

A). Title Page

A study to investigate the relationship among flow, social interaction and ICT skills with
older adults during gameplay

By

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(B). Acknowledgment

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(C). Dedication

I dedicate my MA thesis to GOD Almighty who led me through the program. I am grateful that my soul is preserved and alive in Him alone.

D). Abstract

Although research shows the link between flow and social interaction, this study explores the role of ICT skills in order to experience flow and social interaction. I used constructivism theory as it explains how humans make meaning from personal experiences, social interaction and tools (e.g., language and computer). The theory of flow was applied because it stipulates that people experience flow when they are fully engaged in any activity (Nakamura & Csikszentmihalyi 2002). Four participants were recruited for this study. A pilot study with three stages was conducted to design a research protocol used in the main study. A pre and post-test was answered to determine the significance of ICT skills in relation to the experience of flow and social interaction during gameplay experience. I described the experiences of each participant using a case study approach and all the participants reported flow and social interaction in relation to their level ICT skills. I found that the participant with low ICT score required more social interaction to experience flow and participants with high ICT score required social interaction to maintain flow.

Keywords: online protocol, social interaction, social games, WOW, Quality of Life (QOL), Flow, MMORPG.

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(G). List of Acronyms and Abbreviations

MMORPGS: Massively Multiplayer Online Role-Playing Games

WOW: World of Warcraft

ICT: Information and Communication Technology

QOL: Quality of Life

(H). A Substantial Introduction of the Research

Two introductions are included in this article-based thesis. The first one presents the big picture of the research in detail and the second introduction which is on page 11 is the introduction of the article.

This study explored the links between and among social interaction, flow, and information and communications technology (ICT) skills with older adults during gameplay experience. This was a joint project with Simon Fraser University, l'Université du Québec à Montréal (UQAM), and TÉLUQ (a distance learning school at the Université du Québec). During the summer of 2013, over 200 older adults were asked to answer questions relating to their computer use during leisure time. Results showed that older adults in the Gatineau-Ottawa region do not spend much time playing computer games. I was interested in older adults as opposed to youths because most older adults did not grow up with technology such as computers or digital games therefore it would be noteworthy to train older adults how to play digital games and teach them new ICT skills. Older adults with no ICT skills would have required more social interaction than the youths with more knowledge of ICT. Since there is a need for a guide to train older adults to play digital games, I decided to explore the links between and among ICT, flow, and social interaction among older adults. Most of the studies on human-computer interaction among older adults to date have involved massively multiplayer online role-playing games (MMORPGs), especially World of Warcraft (WOW) (Bardzell, Bardzell, & Nardi 2011; Schiano, Nardi, & Ducheneaut, 2011). This is because WOW is considered one of the most popular MMORPGs that have shown relationships between flow and social interaction (Whitlock, McLaughlin & Allaire, 2012; Dickey, 2011). Therefore, WOW was chosen as an instrument for this study. To study the links among ICT, flow and social interaction, the theory

of flow explains the involvement in any activity with clear goals, positive feedback, and a good balance between skills and challenges (Csikszentmihalyi, 1988; O'Brien & Toms, 2008).

Research has shown that flow is possible when people are engaged in meaningful activities.

To explore the relationship between and among ICT skills, flow, and social interaction, I first conducted a pilot study with three stages. At the conclusion of the pilot study, four participants were recruited following a seven week announcement. All the participants completed an ICT scale questionnaire before the start of the study to determine their level of ICT skill. A pretest which included a mental rotation and cognitive test were administered. The results of the mental rotation and cognitive tests were not analyzed for this study because the focus on this study was to determine the relationship among flow, social interaction and ICT skills. To determine the degree of flow and social interaction, I used the EGameFlow Scale. A semi-structured interview guide was designed to explore participants' experiences during the weeks of gameplay via Mumble—a conversation recorder. Mumble was used to record the interviews. Constructivism was adopted as the interpretive framework because it focuses on individual learning and how individuals adapt to new experiences. A case study approach was used to study each participant's experience during the research. I found that social interaction was possible through an online media with older adults which was a new finding to the existing knowledge of social interaction. I also found that minimum ICT skills are necessary for older adults to experience flow and social interaction during gameplay experience. Finally, I found that the participant with low ICT are needed more social interaction to experience flow and participants with high ICT scores needed less social interaction to maintain flow.

(I). The Article

1. Introduction of the thesis

In Canada, it is estimated that by 2061 the number of people aged 65 and above will be more than double from the 2009 estimation (i.e., from 4.7 million to 15.0 million in a projected population of 52.6 million) (Statistics Canada, 2009). The challenges to meet the needs of this aging population include the creation of new approaches for dealing with the problems associated with ageing such as loneliness, lack of social support, and other neurodegenerative disorders such as Alzheimer's disease (Brickman & Stern, 2009). Information and communication technologies (ICTs) can provide older adults with innovative and novel hobbies such as playing social games with other older adults through face-to-face and online social interaction.

In studies exploring flow and social interaction among older adults, face-to-face observation was the norm (Bardzell, Bardzell, & Nardi 2011; Schiano, Nardi, & Ducheneaut, 2011). When I speak about social interaction in this study, I mean online social interaction. I measured their level of social interaction and flow in relation to the result of ICT skills. I found that participants who are familiar with ICT will experience more flow and social interaction than those with less ICT skills. In the next section, I review the literature related to health and quality of life. Then, I explore other studies on flow and social interaction. The next section introduces the methodology, followed by the results and a discussion of the research. Finally, I present the conclusions.

1.1. Health and Quality of Life

The definition of health adopted by the World Health Organization (WHO) in 1948 has remained unchanged. They defined health as the “state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1948, p. 100). The aging population is a universal phenomenon and about 10% of the total population of the world is aged above 60 years; a figure that is expected to increase to 20% in the year 2050 (Astell, 2013). This statistic does not exclude the developing and less developed countries; an increase in the population of older adults is reported everywhere in the world (Sixsmith, 2013). The challenge to improve the quality of life of older adults can be seen as a worldwide problem because longer lifespan is supplemented with continuous breakthrough for health services (WHO, 2002).

