged by others; this is in line with the ideas of both Piaget and Vygotsky, who saw learning as an active process of creating meaning through interactions with more knowledgeable

individuals.

Moreover, the study supports constructivist views of knowledge as being socially mediated as different patterns of knowledge contribution were created through interaction and argumentation and were highly influenced by moderators and group leaders. This supports the constructivist ideas of Fosnot (1996) who says that it is not possible to understand an individuals' cognitive structure without observing them interacting in context because knowledge is the product of negotiated interaction of individual interpretations, transformations and discussions.

Finally, among the eight core principles of Connectivism defined by Siemens, two are in line with the current study. Firstly, "learning and knowledge rest in diversity of opinions": participants in Study Two claimed that having group mates who came from different backgrounds having unique experiences and knowledge were the main factors that contributed in accomplishing the tasks successfully. Secondly, "nurturing and maintaining connections is needed to facilitate continual learning": all participants in Study Two, without exception, reported as having expanded their social networks through building friendships with group mates and creating private groups on other virtual spaces to keep in touch and work together in other school-related tasks.

The Perception of Social Presence

At the initial stage of the research, social presence was taken to mean the psychological awareness of being connected to and interacting with a real person within a virtual environment. This definition was developed through a review of eleven empirical studies on social presence in virtual environments (Refer to Table 2.2. in Chapter 2). However, through qualitative data analysis in the present study, it was found that *mental models* of others and *voice cues* also played a crucial role in the process of developing social presence. It was only after holding video-based discussions that the participants were able to perceive the social presence of their group-mates that had been

evident during the preceding text-based communication on Piazza. Before that, they had been unable to picture any image of their group mates nor hear their voices in their own minds merely the content of the written messages. Furthermore, through quantitative data, it was found that social presence is a spectrum that ranges from being aware of dealing with another human being to a sensation of communicating face-to-face.

Mental models. Bodily presence is the foundation of social environment in both human and animal populations. If people are not able to make sense of a human body, it is hard for them to build any sort of emotional connection (Anders, 2001). As discussed earlier in Chapter 5, although virtual spaces are just *conceptual spaces*, it is still necessary for human beings to be capable of locating themselves in relation to other elements in their environment (Malpas, 1997). In order to achieve this they need to have a sense of spatial orientation and extension in relation to other elements existent in these subjective spaces. The need for points of references in virtual environments is that conceptual spaces are connected to human bodily sensory, motor and cognitive capacities. In a similar way to a blind person, who needs to make sense of others' presence through body scents, vibrations or drafts in air flow created by peoples' bodies in the physical world, users in the virtual world need to make sense of others' presence through mental representations of those with whom they interact.

Voice cues. A possible explanation of voice cues may be found in the effects of speech on human biology. In a study of hormonal effects of human speech, Seltzer, Prososki, Ziegler and Pollak (2012) compared the hormonal responses of children (68 girls) who heard their mother's voice with those who communicated with their mother via instant message after undergoing a social stress test (Trier Social Stress Test for Children). The researchers measured the participants'

salivary cortisol and the levels of Oxytocin (a hormone that registers levels of stress) in their blood before and after taking the test. The girls who heard their mother's voice over the phone showed a drop in cortisol levels through feeling more relaxed. However, those who received only a text-message from their mothers did not show any relevant changes at the hormonal level. The study suggested that written language, while rich in nuance and emotional tone, may simply be incapable of producing this type of hormonal response in human beings. Such claims are supported by Olff, Frijling Kubzansky, Bradley, Ellenbogen, Cardoso, Bartz, Yee, and Zuiden (2013) who reviewed five empirical studies on Oxytocin administration in humans. In their literature review they reported that, overall, Oxytocin is involved in a wide variety of processes associated with social bonding, including elevation in group trust and improvement in facial emotion recognition. Consequently, auditory signals may be better predictors of the release of similar hormones necessary for the formation of social bonds, suppression of stress and other behavior which are critical to human beings.

Social presence as a spectrum. The spectrum of social presence seems to be closely related to the type of virtual platform in use and its level of virtuality. As explained in Chapter 2, virtual platforms have different levels of virtuality ranging from very low to almost a complete simulation of the physical world. The higher the level of virtuality a virtual platform has, the more real and self-immersed it becomes. In the present study, higher levels of social presence were perceived in the video-based discussions, triggered by a sense of transportation, which made virtual interactions appear closer to actual face-to-face discussions. This backs up previous findings of Ustun and Pazos (2012) who say that 3D worlds generate higher levels of social presence in individuals than 2D web-conferencing meeting spaces. According to Slater et al. (1996), one of the reasons is that 3D displays accommodate a variety of sensory systems; and Bowman and McMahan (2007) add that

the more senses a system stimulates, the more it allows individuals to construct their own internal mental models of reality.

Redefining social presence. Finally, taking into consideration definitions of social presence found in previous empirical studies and this study's findings, the following definition of social presence is suggested:

> Social presence, in a virtual environment, is the experienced sensation of dealing with a real human being through the creation of visual representations and voices re-constructed in the user's mind. This sensation can range from the simple awareness of dealing with another human being to the semblance of actual face-to-face communication.

As discussed here, social presence is key to interaction in virtual spaces and therefore future research into social presence should look further at the ways people exposed to different types of virtual technology use imagery, voice cues and other elements to create social presence in their minds. This may be of help in identifying and understanding more physiological aspects of this phenomenon.

The Paradox of the Social Climate

The findings of the present study support previous claims that social climate is crucial in order for students to feel safe and comfortable when interacting with each other and engaging in an activity (Gao et al., 2010; Gao and Rau, 2011; Kreijns, et al. 2004; Preece, 2000, Price-Mitchel, 2015). However, it also supports Casimiro's (2016) claims that learning communities tend to be supportive of discourse only up to a certain extent and that once conflict happens among members,

they tend to disengage conducting critical discourse. Although preventing conflict and preserving healthy relationships among group members are important, they can lead to the absence of argumentation and thereby preventing from students reaching higher levels of order thinking. From this it can be observed that the relationship between social climate and cognitive engagement seems to be somewhat paradoxical.

The content analysis in Study One revealed that less than one percent of the messages belonged to the category of REJECT and REJECT+. These results were supported by similar findings reported by Sayamon (2013), Shukor, et al. (2011), Shukor et al. (2014), and Van der Meijden (2005) who used the same instrument as the present study to analyze virtual discussions. The interviews in Study Two attributed the lack of argumentation to a "barrier of formality" especially experienced during video-based discussions. According to students, this barrier of formality caused them to stop and rethink before contradicting someone's ideas. Moreover, it made them alter their word choice which at the same time created a sense of "so much politeness" and objectivity in the conversation that they spent too much time trying to challenge each other's ideas.

As discussed in Chapter 2, Preece (2001) and Gao et al. (2010) agree that it is important policies be established in virtual communities for all members to behave with civility. They are important in controlling or preventing uncivil behavior such as abusive language, harassment, etc. They therefore need to be established and reinforced to regulate users' interactions. However, as Gao et al. pointed out, such policies should be properly implemented as they may influence the atmosphere of open discussion. A too strict set of such policies within a virtual community may influence negatively the way members engaged cognitively in their activities. Thus, understanding how formality and especially *politeness* influence students' behavior is crucial, and by doing so, instructors can find ways to nurture argumentation while preventing conflict without affecting the social climate negatively.

The influence of formality on the social climate. Formality, or etiquette, was clearly observed in the text-based discussion, Recitation 1, through expressions such as: "I highly appreciate your initiating first…", "I apologize for the late response", "I'd like to ask one question…" etc. Formality in the language influenced the student's interaction with their group mates as well as students' engagement with the discussion. As explained in Study One, most groups followed the individualistic pattern and during the in-depth interviews in Study Two, some participants claimed that the very formal and grammatically perfect written messages were perceived as being computer-generated, cold and impersonal. The participants reported to not feeling any emotional connection with the person who posted nor did they feel any urgency in replying. These findings mirror those of Tu and McIsaac (2010) in a study on students' perceptions of social presence. They found through eight in-depth interviews that graduate students perceived discussion boards as being formal, and therefore their writing was long and their word choice became "less oral" (meaning more formal). Further, students tended to write more structured sentences with rigid grammar because the messages would become permanent and public. Findings of the present study back up previous claims made by Tu and McIsaac (2010) who said that formality influences the immediacy of the responses as well as the students' willingness to reply because it creates "a psychological distance" between them.

As discussed earlier in Study Two, the formality in the language seemed to be triggered by the associations that students made between the virtual platform (Piazza) and a "real physical classroom". The platform triggered attitudes and behavior in similar ways as those triggered by brick-and-mortar classrooms. This is in line with ideas of Stromer-Galley and Martey (2009) who claim that virtual spaces have the capability to communicate information about social norms that influence users' behaviors within a given context (e.g. a classroom, a library, etc.) both in conscious and unconscious ways. In other words, the visual characteristics of virtual spaces activate spatial

schemas in the user's minds that are associated with off-line spatial contexts and their normative social implications. Further research should be undertaken to explore how students' mental representations of physical spaces help shape their behavior in online spaces.

To diminish high levels of formality in virtual spaces, Tu and McIsaac (2010) recommend that instructors use several communication strategies: such as initiation of conversation, greetings, praising, invitations, etc. to enhance interactive communication. Furthermore, they suggest the use of a casual communication style to encourage the more reluctant students. In addition, they claimed that the physical location from which students gain access may influence students' attitudes towards the virtual community. For example, students who access the discussion from home and their own computer device may perceive a more private and relaxed atmosphere in the virtual communities compared to those who use a computer in a computer laboratory, library or other public space.

The influence of politeness on the social climate. Aside from the perceptions of formality in the language, politeness was another factor that influenced the level of argumentation in the discussions, especially in Recitation 2. However, before moving on to further discussion, it is important to understand the concept of politeness. Politeness is "a key means by which humans work out and maintained interpersonal relationships" (Kádár & Haugh, 2013, p.1). Thus, in order to keep healthy relationships and avoid conflict, Lakoff (1973) says that it is necessary to follow three basic rules: "Don't impose", "Give options" and "Make A feel good, be friendly". In Leech's theory (1983), politeness can also be established by decreasing "the cost" and increasing "the benefit" for the hearer. For instance, giving a direct instruction such as *make a sandwich* would be considered less polite because it increases the cost to the hearer; while turning it into an offer *have another sandwich* involves some potential benefit to the hearer and by reducing the cost to the

hearer, *would you mind making a sandwich?* he/she is able to infer this intention, and it is possible to establish politeness. According to Brown and Levinson (1987), speakers can reduce the threat to the hearer's face (i.e. the image we present to other people) by using strategies such as: off record politeness (e.g. communicating via presuppositions, metaphors, etc.), on-record positive politeness (e.g. seeking agreement, avoiding disagreement, making jokes and presupposing shared knowledge with the hearer) and on-record negative politeness (e.g. giving deference, making ones' speech impersonal). Thus, politeness as a social practice involves various types on interpersonal behavior through which individuals take into account the feelings of others as to how they think they should be treated, and so keep healthy interpersonal relationships with others.

In the present study, on-record positive politeness was observed in both types of recitations, inferring that students were trying to keep the social climate formal while maintaining friendly interpersonal relationships; however, it is still not clear as to why they decided to do that. One explanation, by Kádár & Haugh (2013), is that politeness goes beyond the perceptions of the individual in isolation and at the bottom of politeness lies "a concern with what others think about us" which involves *intersubjectivity:* an agreement or a common understanding of two or more individuals about how they interpret or understand the perceptions, feelings, thoughts, beliefs and desires of others. This intersubjectivity can be related to Cooley's theory called *looking-glass self* which suggests that people tend to adjust their self-identification based on how they think they are perceived by others. As Cooley (1902) puts it, "we perceive in another's mind some thought of our appearance, manners, aims, deeds, characters, friends, and so on, and are variously affected by it" (p. 152). This self-idea is based on three principles: the imagination of our appearance as seen by the other person, the imaginations of his/her judgments of that appearance; and some sort of self-feeling such as pride or mortification. The thing that moves us from pride to shame is not merely the mechanical image of one's self, but the imagined effect upon another's mind. That is, we as

individuals imagine the judgments made by others, and, thus, we develop feelings about ourselves based on our impressions of their evaluations. Thus, we are not actually being influenced by the opinions of others, but instead, we are being influenced by what we imagine the opinions of others to be. Consequently, politeness is not only about making the hearer/receiver feel good by lowering "the cost" and increasing "the benefit," but is also born of a concern of what we believe "others think about us".

The influence of culture. It goes without saying that the degree of formality and politeness within students' virtual discussions may be influenced by the students' cultures.

As previously mentioned, the participants in both Study One and Study Two (except for one student) were of Filipino nationality. In a study of psycho-educational interventions to promote forgiveness among college students, Worthington, Hunter, Sharp, Hook, Van Tongeren, Davis, Miller, Gingrich, Sandage, Lao, Bubod, and Monforte-Milton (2010) claim that Filipino interpersonal relationships are characterized by harmony, non-confrontational communication, group identity and are susceptible to face-saving dynamics. They also highlight that insults and criticisms lead to "hiya" (shame) which can lead to withdrawal or vengeance. These claims are supported by the findings of Correo (2017) who studied the deployment of politeness in virtual conversations of Filipino users. Data drawn from 166 comment threads were analyzed using a coding system based on Brown and Levinson's (B&L) politeness theory. The results showed that among 15 strategies mentioned by B&L, three remained on top: seeking agreement, including both the speaker/hearer in the activity (e.g. we, us, our), and exaggerating their interest, approval or sympathy. These findings support the results of this present study, as the results of the coding analysis revealed that of the eight group discussions, only 0.5% of the total percentage of codes showed rejections of ideas, while 9.3% demonstrated agreement.

In addition, the section regarding Filipino etiquette in the World Culture Encyclopedia (http://www.everyculture.com/) states that "not losing face" is very important in the Filipino culture. Thus, being corrected or correcting someone else in public is considered unacceptable behavior. Moreover, Filipinos try to grant other's requests because failing to do that might cause the person to lose face. Beside etiquette, another cultural factor that may have influenced the level of argumentation in the discussions was language, in this instance, English. Although the majority of the participants in Study One were highly proficient in written English, a couple of participants during the in-depth interviews said that they would have felt more comfortable if they had been allowed to speak Filipino as it would have been easier to "get more messages across" to their peers. Fluency in English depends on the educational level and social status of the person and, thus, there is still a wide spectrum ranging from almost none to that of native-level fluent English speakers in the Philippines.

Ways to foster argumentation. Although formality, politeness and cultural beliefs are likely to have influenced the degree of argumentation in the discussions, it is also possible that most students were unable to question their counterpart as they did not possess the right strategies. There is, therefore, a need to train students in how to state their opinions in a critical but constructive way while keeping their counterparts' *positive face* (the desire of one's wants to be desirable to others). In other words, train students on how to question, reject and criticize their counterpart's ideas without hurting feelings and motivation.

In order to foster argumentation in virtual collaboration, Bonk, Whisher and Lee (2003) suggested the assignment of roles such as "the devil's advocate" to members of the group and incorporate activities such as "critical friend" (someone who agrees to speak truthfully but constructively) to encourage students to take a side in arguments. Moreover, Wang (2008), who

studied the effects of politeness tactics in learning environments to demonstrate the effect of socially intelligent tactics on learning outcomes, suggests a Politeness Strategy Model based on B&L politeness strategies (see Figure 6.1) According to Wang's model, when providing feedback, tutors/instructors typically carry three communicative acts: *criticize*, *suggest* and *explain concept*. Although these actions are aimed at providing feedback to the learner's actions, they may, at the same time, threaten the learner's positive face as well as morale. Thus, the tutor needs to weigh these risks and choose the appropriate politeness strategies to minimize them. Wang went on to suggest three strategies: *positive politeness*, *negative politeness* and *off-record*.