According to Li and Liu (2009), quality of life can be defined as individuals’ perceived satisfaction of their overall life. Stewart and King (1994) suggested quality of life should include areas such as: perceived health and pleasure, energy, sleep, social life, psychological welfare, and self-maintenance.

1.2. Types of Digital Games

Hoppes, Hally, and Sewell (2000) stated that before the development of computer and digital games, card games were played by older adults as part of their recreational activities. However, the trend is changing and more people are now embracing digital games in addition to card games (O’Brien & Tom, 2008). Djaouti, Alvarez, Jessel, and Rampnoux (2011) said digital games whose purpose goes beyond entertainment are considered serious games. The term ‘serious game’ gained popularity in 2002 but it has been used since the early 70s where it was defined as a “mental contest, played with a computer according to certain rules for amusement, recreation, or winning a stake” (Zyda, 2005, p. 25).

According to Frasca (2001), digital games are defined as “any form of computer-based entertainment software, either textual or image-based, using any electronic platform such as personal computers or consoles and involving one or multiple players in a physical or networked environment” (p. 4). Typically, digital games revolve around conflict, rules of play and involve several players (Sauvé, 2010).

One type of digital game played by older adults are social games (Mahmud, Mubin, Shahid, & Martens, 2009). Social games are games that are played and distributed along social networks such as Facebook, MySpace, and Twitter (Ben, Paavilainen, Björk, Rao, & Deterding, 2011). It is difficult to measure how many individuals play these games but research has shown that Farmville 2 (<http://zynga.com/game/farmville-two>), a popular social game on Facebook, attracts 8 million players every day (Bort, 2013).

According to Allaire et al., (2013), older adults play social games with others to socialize online, as well as to reduce boredom and social isolation. Most of the interaction between computers and humans are seen in online social games and social games are becoming popular even among older adults (Allaire et al., 2013). In recent years, playing social games has appeared to be sensational and entertaining to many gamers (Kriman, Paavilainen, Björk, Rao, & Deterding, 2011).

2.0. Literature Review

2.1. MMORPGs and WOW

Millions of individuals are playing Massively Multiplayer Online Role-Playing Games (MMORPGs). An example of a MMORPG is World of Warcraft (WOW). WOW is an online social game played by multiple players around the globe involving a digital world of activity (Bardzell, Bardzell, & Nardi 2011). WOW is considered to be an online social game because it has been used to stimulate socialization (Schiano, Nardi, & Ducheneaut, 2011). Schiano et al.,

(2011) belied the notion that WOW is a game for lonely people but supported research findings that WOW is a social game played by people who may be single, married, young, or old (Dickey, 2011; Schiano et al.). Chen and Duh (2007) found that social interaction with WOW among gamers can be achieved through collective gameplay. One of the reasons people experience social interaction in WOW is due to the fact that they are able to form social contact with other gamers.

2.2. The Theory and Definition of Flow

The theory of flow stipulates that people experience flow when they are fully engaged in what they are currently doing (Nakamura & Csikszentmihalyi, 2002). Flow theory originated from the desire to understand the experience of intrinsic motivation without the external reward (Nakamura & Csikszentmihalyi, 2002). Flow was originally defined as the state of total absorption in any activity comprising of noticeable challenges, well-defined goals, and direct feedback on progress made during the activity (Csikszentmihalyi, 1988). Flow is considered the deepest level of game involvement (Brockmyer et al., 2009). According to Csikszentmihalyi (1975), any time people are engaged in any thoughtful and reflective activities, a mental process will be activated where evaluation and skills are required. When people experience flow, time seems to pass quickly; they are more aware of their action and have a sense of control (Csikszentmihalyi, 1975, 1990).

2.3. Flow and Social Interaction through WOW

To explore the experience of flow in digital games, Takatalo, Hakkinen, Kaisteinen, and Nyman (2011) asked participants to play Halo (Combat Evolved), a multiplayer digital game played on a desktop computer. The participants were divided into two groups, those playing at home and those playing in a computer laboratory. The authors found that those who played at home were more involved in the gameplay than those who played in the laboratory.

To investigate the link between flow and social interaction, Snodgrass, Lacy, Dengah, and Fagan (2011) conducted a study involving 255 participants. Gamers reported flow as a result of the gaming experience and were willing to relate their experiences to others. The authors concluded that the participants were willing to tell others about the study because of the social interaction they had during the study. Therefore, I can conclude that the experience of flow during the study initiated social interaction within and outside the research.

In other research that studied the link between social interaction and flow, Cantamesse, Galimberti, and Giacomini (2011) randomly divided a sample of young people into three groups. One group was allowed to play WOW at home for two hours per week and attend classes. The second group played WOW in a laboratory for three-and-a-half hours per week and attended classes. The third group attended classes but did not play WOW and served as the control group. Cantamesse et al., (2011) found that those who were allowed to play WOW whether at home or in the laboratory reported better social interaction than the control group. The authors concluded that the game experience resulted in greater social interaction with gaming group members and physical contacts.

In a study of 252 online participants, Snodgrass et al. (2013) found that gamers shared their experiences such as feelings of heroism, defeating their enemies, and saving friends on WOW with other members of their family. Gamers who play MMORPGs, such as WOW, live in a virtual world shared by millions of other players with whom they can form social groups, establishing a momentary to permanent bond of interaction (Longman, O'Connor, & Obst, 2009). The EGameFlow scale has been used by researchers to explore the experience of flow and social interaction during gameplay sessions (Juric, Matetic & Brkic, 2014; Zielhorst et al., 2015). Therefore, the social interaction formed during the experimentation was suggested to be a result

of the flow they experienced during gameplay experience. Furthermore, research showed that researchers' approach to their participants can influence the way they express their feelings during any given study (Brett, O'Neill, & O'Gorman, 2014; Eide & Kahn, 2008).