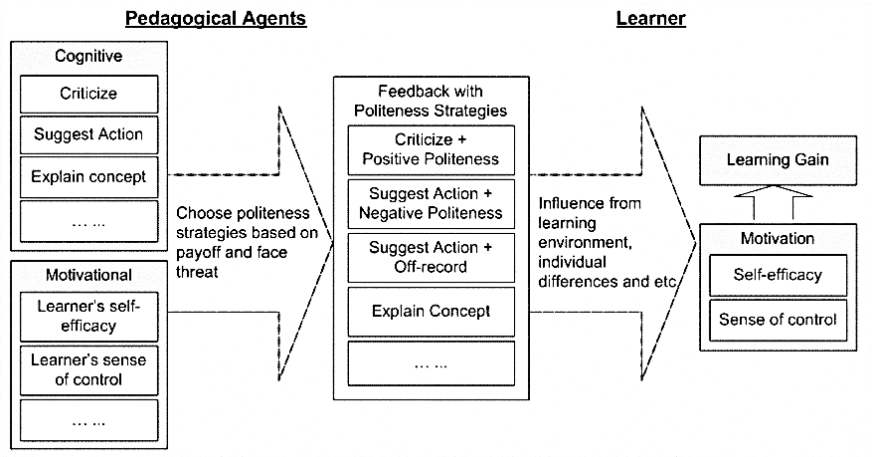

Figure 6.1. The Politeness Effect Model by Wang (2008, p.25)

The mechanism of *positive politeness* strategies conveys common ground with the hearer and emphasizing that both the speaker and the hearer are cooperators for example by replacing "Try again!" with "How about we try again?". Negative politeness strategies include paraphrasing request and questions: instead of "We didn't send the parameter", "Do you want to set the parameter?" is used. Finally, off-record strategies suggest providing feedback by promoting interest and reflection: "It's important to set the parameter". Although this model was not specifically aimed at virtual discussions, it could serve as a reference for instructors when designing strategies

to encourage argumentation and, at the same time, keep a comfortable social climate during the discussions.

Considerable attention must be paid to formality and politeness since both can influence students' engagement in the discussion. Too harsh an environment, in which everyone criticizes each other's ideas may lead students to shy away and stop participating while a too comfortable environment may lead students to agree with the leader's ideas and avoid expressing their points of view in order to keep a friendly social environment. Thus, there must be a "sweet spot" in between that can be created by using similar strategies to those mentioned above. These politeness strategies need to be based on the students' context while at the same time avoiding overgeneralization. It is also important to provide enough time for students to develop strong relationships with other members for them to feel comfortable in contradicting each other's ideas. A good idea would be to explore well-established virtual groups that collaborate in business-oriented environments to learn more about how to apply politeness strategies in discussions.

The Role of Immersion in Virtual Collaboration

Immersion can aid in knowledge construction through the stimulation of real-world sensations and deep reflection of others' experiences. Most significantly, it brings experiences of subjectivity, which involve the construction of mental models used to understand a problem or issue. According to Fosnot (1996), evolutionary biologists and neuropsychologists claim that the ability of the human brain for creating mental imagery has enabled homo sapiens to come up with new ideas and make major social changes. For instance, it was the human capability of envisioning tools for cultivation that led to civilization. This ability, to construct and reflect on mental representations, is crucial for individuals, not only to reflect on their actions and wonder about their own thoughts, but also to consider other individuals' perspectives and attempt to understand what

happens inside their minds. This last ability can be closely related to the other element that immersion brings into play, *empathy*.

In the current study, immersive experiences were associated with participant's empathic behavior in the virtual collaborative environment. Already mentioned, the findings of Study Two showed that only those participants who empathized with their peers experienced full immersion. This mirrors previous findings of Brown and Cairns (2004) who found that empathy was a factor that caused gamers to become fully immersed in video games. According to them, only those who truly empathized with the video game characters felt self-immersed in the virtual environment created by the video game. Findings of the present study further support claims of Collins (2014) who found through quantitative data analysis, positive and statistically significant correlations between chat usage and empathy, and between Facebook usage and empathy. Collin's results revealed that individuals who scored high in a 28-item empathy scale (The Interpersonal Reactivity Index) were more likely to engage in individual conversations using Facebook's chat functions; and that also, the amount of time spent online correlated positively with empathy. Consequently, based on the current study's findings, as well as previous evidence, it can be stated that empathy plays an important role in experiencing immersion in virtual environments, connecting, as it does, humans to other humans/virtual characters emotionally and in a profound way. This may change individuals' perceptions of others and possibly allow them to reach a better understanding of one another; at the same time, it may put individuals in a more receptive state of mind, reducing counter arguments (Green & Fitzgerald, 2017). However, it is yet unclear if empathy interferes with argumentation in virtual discussions, and therefore, further exploration of empathy in virtual discussions is needed.

The current study initially defined immersion as "the feeling of being involved in a virtual environment and becoming removed from real-world stimuli" (Jerome & Witmer, 2004, p.2613)

which consisted of four factors that indicate how immersed a person becomes in a virtual space: attention, emotional engagement, multi-sensory stimulation and physical world detachment. This definition was based mainly on a literature review on immersion in video games and 3D virtual worlds. However, after investigating virtual platforms, with a low-level of "virtuality", used for work-based tasks (Piazza), of the four factors, only three remained consistent: *attention*, *emotional engagement* and *physical world detachment*.

Moreover, it was found that the immersive experiences, in text-based discussions, were the results of two processes: a) a cognitive process of deep thinking and the construction of mental representations/models in order to understand the topic/situation under discussion; and b) a process of getting emotionally drawn by the task set or getting emotionally involved through empathy with others who share the same virtual space. The latter is considered to be close to the phenomenon called narrative transportation. Interestingly, the video-based discussions trigger in participants a sense of transportation to the place inhabited by their counterparts. This phenomenon resembles the concept Bowman and McMahan (2007) describe as visual immersion: how close the visual output is to real-world visual stimuli. Brown and Cairns (2004) explain that "this happens when an individual's cognitive and perceptual capacities are tricked into believing that they are somewhere other than their physical location" (p.38). Similarly, Hall, and Bracken (2011) explain that audiovisual narratives create a sense of transportation. However, they claim that individuals who have a strong tendency to imagine themselves in the place of others are more likely to feel transported into a filmed narrative while experiencing enjoyment. Similar thoughts are shared by Green and Fitzgerald (2017) who say that individuals with tendencies towards mental imagery production and emotional response affect have a higher likelihood of perceiving full immersion. There may be other human traits such as anxiety and introversion (Jurnet, Beciu, & Maldonado, 2005) which may also lead to immersion, and thus, future studies should look further into the

characteristics of individuals who become highly immersed in virtual environments in order to understand more about the nature of immersion in virtual collaboration.

Based on findings of the review of the literature together with those of the present study, a definition of immersion in task-based virtual platforms use for collaboration is proposed:

> Immersion is the process of becoming involved with a task in a virtual collaborative environment and becoming removed from real-world stimuli. This process involves attention, emotional engagement, transportation and/or physical world detachment.

In concluding this section, it is important to bear in mind that the current study is one of the first attempts to investigate immersion in virtual spaces, with a low-level of virtuality used for academic task-based purposes. Further research is needed to validate the findings described here.

A New Theoretical Framework of Cognitive Engagement in Virtual Collaboration

Consolidating the findings of the three studies, this study proposes a new theoretical framework of cognitive engagement in virtual collaboration consisting of four constructs: type of task set, degree of interaction between members, the degree of argumentation, and patterns of knowledge contribution. A representation of the framework can be seen in fig 6.2 below.

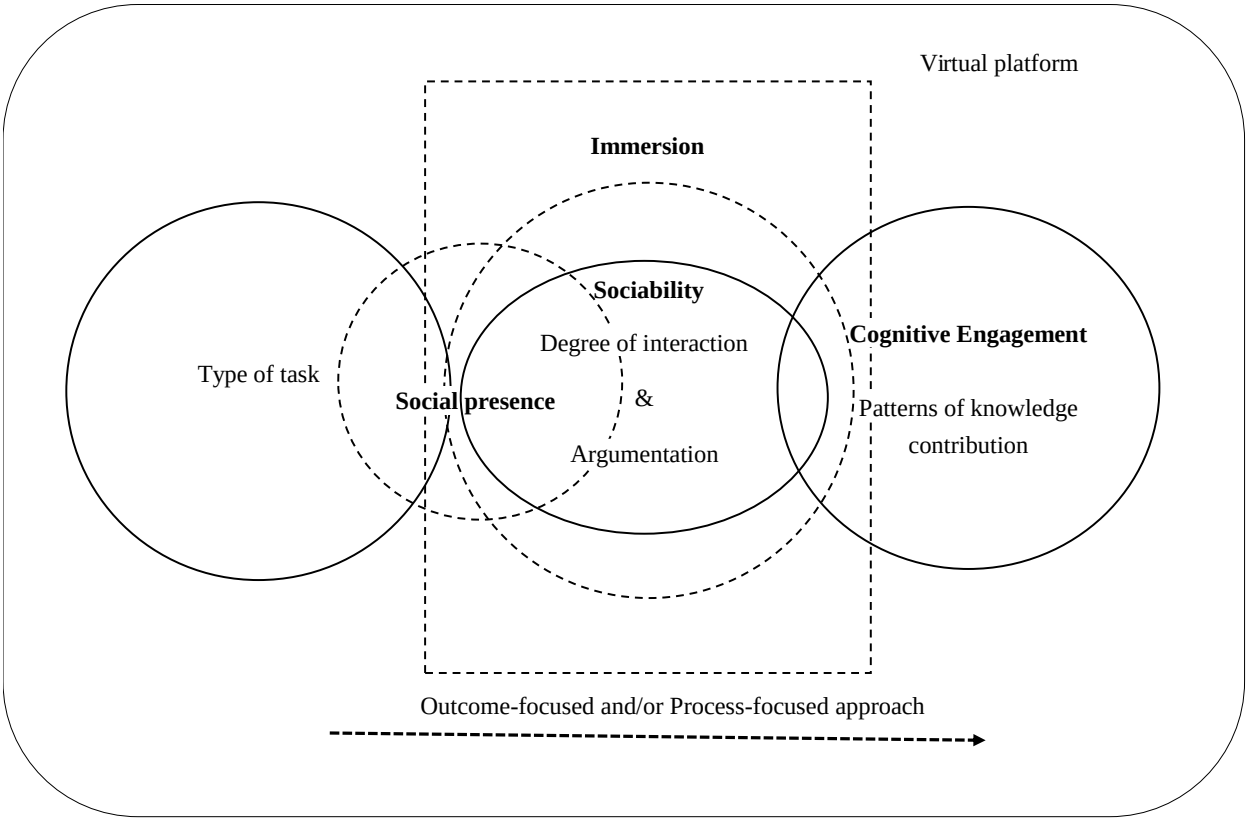

Figure 6.2. A new theoretical framework of cognitive engagement in virtual collaboration

The type of task. The type of task is crucial in engaging students at high levels of cognitive engagement as every task requires different *types of knowledge* and different degrees of *interdependence* among group members for it to be accomplished. Some tasks require technical skills or specific knowledge to come up with a single answer (e.g. mathematics), while others require theoretical knowledge to discuss subjective topics with different possible answers (e.g. philosophy). Thus, some tasks require students to simply contribute individual answers, while others require students to look for consensus within their groups. Unquestionably, the depth of cognitive engagement reached by each individual may be determined by their level of interest, previous knowledge, as well as how much effort they make to understand the matter in question.

It is worth mentioning that McGraths' (1984) Group Task Circumplex is of great help in classifying and analyzing the types of task. Base on this model, tasks may fall into four main categories: *Generate* (Generating plans: e.g. problem solving; and Generating ideas: e.g. brain storming), *Choose* (Intellective tasks: e.g. problem solving tasks with a demonstrable right answer; Decision making task: e.g. tasks for which there is not a demonstrably correct answer, and thus, it is agreed by consensus); *Negotiate* (Resolving conflicts of viewpoints: e.g. some jury tasks; Resolving conflicts of interest: e.g. doing negotiations); and *Execute* (Contests: e.g. competitions or battles). By using this, or similar models, instructors may have a better understanding of the nature of the tasks being performed, as well as the type of knowledge students' may require to accomplish it.

The degree of interaction and argumentation. The degree of interaction between group members is crucial in fostering dialogue and in the construction of knowledge, as a lack of desired interactions results in only a few members contributing to the discussions, leading to the demise of the virtual community. This study reveals that groups whose members simply contribute with individual answers do not demonstrate higher levels of cognitive engagement, nor are they able to come up with a clear synthesis of the whole group idea. In addition to interaction, the degree of argumentation plays a crucial role in higher order thinking, as it creates in students a state of disequilibrium between what is understood and what is encountered. This later leads to accommodation, which encourages students to try and reduce such imbalances through the development of new schemes, or the adaptation of old ones, until equilibrium is restored.

Both the degree of social presence and degree of argumentation are mediated by three major factors: social presence, sociability and immersion.

Social Presence. The perception of social presence is very important for students to establish psychological safety in the virtual space. Students need to be aware that they are, indeed, interacting with other real human beings to share information and maintain a suitable degree of interaction among group members. As members of the community come to feel connected with other human beings, they become willing to share more personal information, which in return, facilitates discourse. If there is a high degree of social interaction, there is a high degree of exchanging of information, and as a result, there is a high degree of perception of social presence. Although social presence may not guarantee cognitive engagement, it is crucial in laying the groundwork for the next variable, sociability.

Sociability. Sociability is almost exclusively determined by the group dynamics created by the social climate. The social climate (a major factor of sociability) is highly influenced by two main variables: formality and politeness. These two variables help to prevent conflict and preserve healthy relationships among group members. They also make group members feel socially responsible for helping one another. However, high levels of formality can create a physiological distance among group members, making them feel emotionally detached from their peers; and high levels politeness may prevent students from questioning or contradicting other's ideas to avoid hurting someone's feelings. Consequently, these two variables may not only influence positively and negatively the degree of interaction among group members but also, and of more concern, the degree of argumentation in the discussion.

Immersion. The degree of immersion, in the virtual environment, is another factor influencing the level of cognitive engagement. Superficial levels of immersion are considered to have a direct impact on students' cognitive engagement. The present study found that at superficial

levels of immersion, students focused on understanding matters under discussion rather than on the person who posted them and were, therefore, able to create mental representations of the matter described from the messages they read.

Higher levels of immersion are considered to have a direct impact on both social presence and social climate, while having only an indirect impact on cognitive engagement. In this study students invested more time and extra effort to convey their emotions through their messages and consciously made efforts to empathize with their group mates. Empathy, therefore, helped students, not only to understand more about their group mates' personalities, and so build closer relationships, but also to understand their needs and consider how they could be helped. However, although empathy may help to reduce communication barriers among students by making them emotionally connected with others; it may also influence the degree of argumentation by causing students to be more inclined to understanding others rather than contradicting their ideas or beliefs.

Attitudes towards the task. The level of argumentation in the discussion is also influenced by the group members' attitudes toward the task assigned. Groups that give more importance to merely meeting the activity requirements and completing the task (shortened as *outcome-focused approach*) may not engage much in questioning or contradicting each other's ideas. On the other hand, those groups giving greater importance to the process of exchanging ideas with group mates and learning from one another (shortened as *process-focused approach*) may engage more in argumentation to construct new knowledge. From this it can be stated that the process of collaboration together with the quality of the final product of the collaboration should be valued equally.

Patterns of knowledge contribution. All the variables mentioned above influence the behavior of individual group members and the quality of their contributions during the process of collaboration: leading to the formation of different patterns of knowledge contribution, which, in turn, represent the level of cognitive engagement of the entire group. The nature of these patterns depends not only on the synchronicity or asynchronicity of the communication, but also on the affordance of the virtual platform stipulated. From Study One three patterns of knowledge contribution have been identified in text-based discussions: individualistic, leader centric and democratic patterns and three more in video-based discussions: strict, mild and flexible moderation patterns.

The virtual platform. Many of the social interactions in the virtual world are governed by social norms and interactions from the physical world (Yee, Bailenson, Urbanek, Chang, & Merget, 2007). It is therefore important to take into consideration the visual characteristics of a virtual platform, since it may influence students' behavior. In the present study, perception of formality is closely related to the emotions and mental representations that the virtual platform prompts in a student's mind. Whenever students access Piazza, the feeling is one of being inside a physical classroom. As discussed earlier, visual settings can trigger schemas related to individuals' understanding and experiences gained from physical spaces. These schemas contribute to shaping social norms and frameworks for interaction that users then attach to the virtual space in use for collaboration.