There is no extant research linking ICT skills, flow, and social interaction. However, O'Brien and Toms (2008) investigated the role of challenge in flow. They found that for flow to occur for older adults during gameplay, there must be a balance between gameplay and challenge. From the study, flow was linked to the knowledge of ICT in terms of the challenge faced but not vice-versa.

2.4. Benefits of Playing Games

According to White et al. (1999), the use of ICT can prevent social isolation in older adults and encourage social interaction online. In support of this claim, Vaida and Greenberg (2009) found that older adults who played digital games with young gamers reported gaming to be a social bridge that connects diverse generations. Older adults who played digital games reported higher levels of well-being and social interaction, increased learning skills, and had less health problems compared to older adults who did not play digital games (Allaire et al., 2013).

Groves and Slack (1994) found that the use of computers among older adults living in nursing home residences resulted in increased autonomy and higher engagement in social activities. When exposed to computers, they found that older adults who had never operated a computer before were thrilled at the ease of operation and their fears of computers diminished. Research has shown that older adults will commit to playing digital games when they know the health benefits that come with playing, suggesting that older adults are open to the use of digital games (O'Brien & Toms, 2008).

There is evidence to suggest that human interaction found in social games may promote socialization among older adults. Cornejo, Hernandez, Favela, Tentori, and Ochoa (2012)

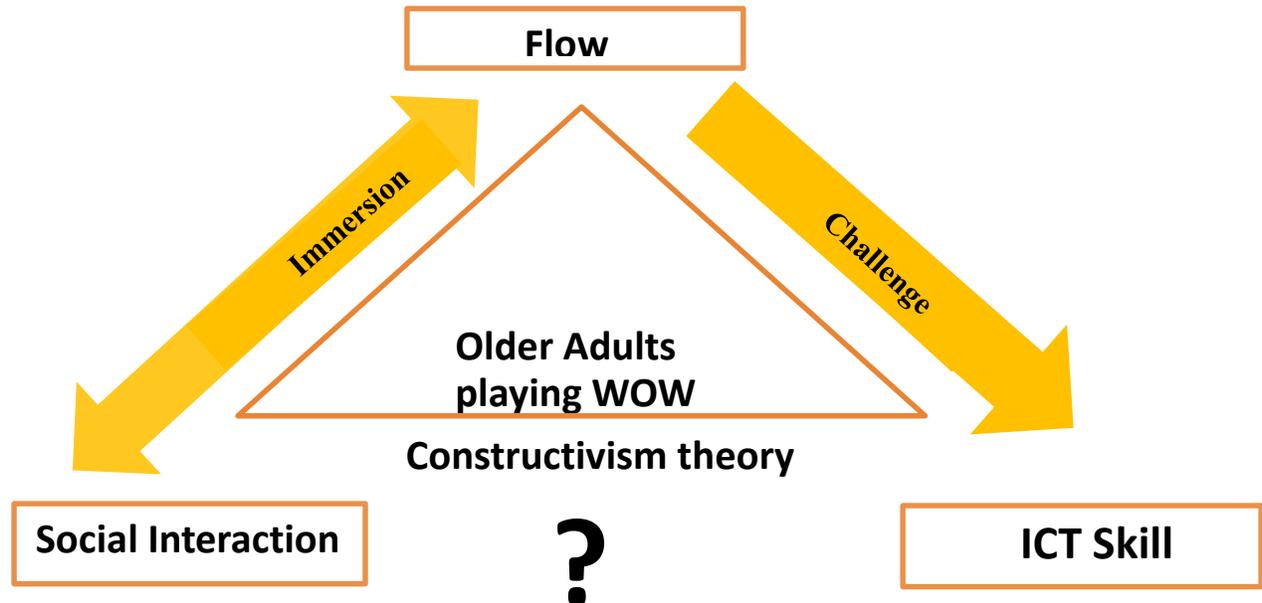
suggested that older adults who played social games for three weeks were enthusiastic about the role of social games in reducing loneliness and increasing social interaction. Mahmud et al., (2009) reported that all participants who were socially isolated before the start of their study reported higher levels of engagement and social interaction during and after the research with their family members. In this study, social interaction was observed between group members and opponents as players motivated each other, as well as their opponents, suggesting that older adults who play social games are not only interested in their own team's effort, goals, and achievement but also in motivating their opponents (Mahmud et al., 2009).

2.5. Statement of the Problem

The studies explained above show that flow is linked with social interaction but these studies did not take into account the link that might exist among flow, social interaction and ICT skills especially with older adults. The literature review showed the link between flow and social interaction among gamers but without exploring the effect of ICT skills in relation to these two factors. This study explored the use of WOW because it has the potential for social interaction among players (Whitlock, McLaughlin & Allaire, 2012).

Therefore, I decided to explore the relationship among ICT, flow and social interaction among gamers especially older adults. As a result of these observations in the literature the research question is: what are the links among ICT skills, flow and social interaction with older adults during gameplay?

2.6. Conceptual Framework



The framework is a viable representation of the research question. Although there is a link between flow and ICT in form of challenge faced during installation and during game sessions, there is no existing study to show the link among ICT, flow and social interaction. This study explored this link.

3. Methodology

3.1. Theoretical Approach

Because I focused on how people construct their knowledge, I chose constructivism as a framework. Constructivists who focus on individual learning, such as Piaget, describe how individuals subjectively construct their knowledge based on their past experiences, regularly updating and adapting their knowledge to cope with new experiences (Proulx, 2006). Social constructivists, such as Vygotsky (1986), added that social interactions, practices, and tools play a special and indispensable role in the development of human mental processes. Vygotsky (1978) wrote that human knowing originates in social practices or relationships and only subsequently becomes the basis for individual thinking, through a process of “internalization” (Davidov &

Kerr, 1995). For example, as children learn language by engaging in signs and sounds with other people, those signs and sounds give shape and structure to their thinking. Conceptual tools like mathematics and language are not the only cultural artifacts that mediate our knowledge; physical tools people regularly use, like screwdrivers or computers, do as well. For instance, calendars help us to think about and carry out long-term plans in a more organized manner.

Those researching human learning, then, need to pay close attention both to how individuals construct meaning based on individual experiences and to how these experiences are constructed through participation in social interactions, practices, and tool use. In the present study, I was interested in the relationships among social interaction, digital game use, and flow. Literature shows that people are more likely to experience flow when they are actively engaged in constructing knowledge, whether this occurs in social interaction or during computer use (Ghani, Supnick, & Rooney, 1991; Ghani & Deshpande, 1994; Hoffman & Novak, 1996; Huang, Backman, & Backman, 2010; Shin, 2006; Skadberg & Kimmel, 2004).

3.2. Participants

Four individuals participated in this study (2 male and 2 female). I used a case study method to describe their engagements in section 4. All participants were given \$100 at the end of the study as an incentive to start and finish the research.

3.3. Case Study

To gather more in-depth information and to explore the deeper experiences of each of the participants, a case study design was used. Case study design can be defined as the research method which can be used to study a given problem in great detail (Easton, 2010). Case study design has been used in studies with older adults involving digital games (Gerling, Schild, & Masuch, 2010; Riedel, Feng, & Azadegan, 2013) and has allowed in-depth exploration to answer specific questions as to why some participants experience a phenomenon and why some do not.

3.4. Pilot Study

I conducted a pilot study to design an online protocol to explore the relationships among flow, social interaction, and ICT skills. The pilot study helped determine sampling techniques and to identify ways to improve the delivery of the pre- and post-tests from multiple documents to one Google document with an accessible link.

The pilot study had three stages. According to Teijlingen and Hundley (2011), pilot studies are mini versions of a study and they are central to having an effective study strategy. The first stage of the pilot was conducted online with an older adult aged over 60 years old. The participant and I spent about an hour together and I taught her how to create and move her WOW character on her computer. During this stage of the pilot, it became clear that I needed to convert the questionnaires from Microsoft Word documents to Google documents. Changing the format to links which they can easily access made it easier for me to track those who replied and it made it easier for them to fill the form online. In relation to older adults, I realized the possibility of them playing the game later in the evening. I thought they would be playing during the day but I realized that some of the participants may still be working either part-time, full-time, or as volunteers.

The second stage of the pilot included three participants and was conducted onsite. Two graduate students and a professor from the Faculty of Education, University of Ottawa, agreed to participate in this 90 minute pilot. I had three participants to visualize what it would be like to have multiple players playing the game at the same time. One participant left during the pilot as she felt she did not fully understand the whole process. I found out that it was necessary for the researcher to reassure the other participants to be calm in the case of a dropout during the experiment as dropout can happen at any time. My role during this stage of the pilot study was to make sure that all participants play simultaneously. I had to wait for them to call on me for help

as it was necessary to let them learn by themselves as opposed to teaching them what to do. In simple terms, I became more of a coach and a guide to them than a teacher.

For the final stage of the pilot, I recruited two participants and they played the game online at different times. The reason I included the result of this round of pilot study together was because the two participants reported similar reactions at the end of their individual participation. I spent two hours with the first participant. The second participant spent 10 hours every week for five weeks. For both participants, they tried the tests and questionnaires. It was easier to train these two participants based on the experiences from previous stages. The second participant played more hours than the first because she was recruited to help in data collection.

The last two participated reported flow and social interaction as time passed quickly. Although they had fun during gameplay, they were tired after 90 minutes of gameplay as opposed to two hours which was planned before the start of the research. I concluded that older adults might want to play less than two hours. There were no problems encountered during this round of the pilot study. My role as the researcher during this stage was to see if any of the participants experienced flow and a sense of social interaction during the experimentation. These two participants experienced flow and online social interaction by their loss of awareness of time and the fun they shared after the experiment. The pilot study helped determine my sampling techniques and identified ways to improve the delivery of the pre and post-tests from multiple documents to one Google document with an accessible link. As such, I was able to design an online research protocol used for the main study.

3.5. The Research Protocol

Figure 1 below shows the research protocol that was designed based on the results of the pilot study and used for the main study.

Figure 1 Research Protocol

Figure 1 below shows the research protocol that was designed based on the results of the pilot study and used for the main study. The first step was to send the links to all participants and they chose their availability. The next thing they did was to install the game and mumble. The pre-test preceded the start of the experiment. At the end of gameplay sessions, they answered the post-test questionnaires. The participants chose different dates for the interview

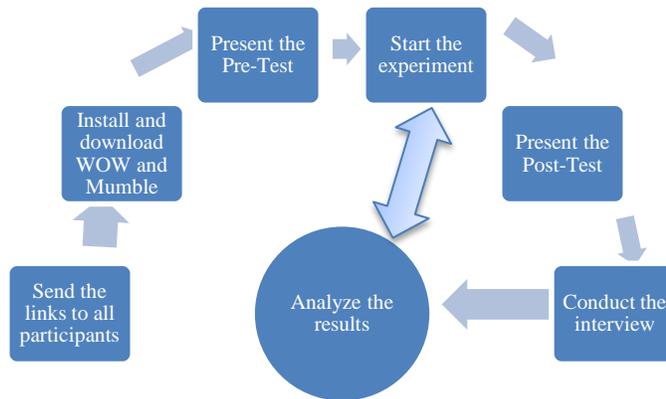


Figure 1 Research Protocol

3.6. Instruments

3.6.1. Demographic Questionnaire

The pre-test contained a demographic questionnaire (see Appendix A. All participants were required to answer all the questions during the first session of the study.