CHAPTER 7

Conclusion

The purpose of the current research was to develop a framework that explains collaborative cognitive engagement along with specific variables – social presence, sociability and immersion. To achieve this goal, Study One employed Content Analysis to examine the levels of cognitive engagement of eight groups of fully online students engaged in virtual collaboration. Then, through in-depth interviews, Study Two explored the individual perceptions of social presence, sociability and immersion of eight students who were part of these groups. Finally, Study Three collected data from a large group of people with experience of virtual collaboration to explore the relationships among immersion, social presence and sociability.

The main findings from the three empirical studies lead to the conclusion that it is possible to engage fully-online students at high-levels of cognitive engagement, and at the same time, contradicts previous generalizations that students remain at low levels of cognitive engagement. Additionally, it suggests that in order for this to happen, the type of task/activity needs to be carefully crafted. It should require students not only to apply practical but also theoretical knowledge when proposing alternative solutions to the same issue. Moreover, it should require a certain degree of interdependence among group members so that it encourages students' individual participation, and interaction with other group members to lay the ground for collaboration.

The processes of developing the product and the quality of that final product should be valued equally. Within the process of development, group members should be encouraged to get to know each other and support and learn from one another to build a sense of team belonging. In addition, and most importantly, argumentation must be nurtured along with this process. Group

members should question and challenge ideas that have been taken for granted while providing explanations and evidence to back up their discussions. In so doing, users will be able to either explore ideas to their logical conclusion, discover new concepts, or find resolution of ideological differences. Through argumentation, therefore, all group members have an opportunity to express their views, challenge existing beliefs and create an impact on the group conclusions.

In order to develop a suitable virtual collaborative environment for cognitive engagement to occur, firstly, psychological safety needs to be established through social presence. This is a necessary factor in maintaining a suitable degree of social interaction. If social interactions do not occur as desired, few users will contribute to the discussions, leading to the demise of the virtual community. Social presence, therefore, lays the foundations for building sociability which, eventually, contributes to creating a suitable social climate. As members of the community become more familiar with each other, and feel connected, respected and cared about, they become more willing to share personal information, which in turn, facilitates discourse leading to knowledge construction. Once social presence and sociability set the stage for the work to progress, immersion comes into play. Immersion takes social presence and connects it to sociability, taking it to a deeper level through psychological realism and feelings of closeness. It makes users become emotionally engaged while attempting to empathize with groups mates who they have yet to know in person. Empathy helps people to understand what others really need and, therefore, to know how they can be helped. This puts users in a more receptive state of mind, which may help to reduce communication barriers among users during conversations. At the same time, immersion brings deep thinking and the construction of mental models of the situation or problem needing to be discussed. Therefore, it can be concluded that social presence, sociability and immersion are three closely related variables that support the process of cognitive engagement in virtual environments.

Theoretical Contributions

This study contributes knowledge to the fields of education technology, distance education and psychology. It offers important insights in helping to understand the social and psychological factors affecting the cognitive engagement of fully online students while collaborating virtually in groups.

The study proposes a new theoretical framework that explains the roles of the variables; social presence, sociability and immersion on students' cognitive engagement in virtual collaboration. More specifically, the framework provides a visualization of the influence the three variables have on the degree of interaction and argumentation during discussions which then lead to the construction of different patterns of knowledge contribution. The model also considers the importance of the characteristics of the task set and the attitude of the students towards the activity in the construction of these patterns.

Secondly, the study makes a noteworthy contribution to the research on immersion in virtual spaces. To date most of the research on immersion in virtual spaces has been limited to video games and 3D virtual worlds, leaving virtual spaces used for work-based tasks unattended. This study is one of the first to introduce a theory of immersion into the theory of virtual collaboration and to explore both, qualitatively and quantitatively, students' immersive experiences in traditional virtual platforms commonly used for work-based tasks in educational settings. Furthermore, it opens a new door to explore the connection of immersion and empathy more deeply and the degree to which these two variables influence argumentation in virtual discussions.

Thirdly, this work makes a contribution to the growing body of literature on sociability in virtual environments. It expands the scope of the research on sociability of social software, led by Preece (2001) and Gao et al. (2010), by the exploration, both qualitatively and quantitatively, of the perceptions of sociability in educational software used for collaboration in online education.

Moreover, it supports previous ideas on the importance of the social climate on students' performance by providing evidence, through statistical data, of the strong relationships between the social climate and students' focus on the task.

Fourthly, it is one of the first studies to apply a coding scheme system previously used by four other studies to measure cognitive engagement, and to explore how its results differ from those of previous studies through looking into the design of the task. Through this approach it provides a degree of evidence in support of previous ideas; that the design and the characteristics of the task play important roles in the contribution of knowledge at different levels of cognitive engagement.

Fifthly, it contributes to existing knowledge on the perception and influence of social presence on performance. The empirical findings of this study enhance understanding of the concept of social presence and the crucial role it plays in establishing 'psychological safety' in the virtual environment. It discusses the importance of voice cues in the creation of mental models that, in turn, lead to the perception of social presence. Furthermore, based on the current study's findings, the study proposes a new definition of social presence in virtual collaboration.

Finally, the study refines and statistically validates previously used instruments for studying students' perceptions of social presence and sociability. Moreover, it adapts and validates an instrument used to measure the level of immersion in virtual collaboration experienced on platforms used for discussions. It is hoped that such instruments can be used by future researchers to explore students' perceptions of social presence, sociability and immersion on other types of virtual platforms employed as learning management systems.

Suggestions for Practitioners

The present theoretical framework can be of use in raising awareness, among practitioners, of key factors that influence the degree of interaction and argumentation in virtual discussions, as

well as the patterns of knowledge contribution that various types of tasks may trigger. The framework, therefore, can be used as "a road map" for the designing of virtual collaborative tasks: before starting the design of a collaborative activity, online instructors may begin by analyzing the nature of the task (planning, intellective, decision making, etc.) the type of knowledge (practical or theoretical) and the degree of interdependence among group members required for it to be accomplished. Based on this analysis, online instructors can then attempt to predict possible patterns of knowledge contribution that the task may trigger during the discussions, and therefore craft directions that lead to more fruitful discussions.

The framework can also be used to raise awareness of the importance of social presence in establishing "psychological safety" in the virtual environment. Based the findings of the present study, two ways are suggested: using "voice cues"; instructors may consider requesting students to record an oral self-introduction using their mobile devices and share it among their team members; holding a short video-based meeting with group members before starting work on the task given. As previously discussed, social presence is important in maintaining a certain degree of interaction among group members and to initiate the building of a social climate in the virtual platform.

Furthermore, the framework can be used as a reminder that the degree of interaction and argumentation are also heavily influenced by sociability. To be more specific, by formality and politeness, which are two variables found within the social climate. Therefore, it is important that online instructors be able to teach "politeness strategies" so that students can question or contradict someone's ideas while keeping a suitable social atmosphere during the collaborative process. In addition, instructors should raise awareness among students of the important role that argumentation plays in the finding of alternative solutions to problems, as well as the creation of new ideas.

Finally, it is hoped that the framework is helpful to instructors when reflecting on the influence of virtual space in students' behavior. Virtual spaces can trigger similar feelings to those associated with physical spaces. Choosing the right platform for the collaborative task is therefore crucial, as it can influence the students' attitudes towards the task, perceptions of formality and social presence, which can have a great impact on the degree of interaction among group members.

Limitations of the Study

The generalizability of the results is subject to certain limitations, which call for further research.

First of all, the study measures perceptions, which are a set of beliefs and feelings respondents experienced in regard to social presence, sociability and immersion, in virtual collaboration; the participants in Study Two mainly relied on memory traces, together with their emotions while answering questions during the in-depth interviews.

Study One was conducted within the same course, and the topic of the task to complete was incorporated as part of the course requirements. This may have affected the participants' attitudes, motivation and sense of responsibility to accomplish the tasks given. Furthermore, although most of the participants were of a single nationality, Filipino, the groups were not all equally composed, and their distribution depended on the number of students enrolled in the course and the course instructors' choices for group composition. Aside from this, demographic characteristics of the members in each of the groups such as age, gender, computer skills, experience with virtual collaboration and professional background varied considerably.