3.6.2. ICT Scale

The ICT scale has 11 questions which were administered before the start of the study (see Appendix B). All participants answered all the questions. The maximum score was 55. It measures competence and understanding of computer installation processes and the computer as a medium for getting information. The scale for responding ranges from totally agree to totally disagree.

3.6.3. EGameFlow Scale

To measure the amount of flow and social interaction of participants, the EGameFlow scale (see Appendix C) was used. The scale measures other dimensions including autonomy, goal clarity, feedback, and concentration. It has 15 questions and it was administered at the end of the last gaming session. The EGameFlow scale has been used by researchers to explore the experience of flow and social interaction during gameplay (Juric, Matetic & Brkic, 2014; Zielhorst et al., 2015).

3.6.4. Semi-structured interview

Semi-structured interviews help researchers gather more perceptions and explore the responses of the participants (Reid-Searl & Happell, 2011). A semi-structured interview was conducted after the last session (see Appendix D). The interview questions were directed at participants' experiences before, during, and after gameplay sessions.

3.6.5. Mumble.

Mumble is a voice chat program developed to record conversations and chat especially for gaming communication. A username and password was created by each participant so they could connect and interact with the researcher and others during gameplay sessions. Mumble was used to record interviews and gameplay sessions.

3.7. WOW.

All participants played WOW. WOW was chosen because studies showed that it can aid social interaction among players (Chen & Duh, 2007). I helped all the participants install the game during the first session except Daniel who was an onsite participant. See Appendix E for the requirement to download WOW. All participants played from level one to level eight. This is because it would take about 10-12 hours of gameplay sessions to reach level eight and I asked for these same hours of commitment during recruitment

3.8. Procedure and Data Analysis

All participants read and signed the consent form (see Appendix F). During the main study, I followed the research protocol without any modification. I played the game with the participants to train them how to move their characters and answer the quests. Mumble recordings were transcribed and coded under categories which were fun (I found the game to be fun), enjoyment (I felt comfortable), and control over game (I felt I can control it). The categories can from the data collected. I looked at specific questions with low and high scores on the EGameFlow scale and I analyzed what might have led to having such discrepancy during discussion. The results of the EGameFlow and ICT scale were explored to show the link between flow, social interaction, and ICT skills.

3.9. Ethical Considerations

There was no risk of physical harm, legal repercussion, or physical discomfort to participants in this study. Pseudonyms were used to protect the identity of each participant.

4. Results

4.1. Gameplay Experience

Each participant's gameplay sessions during the study are summarized in the following sections. For the EGameFlow and ICT scale, I presented what they had in common to discuss the differences in scores.

4.1.1. Mary

Mary is an African Canadian living in Montreal. I met Mary through her daughter. Mary lives with her family. She is over 60 years old and was educated as a registered nurse. She completed a two-year degree and works part-time as a nurse consultant. Mary was an online participant who participated on Fridays and Saturdays between 8:00 a.m. to 10:00 a.m. for 4 weeks. It took her 4 hours to install the game and 2 hours to learn how to move her character.

She played the game for 10 hours. I communicated with her through email, telephone calls, and text messages throughout the study. During the first session, Mary signed the consent form, downloaded Mumble, and registered through www.battlenet.com in order to have an account with WOW. She had no problem signing the consent form.

On the second day, Mary created her avatar on WOW and I guided her during the first session on how to move her character. Mary asked if she could ask her son to teach her to move her character in the game and I said yes. This was because she was a little bit stressed as a result of the long process of teaching her to move her character. This curiosity suggests that she was very interested in the study. I spent approximately 12 hours together in total and she was able to play the game from the beginning to the end (i.e., to level 8).

Challenges

Mary had some problems installing the game. She said “I am not good at games and I’m worried I would mess up your data.” Although I tried to help her stay calm during the first few hours of the study, she said “I don’t know what I am doing” (during installation). The solution was to stop the game and ask her to continue the next time as she felt uncomfortable with installing and downloading the game. She played with her hand and mouse instead of playing with the mouse alone. It is more challenging to play with both hands.

ICT

Mary’s ICT score

QUESTION	SCORE
I am computer literate	4
Computers do more harm than good	2

The table above shows her response to computer literacy

When asked what she does with computers during her free time she said “check email, research information, listen to movies and watch movies.”

Flow

At the end of 10 hours of game sessions, when asked to describe her experience during the last 2 weeks, she said “I do not see time passing away and I feel I can control the game.”

When asked if she would consider playing the game after the study she said, “Yes, I will

Mary’s Flow experience

QUESTION	SCORE
I forget about time passing while playing the game	7
I become unaware of my surrounding while playing the game	7
I temporarily forget worries about everyday life while playing the game	6
Generally speaking, I can remain concentrated in the game	7

The table shows her response to flow

continue”

Social Interaction

Mary commented on the researcher’s attitude as one of the reasons she had a good experience. She said “he (the researcher) was very helpful”. She spoke to her kids about the study to help her “learn how to move her character”.

Mary's score on Social Interaction

QUESTION	SCORE
I strongly collaborate with others	7
The game supports social interaction between players (chat, etc.)	7
The game supports communities outside the game	7

The table shows her response to social interaction

4.1.2. Daniel

Daniel is an African Canadian living in Ottawa. He lives with his family and is over 65 years old. I was introduced to Daniel by a medical doctor. He has a doctoral degree in chemical engineering. He works as an environmental scientist for the Canadian government. Daniel was an onsite (i.e. face-to-face) participant who played the game on Wednesdays and Saturdays between 11:00 a.m. and 1:00 p.m. He decided to play onsite because he did not want to download the game on his computer. Daniel played the game for 3 weeks. I communicated with him through email and telephone calls. In his first session, he signed the consent form, created a Battlenet account, and learned how to move. On the first day of his participation, he played until level two. He attended each session until the end of the study. He played the game for approximately twelve hours. He answered the demographic questionnaire and learned how to move his character in two hours.

Challenges

The game was already installed for Daniel. However, he had some problems learning how to move his character. To solve this problem, I taught him to use his keyboard instead of his mouse to move his character.