Moreover, it is worth mentioning that participants of Study Three evaluated their collaborative experiences based on different virtual platforms; thus, there might be other factors that affected their perceptions of the aforementioned constructs. A further limitation of Study Three

was the size of the survey sample, a general rule of thumb being that there must be at least 10 cases per item, meaning that ideally, 430 respondents were necessary here.

Above all, the results of the present study are restricted to collaboration in task-based virtual spaces; caution must, therefore, be applied when it comes to comparing the present study results with those of other studies on, for example, video games, virtual reality or 3D worlds.

Directions for Further Research

In addition to the recommendations for further research mentioned in connection with the various findings summarized in the preceding sections, the following topics should be considered for future research.

Further empirical studies would provide the opportunity to compare content analysis results, using the same coding scheme, with a view to validating the claims of the current study. Importantly, consensus among researchers in similar fields is needed to develop standard analytical schemes and dimensions to measure cognitive engagement in virtual discussion forums. Future studies may consider adding an extra layer of coding to the scheme using, for example, the Bloom's Taxonomy for classifying messages in more specific cognitive dimensions. This approach, it is to be hoped, will provide a better understanding of the depth and type of knowledge students contribute to the virtual discussions.

The present study analyzed students text-based interactions on Piazza, and three main patterns of knowledge contribution were observed. However, these patterns might be different in other platforms. Therefore, it would be interesting and instructional to see how the affordance of other virtual platforms triggers similar or different patterns of knowledge contribution.

Regarding social presence, in this study, most students needed to build mental models of their group mates through the exchange of text, voice and video in order to perceive their social

presence. These models helped facilitate the communication between them and to build social relationships. In order to reinforce these claims, future research should look further into ways bodily impressions of others are recreated in students' minds and how students use these impressions to perceive social presence in virtual environments.

The current study suggests that age and gender are factors influencing students' degree of argumentation. It was found that a group of mature male students felt more comfortable challenging other's opinions than did younger students. Conversely, groups exclusively composed of young female students showed more agreement than those composed of older male students and built their opinions on those of the group leader during the discussions. Despite the findings of the present study showing some degree of influence on argumentation by age and gender, it remains difficult to draw solid conclusions, and research is needed to examine the influence of students' age and gender on the degree of argumentation in virtual discussions.

It is worth mentioning that the cultural background of students may be yet another factor that impacts the degree of formality and politeness; two factors that have a direct impact on argumentation in virtual discussions. Future studies, ideally, will assess different methods of increasing argumentation in the discussions without putting at risk the social climate. Of particular interest would be a comparison of students from other countries, such as the U.S. and Japan, to see how similarly or differently they engage in argumentation during virtual discussions.

Finally, further research is definitely needed to better understand students' perception of immersion in relation to other factors, the relationships between immersion, empathy and critical thinking especially deserve further research. It has been claimed that empathy influences the generation of counterarguments and make individuals more inclined to accept the perceptions and beliefs of others. A future study, therefore, might explore whether or not these claims are true in virtual discussions.

Concluding Remarks

Previously established theories of learning help us understand the way human beings construct knowledge within a social environment; however, it is important to highlight that nowadays human beings have already begun living in a new computer-mediated ecology. With the development of new technological tools, such as virtual reality, augmented reality and mixed reality, supported by mobile technology, human beings will not only learn exclusively through their physical bodies, which are in contact with physical spaces, but also through digital extensions of their bodies and subjective spaces constructed by these technologies. Moreover, with the recent development of Artificial Intelligence (AI), human beings will not only learn from more knowledgeable human beings, but also from more intelligent machines that can provide broader knowledge at a faster pace than any human being. As technology changes the speed at which we experience things, the human brain needs to adapt in order to cope with such speed of stimulation. This implies that current theoretical views about learning presented here may become insufficient to explain how future generations, of fully-online students, construct knowledge while collaborating in state-of-the-art virtual spaces.

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Glossary

Cognitive engagement. It is defined as "a psychological investment in learning" (Newman, 1992, p.12) "which occurs when a student gives sustained attention to a task that requires mental effort, and authentic, useful learning is produced by extended engagement in optimally complex cognitive activities" (Corno & Mandinach, 1983, p.88).

Conceptual space. the subjective space in which human beings think and engage with knowledge.

Knowledge construction. "The provision of elaborations in the form of posing comprehension questions that require explanations, the provision of answers with arguments or justifications, the presentation of new ideas accompanied by explanations, and the acceptance or rejection of the ideas of others accompanied by arguments for doing this" (Van der Meijden, 2005, p. 13).

Immersion. "[the feeling of] being involved in a virtual environment and becoming removed from real-world stimuli" (Jerome & Witmer, 2004, p.2613).

> Immersion is the process of becoming involved with a task in a virtual collaborative environment and becoming removed from real-world stimuli. This process involves attention, emotional engagement, transportation and/or physical world detachment.

Performance. In the current study, it is operationalized as cognitive engagement.

Physical world. It refers to "the natural world of plants and animals, and geographic and climatic features, and the built world of urban, suburban, exurban, and rural layouts; cities and village greens; dwellings and other structures in which human activities take place" (Germain & Bloom, 1999, p.32).

Social presence. The psychological awareness of being connected and interacting with a real person within a virtual environment.

> Social presence, in a virtual environment, is the experienced sensation of dealing with a real human being through the creation of visual representations and voices re-constructed in the user's mind. This sensation can range from the simple awareness of dealing with another human being to the semblance of actual face-to-face communication.

Sociability. The extent to which a virtual collaborative environment is perceived as being suitable for social interactions and social connectivity, among group members, through synchronous and asynchronous communication (Gao et al., 2010; Gao and Rau, 2011; Kreijns, et al. 2004; Preece, 2001).

Virtual collaboration. Members of virtual communities "work together to understand and formulate an information need through the help of shared representations; seeking the needed information through a cyclical process of searching, retrieving and sharing; and putting the found information to use" (Karunakaran, Reddy, & Spence, 2013, p.2.).

Virtual collaborative groups. “Teams in which members coordinate and execute their work predominantly by using computer-mediated communication such as [texting], e-mailing, and video calling tools” (Glikson & Erez, 2013, p.4).

Virtual world. A completely “spatialized visualization of all information in global information processing systems, along pathways provided by present and future communication networks, enabling interaction of multiple users, allowing input and output, remote data collection and control through telepresence, and intercommunication with a full range of intelligent products and environments in real space” (Novak, as cited in Hillis, 1999, p. xiv).

Virtual spaces. Any virtual (online) platform developed for a specific purpose whether it be socializing, collaborating or simply sharing information, pictures, etc.

Appendices

Appendix A

The Coding Scheme for Content Analysis (Van der Meijden, 2005)

Code	Definition * Indicates high-level cognitive engagement
Cognitive: Asking Questions	
CHVI	Asking questions that do not require an explanation (facts or simple questions).
*CHV2	Asking questions that require an explanation (comprehension or elaboration).
CHVER	Verification or asking for agreement.
Cognitive Giving Answers	
CHG 1	Answering without elaboration.
*CHG2	Answering with elaboration (using arguments or by asking a counter-question).
*CHG2 EXPL	Providing an example to back up CHG2 answers/ideas.
Cognitive: Giving information	
CI 1	Giving information (an idea or thought) without elaboration.
*CI 2	Giving information (an idea or thought) with elaboration.
CIT	Referring to earlier remark/information.
CIE	Evaluating the content (summarizing/concluding).
ACCEPT	Accepting contribution of another participant without elaboration.
*ACCEPT+	Accepting contribution of another participant with elaboration.
REJECT-	Not accepting contribution of another participant without elaboration.
*REJECT+	Not accepting contribution of another participant with elaboration.
Affective	
A	Positive, neutral or negative emotional reaction to another participant or with regard to the task (Thanking, apologizing, praising, etc.)
GREE	Greetings (e.g. Hi, hello, Good morning, etc.)
Metacognitive	
RV	Planning, monitoring or evaluating the task or group process.
INST	One participant instructs another or other participants.
REST	Non-task related remarks, unfinished sentences or interactions that do not fall into any category.

Appendix B

The Rubric Table for Wrap-up Report of the Discussion

Directions: Evaluate students' wrap-up group report of the online discussion based on the following criteria.