ICT

Daniel's ICT score

QUESTION	SCORE
I am computer literate	3
Computers do more harm than good	2

The table showed his response to ICT

When asked what he does with computers during his free time he said “write emails, don't play games at all, and read scientific news.”

Flow

Daniel's flow experience

QUESTION	SCORE
I forget about time passing while playing the game	7
I become unaware of my surrounding while playing the game	7
I temporarily forget worries about everyday life while playing the game	7
Generally speaking, I can remain concentrated in the game	7

The table shows his response to flow

At the end of 10 hours of game sessions, when asked to describe his experience during the last 2 weeks, he said “I lost the sense of time and I was alert into the game.” When asked if he would consider playing the game after the study he said, “Yes, I will consider it.”

Social Interaction

Daniel did not have anyone to discuss the game with because most of his friends “are elders in the Church who are not interested in games” he said.

Daniel’s score on Social Interaction

QUESTION	SCORE
I strongly collaborate with others	7
The game supports social interaction between players (chat, etc.)	7
The game supports communities outside the game	3

The table shows his response to social interaction

4.1.3. Tom

Tom is a Caucasian living in Montreal. I met Tom through his brother. He is between 60 and 69 years old. He has a master’s degree and currently works as a part-time psychologist and as a city councilor. Tom was an online participant who decided to play every Friday and

Saturday between 2:00 p.m. and 4:00 p.m. for three weeks. I communicated with him through email and telephone calls. In his first session, he signed the consent form, downloaded the game, and installed Mumble. At this point, he stopped in order for WOW to install properly. On the second day of gameplay, he created an avatar and I taught Tom how to move it. He spent approximately 10 hours playing WOW. I taught him how to install WOW, Mumble and move his character for two hours.

Challenges

After installation, Tom learned how to move his character quickly. He used both his hand and mouse. However, in one of the game sessions he said, “there is a need to have guide in games like this because it can be very difficult for seniors.”

ICT

Tom’s ICT score

QUESTION	SCORE
I am computer literate	4
Computers do more harm than good	4

The table shows his response to ICT

When asked what he does with computers during his free time, Tom said, “reading and sending emails, reading newspaper and banking activities”

Flow

Tom’s Flow experience

QUESTION	SCORE
I forget about time passing while playing the game	7

I become unaware of my surrounding while playing the game	7
I temporarily forget worries about everyday life while playing the game	6
Generally speaking, I can remain concentrated in the game	6

The table shows his response to flow

At the end of 10 hours of game sessions, when asked to describe his experience during the last 2 weeks, Tom said “Well all the time, as you must be focused on the game”

Social Interaction

Tom’s score on Social Interaction

QUESTION	SCORE
I strongly collaborate with others	7
The game supports social interaction between players (chat, etc.)	6
The game supports communities outside the game	5

The table shows his response to social interaction

Tom told his friends about the study so they can participate but they were not interested in playing games. He said he plays games with his brother every five years “to see what’s new in the market”. In relation to having a guide, Tom said he was lucky because the researcher “showed me how to play. But I guess some people they learn on their own. For older folks, I would think that some of the stuff without a guide will be a little difficult and I could understand that people will get discouraged.”

4.1.4. Esther

Esther is a Caucasian living in Vancouver. Esther was recruited to the study by the research supervisor. She is between 55-59 years old. She has a college diploma and works full time. Esther was an online participant. Esther played every Friday and Saturday between 4:00 p.m. and 6:00 p.m. for 3 weeks. Esther spent approximately 10 hours playing WOW. I communicated with her through text messages and telephone calls. On the first day, Esther signed the consent form, created her account through www.battlenet.com, and downloaded the game. On the second day, she created an avatar and I taught Esther how to move it. Esther learned how to move her character with the remaining 2 hours.

Challenges

During installation, Esther had some problems with the audio of her computer. She called a technician to help fix it. She was worried about the design of the game when she said “I don’t know how this would turn out to be because I don’t play digital game except card games.” She used both her hand and mouse. During the first game session she said she is “not good at games” but would give it a try.

ICT

Esther’s ICT score

QUESTION	SCORE
I am computer literate	4
Computers do more harm than good	2

The table shows her response to ICT

When asked what she does with computers during her free time Esther said ““I watch Netflix, Facebook, and YouTube, search for information, and I Google”

Flow

Esther’s flow experience

QUESTION	SCORE
I forget about time passing while playing the game	7
I become unaware of my surrounding while playing the game	5
I temporarily forget worries about everyday life while playing the game	6
Generally speaking, I can remain concentrated in the game	6

The table shows her response to flow

At the end of 10 hours of game sessions, when asked to describe her experience during the last 2 weeks, Esther said “I was alert and was into the game as I lost the sense of time”.

Social Interaction

Esther’s score on Social Interaction

QUESTION	SCORE
I strongly collaborate with others	5
The game supports social interaction between players (chat, etc.)	6
The game supports communities outside the game	4

The table shows her response to social interaction

Esther told one of her co-workers of her participation in the study. When asked about her interaction during the study, she said “I like the live collaboration in the game because he (the researcher) helped me.”

4.2. Game Session with 2 participants

The results showed that social interaction was possible with older adults as Daniel and Tom played together in one of the sessions. Tom led the quest because he volunteered. The transcription below illustrated a scene when they were lost and needed to find a common place to meet and finish the quest.

Tom: where is the quest? I can't find it? Do you understand me Emmanuel?

Researcher: Yes I do but I want both of you to play together.

Daniel: where are you?

Tom: I don't know where I am going?

Daniel: I can't find you

Tom: Can you see me?

Tom: Let's find a common point to meet each other

Researcher: Can you see Daniel, Mr. Tom? Where are you Mr. Tom, he is waiting for you

Tom: move forward slowly so we don't lose each other. Move closer and then we have to go on this side. Can you see me? Yes, you can find me, fine. I am waiting for you okay.