Criteria	Exemplary 4 Yes	Accomplished 3 Yes, but	Developing 2 No, but	Beginning 1 No
Organization	☐Very good organization; points are logically ordered; sharp sense of beginning and end.	☐Organized; points are somewhat jumpy; sense of beginning and ending.	☐Some organization; points jump around; beginning and ending are unclear.	☐Poorly organized; no logical progression; beginning and ending are vague
Quality of content	☐Supporting details specific to subject. Enough detail is presented to allow the reader to understand the content and make judgments about it.	☐Some details are non-supporting to the subject. Enough detail is presented to allow the reader to understand the content and make judgments about it	☐Details are somewhat sketchy. Do not support topic.	☐Unable to find specific details.
Grammar, and Spelling	☐No errors	☐Only one or two errors.	☐More than three errors.	☐Numerous errors distract from understanding.
Level of interest	☐Vocabulary is varied; supporting details vivid.	☐Vocabulary is varied; supporting details useful.	☐Vocabulary is unimaginative; details lack "color".	☐Basic vocabulary; needs descriptive words.
Timeliness	☐Report on time	☐Report one class period late	☐Report two class periods late	☐Report more than one week late

Check just one box per row.

Directions: Write your comments about the wrap-up report.

(E.g. Do you think that the report show a clear understanding of the topic, critical thinking and uniqueness of contribution? Are you satisfied with this group's report? Yes/ No? Why? …etc.)

Appendix C

Observation Form

Group number: _____

a). Directions: Check only the boxes that match with your observations.

	Check
1. Members attend respectfully to peers comprehension or puzzlement.	☐
2. Members ask questions that challenge them to think more deeply.	☐
3. The requirements for course interaction are clearly stated.	☐
4. Members encourage their peers to respond throughout the discussions.	☐
5. Discussion postings show respect and sensitivity to peers' gender, cultural and linguistic background, political and religious beliefs, etc.	☐
6. Members use positive reinforcement to encourage student participation and intellectual risk-taking.	☐
7. Members address potentially disruptive behaviors before they impact the discussion.	☐
8. Is the instructor is present, proactive, and engaged.	☐
9. Discussion postings reflect students' understanding of the required readings and underlying concepts including correct use of terminology.	☐
10. Discussion postings show a sense of community building through continuous communication and collaboration.	☐

c) Directions: Write any comments and suggestions based on your observations:

Appendix D

Letter of Approval from The Research and Publication Committee (RPC)

UNIVERSITY OF THE PHILIPPINES
OPEN UNIVERSITY

OFFICE OF THE CHANCELLOR

31 May 2017

MR. GIBRAN ALEJANDRO GARCIA MENDOZA
Graduate School of Art and Sciences
International Christian University

Dear Mr. Mendoza,

We are approving your request to conduct research on **Spatial Dimensions and Cognitive Engagement: Explorations in a Virtual Collaborative Environment** with the following conditions:

1. Obtain the express and written consent of the participants for participating in the survey and disclosing their personal information;

2. In obtaining the consent of the participants, fully disclose in the consent portion of your questionnaire what your study is about, how it will be used, published and disseminated, and more importantly, disclose to whom and to what entities the personal information of the participants will be shared. (These preliminary information are important to allow the participants to make an informed decision as to whether or not they will participate in the survey and whether or not they will give their consent to the disclosure of their personal information. The participants should be made aware that they are disclosing information directly to you and not to UPOU.); and

3. Conduct the survey yourself with the assistance of UPOU. However, the assistance of UPOU should be limited to forwarding your request to the UPOU constituents and allowing them to participate voluntarily, if they so agree.

   Specifically, UPOU through the Research and Publications Committee (RPC) will email to your target respondents the consent form, which you will prepare and email to OVCAA (ovcaa@upou.edu.ph). In preparing the consent form, make sure to incorporate the conditions specified in item no. 2 and include this statement: "If you are willing to participate in this study, please proceed by going to this link (URL for the online questionnaire).

Thank you and we look forward to your presentation of initial results/findings to UPOU in one of our Research Conversation schedules.

Truly yours,

MELINDA dP. BANDALARIA
Chancellor

Los Banos, Laguna 4031 Philippines
Tel Nos. +63(49) 536-6001 to 06 local 800 Telefax +63(49) 536-6015 Email: oc@upou.edu.ph

Appendix E

Results of the Research Ethics Committee at ICU

Notification of Investigation Results

Date: 2/17/2017

To (Applicant): Professor JUNG, Insung
From: President, International Christian University

Document No.: 2016-26
Name of Research Project: Spatial Dimensions and Cognitive Engagement: Explorations in a virtual Collaborative Environment

Individual Responsible for Research: Gibran Alejandro Garcia Mendoza (ID No.169004)

I herewith notify you of the following results of the Research Ethics Committee's investigation of the above named research project.

1. Decision:
   - ■ Approved
   - ☐ Conditional approval
   - ☐ Changes recommended
   - ☐ Rejected
   - ☐ Not applicable

2. Reason:
N/A

3. Remarks:
"Changes recommended" with the following remarks:
1) Research Ethics Investigation Request Form
   - Item: Writing a wrap-up report (p.2)
     "to be graded." should be changed to "to be compared and evaluated."
   - Item: Requesting participants to write a self-report (p.3)
     "to be graded." should be changed to "to be evaluated."

※ If changes are recommended, investigation request must be resubmitted.

Signature:

Appendix F

Questionnaire for In-depth Interviews

Warm-up: Introducing myself/ making small talk.

Social presence

a) What do you usually have in mind when you read your teammates' comments/postings? Can you hear their voices or visualized their faces? If so, share a particular example.
b) Do you feel as if you were dealing with a real person while having online discussions? If not, why? If yes, when was that feeling stronger? When you held text-based or video-based conversations?

Sociability

Social climate

a) How comfortable did you feel sharing personal information and expressing your opinions with your teammates? Did you feel uncomfortable at any point during the activity? When? Why? Please share that experience with us.
b) How did the online social environment affect you mentally, emotionally and socially?

Benefits & Reciprocity

a) What is one thing that is most beneficial for you or the take away from the discussion? Share a more specific example. Did you feel that they recognized your effort?
b) Would you agree if I say that "the online environment, including the platform and teammates relationships, was just right to perform well?" Why?
c) Was the platform helpful to work effectively with all your teammates? Why? If not, what would you like to change?

People

a) Would you agree if I said that all members of your team had similar characteristics such as interests, knowledge, and experience? If not, could you describe them?
b) Would you say that the number of members was enough to have a productive online discussion? If not, what would be a good number for you?
c) Were you able to expand your social network after this activity? If not, why?

Interaction Richness

a) How often did you have spontaneous conversations with other classmates on this platform? Were they exclusively related to the class content? If not, what did you talk about?
b) How often did you use emoticons, emoji, gif, pictures or videos to express your feelings or ideas? Was the platform useful to communicate/stay in touch with all your teammates?

Self-representation

a) Do you have a positive or negative personal impression of your teammates? If negative, what kind of people do you think they are? Were you able to transmit a good impression of yourself to your teammates? If no, why?
b) Were you able to build an "online persona"? If no, why? If yes, how is it different from the off-line version of yourself?

Immersion

Attention

a) How do you feel about the online environment? (*What about Piazza?*)
b) Did you feel engaged with the topic of discussion? Could you give us an example?
c) At what point did you feel more engaged? Can you relate your experience to a story?

Emotional engagement

a) Tell us your feelings when you are in an online discussion.
b) Was the online discussion challenging enough for you? Can you give an example of that?
c) Did you feel motivated or demotivated while interacting with your teammates? Can you share an experience?

Multisensory environment

a) When you are in an online environment, do you feel the same experience as when you are in a physical environment? Could you share an example or a related an experience?

Physical world detachment

a) Would you agree if I said, when you were discussing online you had a feeling of being transported to another place? If yes, tell me about that feeling. If not, where did you feel you were? (…a room?)
b) After finishing the online discussions, did you have any feeling of regret for spending so much time on the online session instead of socializing/doing something offline?

This is the end of the interview, Thank you!

Appendix G

Online Survey Concerning Virtual Collaboration

WELCOME!