They were able to find each other despite the difficulties they faced in locating a common place to meet. Moreover, this was their first time of playing together yet they were able to experience online social interaction without any visual means of expressing themselves.

5 Discussion

The balance between skill and challenge led to the experience of flow which was also recorded in other studies (Chiang, 2012; O'Brien & Toms, 2008; Takatalo et al., 2012). The

challenge posed by the game was equal to Mary and Daniel's level of ICT skills; subsequently, both experienced flow and social interaction.

5.1. Social Interaction

The interaction between Mary and her son led to her interest in the game although she claimed that she was not good with digital games and this supports Vygotsky (1986) that learning comes through social interaction not just with the available tools of learning. This also supports the literature that older adults who are committed to playing social games report greater levels of interaction with their family and friends during and after the research (Mahmud et al., 2009).

Daniel's inability to find support among his friends led to him playing onsite and this indicated that the social network available to an individual might determine how they use computers. Daniel did not say anything about his experience to others. This might be attributed to the fact he said most of his friends do not play digital games. The exciting episodes during game sessions supported the findings that social games are seen as sensational and entertaining to game players (Allaire et al., 2013; Cornejo et al., 2012; Mahmud et al., 2009) even to those with little or no prior gaming experience.

The design of WOW resulted in the initiation of social interaction among participants. As stated earlier, WOW is designed to help gamers interact with each other (Cantamesse et al., 2011; Snodgrass et al., 2013). Furthermore, the relationship between the participants and the researcher during the study led to the positive feelings of the study which is similar to previous findings that participants' relationships with the researcher is underestimated (Brett, O'Neill, & O'Gorman, 2014; Eide & Kahn, 2008).

5.2. Flow and ICT

The total immersion experience during the game led to flow during gameplay. All participants were identified as experiencing flow as indicated in the result. This supports the conclusion of a study by Bardzell, Bardzell, and Nardi (2011) that older adults experience flow during gameplay sessions. The basic ICT skills already possessed by the participants which were the ability to move the cursor, to download and install software, to open files (e.g., doc, pdf), and to compose and send email led to playing the game successfully. This finding supported other conclusions from similar studies (Bardzell, Bardzell, & Nardi 2011; Schiano, Nardi, & Ducheneaut, 2011; Takatalo et al, 2011).

5.3. Case Study and Constructivism Theory

Tom said it would be difficult to play WOW without having a guide and this statement supported Vygotsky's (1978) notion on constructivism that people are shaped by and 'internalize' social activities through interaction with others. It highlights how humans make meaning from personal experiences, social interaction, and tool use. The interplay between the tools we use (e.g., language and computer) in continuous gameplay sessions with the participants led to the experience of flow and online social interaction.

Using a case study method resulted in deeper exploration of participants' experience in gameplay (Fidel, 1984). Their shared experiences helped me to conclude that the minimum ICT skills that they already possessed, which included checking email, downloading files, and reading newspapers—activities that require moving and clicking icons—are needed to play social games.

5.4. Online Methodology

The study led me to develop an online methodology which can be applied to any study which involves older adults and online social games. Older adults were able to play an online

social game for the first time without any physical contact to help them with installation or with any other problems they encountered during gameplay.

5.5 Limitations

Although the aim of the study was to make participants play with other gamers, unfortunately, they could not play with each other but with me except during a session which happened between Daniel and Tom. The reason was because they chose different times to play. The result could have been different if they played with each other because to achieve the same results I found in this study, they might have had to play for more hours than they did. This is because they played with me and most times when lost, I led them to complete the quest. But playing with each other may have required more patience on their part as they might have been obligated to wait for each other. Although none withdrawn from the study, this might not be the case if they play with each other without my assistance. It is possible that they might withdraw or not finish the game because of the challenges they would have experienced without a knowledgeable gamer.

Another limitation to this study would be the inability to recruit older adults living in residence. Although I tried to present the study and its benefit to residences, no one in these settings signed up for the study. The study might have had slightly different findings if I was able to recruit older adults who are socially isolated or lonely. If older adults from residences were recruited, they might need more social support than the participants used in this study. To increase their social interaction during the study, I might have had to encourage them to interact with other gamers because they would not have any social support from their family which the participants in this study had. However, they might be willing to socialize more with other gamers since all the gamers are living in the same residence and they know each other.

J. Conclusion of the article

The research question explored in the study was: What is the link between ICT skills, flow, and social interaction with older adults during gameplay sessions? To explore the links between and among flow, social interaction, and ICT skills, I recruited four adults and studied their online gameplay sessions. I analyzed their scores on the EGameFlow scale and their ICT skills and found that they had minimum ICT skills, such as checking email, watching movies, listening to music, and reading online newspapers. These skills are needed among older adults to play WOW in order to experience flow and social interaction. This is because these basic ICT skills involve moving the cursor and clicking on icons and these skills are needed to play online social games. I found that (Daniel) the participant with the lowest ICT score required more social interaction to experience flow and participants with higher ICT scores required less social interaction to maintain flow. Daniel decided to play onsite because he was not sure of his level of ICT skill and the result showed that he had the lowest ICT skill. Therefore, to maintain his level of flow, he needed higher level of social interaction than others. Also, the design of the research protocol which was developed during the pilot study helped me to assess the tools and to create a model for any online gaming activity.

6. Conclusion of the thesis

Although Daniel had the highest level of education among the participants, he had the lowest score on the ICT scale. He finished the game like the others but I wonder why he had a low score. It appears that the level of education has little to do with the level of ICT skill. The results showed that the participant with the lowest ICT score (Daniel) needed more social interaction to experience flow and others with higher ICT scores, needed average social interaction to maintain flow. I also found that social interaction cannot be limited to face-to-face only because it is possible for older adults to socialize online.

Although I was able to design a protocol which was used during the main study with four participants, and all the participants reported flow and online social interaction during gameplay experience, more research with a larger sample needs to be carried out to generalize the findings of the effect of ICT skill on gaming experience.