Dear students,

You are cordially invited to participate in an online survey regarding your recent experience with online discussions. This survey is part of a research study on students' perceptions of *immersion, sociability* and *cognitive engagement* in online learning environments. The study aims to explore students' perception of immersion and sociability in online environments and examine the impact of these two factors on their engagement and cognitive performance. Based on its results, the study attempts to contribute with knowledge to identify relevant conditions to support online students.

This survey has 5 sections and should take about 10 minutes.

Section 1, Demographics
Section 2, The online Platform
Section 3, Presence
Section 4, Immersion
Section 5, Sociability

Your participation in this online survey is voluntary. Your decision whether or not to participate will not affect your present or future relationship with your instructor or educational institution. The survey will keep your anonymity from other besides the researchers. **There are no foreseeable risks to you as a participant in this research.** All the personal data obtained from the survey will be kept confidential. No one other than the researchers and authorized collaborators will have access to the answers of this survey. Digital data will be kept securely in a password protected USB for five years after being collected. A summary of the main findings will be shared upon request.

If you agree to participate, please answer the questions as honestly as possible.

If you have any questions about this project, feel free to contact us at g169004t@icu.ac.jp

Thank you for your contribution.

Sincerely,
Gibran A. Garcia Mendoza, Ph.D. Candidate.
Education and Psychology Program
International Christian University (ICU)
10-2, Osawa 3-chome, Mitaka-shi, Tokyo, Japan

Agreement

Please click/tap the **"YES"** button below if you are 18 years or older, have read and understood the explanation above and agree to voluntarily participate in this survey. If not, please click/tap "NO" and exit this page.

□ YES

□ NO

---

1. Demographics

Age *

Please choose only one of the following:

□ 18 -20 years old

□ 21- 30

□ 31- 40

□ 41- 50

□ 51- 60

□ Above 60

Gender *

Please choose only one of the following:

□ Female

□ Male

□ Other

Occupation *

Please choose only one of the following:

□ Fulltime online student.

□ Part-time working & online student.

□ Full-time working & online student

□ Other:

Please write your answer here:

_____

2. The online platform

- **Think of THE MOST RECENT ONLINE DISCUSSION you had and choose the answer that best describes your experience.**

Tick the MAIN ONLINE PLATFORM that you used with your groupmates for the online discussions.

* Please choose only one of the following:

□ Skype

□ Google hangouts

□ Piazza

□ Basecamp

□ Whatsapp

□ Viber

□ Facebook

□ Messenger (Facebook)

□ Moodle

□ Other

If you are on another platform, please state it here: *

Please write your answer here: _____

- **Tick the MOST FREQUENTLY DEVICE you used to access the online platform.**

* Please choose only one of the following:

□ Smartphone

□ Tablet (e.g. iPad)

□ Laptop PC

□ Desktop PC

□ Other

If you are on another device, please state it here: *

_____

3. Social presence

- **Tell us about your experience with the groupmates you communicated with during the discussion.**

1. BEFORE the online discussion, I have met most of my groupmates FACE-TO-FACE.
   Yes No
2. BEFORE the online discussion, I have met most of my groupmates through merely CALLS or VIDEO-BASED CONVERSATIONS.
   Yes No
3. BEFORE the online discussion, I have met most of my groupmates through merely TEXT-BASED CONVERSATIONS.
   Yes No

- **Now, tell us how you felt about interacting with them on the platform you have just selected above.**

1. When I had TEXT-BASED discussions on this online platform, I had my groupmates in my mind's eye.
   Not at all 1 2 3 4 Totally

2. When I had TEXT-BASED discussions on this online platform, I also felt that I was dealing with very REAL people and NOT with computer- generated people.
   Not at all 2 3 4 Totally
3. I felt that TEXT-BASED discussions on this online platform can hardly be distinguished from face-to-face conversations.
   Not at all 2 3 4 Totally

- **If you had VIDEO-BASED discussions ON THE SAME PLATFORM, tell us about your experience. If NOT, go to the next section.**

1. When I had VIDEO-BASED conversations on this online platform, I had my groupmates in my mind's eye.
   Not at all 2 3 4 Totally
2. When I had VIDEO-BASED conversations on this online platform, I feel that I was dealing with very real people and not with abstract people.
   Not at all 2 3 4 Totally
3. I felt that VIDEO-BASED conversations on this online platform can hardly be distinguished from face-to-face conversations.

Not at all 2 3 4 Totally

4. Immersion

- **Tell us about your experience with the online discussion.**

1. To what extent did the online discussion hold your attention?
   Not at all 2 3 4 Totally
2. To what extent did you feel focused on the online discussion?
   Not at all 2 3 4 Totally
3. To what extent did you feel emotionally drained by the online discussion?
   Not at all 2 3 4 Totally
4. To what extent did you find the online discussion challenging?
   Not at all 2 3 4 Totally
5. To what extent did you find the online discussion easy?
   Not at all 2 3 4 Totally
6. To what extent did you feel like you were making progress towards the end of the online discussion?
   Not at all 2 3 4 Totally
7. To what extent did you feel motivated while discussing?
   Not at all 2 3 4 Totally
8. To what extent were you interested in seeing how the discussion would progress?
   Not at all 2 3 4 Totally
9. To what extent did you feel that the online discussion was something you were experiencing, rather than something you were just doing?
   Not at all 2 3 4 Totally
10. To what extent did you feel that you were interacting with the online environment during the discussion?
    Not at all 2 3 4 Totally
11. To what extent did you lose track of time while having discussions?
    Not at all 2 3 4 Totally
12. To what extent was your sense of being in the online environment stronger than your sense of being in the real world?
    Not at all 2 3 4 Totally
13. To what extent did you feel as though you were separated from your real-world environment?
    Not at all 2 3 4 Totally
14. To what extent did you notice events taking place around you while having discussions?
    Not at all 2 3 4 Totally

15. To what extent were you aware of yourself and your surroundings while having discussions?

    Not at all 2 3 4 Totally

16. To what extent did you forget about your life concerns while having discussions?

    Not at all 2 3 4 Totally

17. To what extent did you feel consciously aware of being in the real world whilst discussing?

    Not at all 2 3 4 Totally

18. How well do you think you performed in the online discussion?

    Not at all 2 3 4 Totally

19. How much effort did you put into the online discussion?

    Not at all 2 3 4 Totally

20. Did you feel that you tried your best during the online discussion?

    Not at all 2 3 4 Totally

21. Were you axious about whether or not you would win or lose the discussion?

    Not at all 2 3 4 Totally

22. How much did you want “to win” the online discussion?

    Not at all 2 3 4 Totally

23. Were there any times during the online discussion in which you just wanted to give up?

    Not at all 2 3 4 Totally

24. At any point did you find yourself become so involved that you were unaware you were even using the keyboard?

    Not at all 2 3 4 Totally

25. At any point did you find yourself become so involved that you wanted to speak to your groupmates face-to-face?

    Not at all 2 3 4 Totally

26. How much would you say you enjoyed the online discussion?

    Not at all 2 3 4 Totally

27. Were you disappointed when the online discussion was over?

    Not at all 2 3 4 Totally

28. Would you like to join the online discussion again?

    Not at all 2 3 4 Totally

5. Sociability

- **Tell us about your experience with the online social environment.**

1. This online learning environment enables me to easily contact my groupmates.

Not at all 2 3 4 Totally

2. I do not feel lonely in this online learning environment.

Not at all 2 3 4 Totally

3. This online learning environment enables me to get a good impression of my groupmates.

Not at all 2 3 4 Totally

4. This online learning environment allows spontaneous informal conversations.

Not at all 2 3 4 Totally

5. This online learning environment enables us to develop into a well performing team.

Not at all 2 3 4 Totally

6. This online learning environment enables me to develop good work relationships with my groupmates.

Not at all 2 3 4 Totally

7. This online learning environment enables me to identify myself with the team.

Not at all 2 3 4 Totally

8. I feel comfortable with this online learning environment.

Not at all 2 3 4 Totally

9. This online learning environment allows for non task-related conversations.

Not at all 2 3 4 Totally

10. This online learning environment enables me to make close friendships with my groupmates.

Not at all 2 3 4 Totally

This is the end of the Survey

THANK YOU