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L). Appendix

Appendix A World of Warcraft System Requirements

FOR WINDOWS

	MINIMUM REQUIREMENTS	RECOMMENDED SPECIFICATIONS
Operating System	Windows® XP/Windows Vista®/Windows® 7/Windows® 8 (Updated with the latest Service Packs)	Windows® 7/ Windows® 8 64-bit with latest service pack
Processor	Intel® Pentium® D or AMD Athlon™ 64 X2	Intel® Core 2 Duo 2.2 GHz, AMD Athlon™ 64 X2 2.6GHz or better
Video	NVIDIA® GeForce® 6800 or ATI™ Radeon™ X1600 Pro (256 MB)	NVIDIA GeForce 8800 GT, ATI™ Radeon HD 4830 (512 MB) or better
Memory	2 GB RAM (1 GB Windows® XP)	4 GB RAM

Storage	25 GB available hard drive space	
Internet	Broadband internet connection	
Media	None for the recommended digital installation	
Input	Keyboard and mouse required. Other input devices are not supported.	Multi-button mouse with scroll wheel
Resolution	1024 x 768 minimum display resolution	

FOR MAC

	MINIMUM REQUIREMENTS	RECOMMENDED SPECIFICATIONS
Operating System	OS® X 10.7.x (latest version)	OS® X 10.8.x (latest version)
Processor	Intel Core™ 2 Duo	Intel Core™ i3 or better
Video	NVIDIA® GeForce 8600M GT or ATI™ Radeon HD 2600	ATI™ Radeon HD 5670 or better
Memory	2 GB RAM	4 GB RAM
Storage	25 GB available hard drive space	
Internet	Broadband internet connection	
Media	None for the recommended digital installation	
Input	Keyboard and mouse required. Other	Multi-button mouse with scroll wheel

	input devices are not supported.	
Resolution	1024 x 768 minimum display resolution	

Appendix B Demographic Question

1. Sex:

Female Male

2. Age:

55-59 60-64 65-69 70-74 80-89 90 +

3. Primary language

English French Other _____

4. Country:

In which country were you born? _____

In which city do you live now? _____

5. What is your ethnic group?

Caucasian Asian African-American Aboriginal

Other _____

6. Living arrangement:

Alone In a couple With family With others

7. Where do you live?

Home Assisted-living facility Nursing home Other _____

8. Level of education completed:

Less than High school

High school or equivalent (such as GED)

Some College/CEGEP

2-Year degree (associate, diploma)

4-Year degree (BA, BS)

Professional designation (e.g., CA,CGA,CMA)

Master's Degree

Doctoral Degree (e.g., PhD, EdD, MD, JD)

9. Are you retired?

Yes No Never worked

10. Describe your working situation at the present time:

Not working

Working part-time (paid or voluntary)

Working full-time (paid or voluntary)

Appendix C ICT Scale

Items are rated on a 5-point Likert-type scale (Strongly Disagree, Disagree, Neither Agree, Agree, Strongly Agree). Scoring: Scores can range from 12 to 55. A high score of 50 and above suggests that an individual is generally good at using computers.

Items	Strongly Disagree	Disagree	Neither Agree	Agree	Strongly Agree
I know what e-mail is					
I am computer literate					
I regularly use a PC for word processing					
I am good at using computers					
I know how to install software on a personal computer					
Overall, I am satisfied with computer use					

After using computers, I am pleased with it					
Computers save time and effort					
Computers do not scare me at all					
Computers are a fast and efficient means of getting information					
Computers do more harm than good					
I have no difficulty in understanding the basic functions of computers					

Appendix D EGAMEFLOW SCALE

Items are rated on a 7-point Likert-type scale (Strongly Disagree, Disagree, Neither Agree, Agree, Strongly Agree).

Item	Strongly Agree	Agree	Agree Somewhat	Undecided	Disagree somewhat	Disagree	Strongly
I strongly collaborate with others							
The cooperation in the game is helpful to the learning							
The game supports social interaction between players (chat, etc)							

The game supports communities within the game							
The game supports communities outside the game							
I forget about time passing while playing the game							
I become unaware of my surrounding while playing the game							

Item	Strongly Agree	Agree	Agree Somewhat	Undecided	Disagree somewhat	Disagree	Strongly
I temporarily forget worries about everyday life while playing the game							
Overall game goals were presented clearly							
I experience an altered sense of time							
I can become involved in the game							

I enjoy the game without feeling bored or anxious							
The challenge is adequate, neither too difficult nor too easy							
The game provides content that stimulates my attention							
Generally speaking, I can remain concentrated in the game							

I am not distracted from tasks that the player should concentrate on							

Appendix E Semi-structured interview questions

1. What are your main leisure / hobbies and activities during your free time?
2. What are your main activities with a computer during your free time?
3. How many people do you meet in average every week? Who?
4. Could you describe briefly how your social network is composed?
5. Can you explain how you felt during the last two weeks especially when you played WOW?
6. Why do you think you experienced this feeling during gameplay?
7. Can you describe a particular day you felt immersed into the game and don't feel like leaving your computer even when we told you that time is up?
8. What are some of the features you think the game does not possess and which can help for your enjoyment?
9. Can you explain what kind of social interaction you had with other participants during the game?
10. Can you explain what kind of social interaction you had with other participants out of the game?
11. Do you think this experiment has improved your cognitive skills? In what sense?

Appendix F Consent Form

The University and those conducting this research study subscribe to the ethical conduct of research and to the protection at all times of the interests, comfort, and safety of participants. This research has received ethics approval and is being conducted under permission of the Simon Fraser University Research Ethics Board. The Board's chief concern is for the health, safety and psychological well-being of research participants.

Title: socio-cognition dimension in learning activity with a multi-player digital game

Principal Investigator: Emmanuel Israel

Goal: To explore how digital games can influence the quality of life (QOL) of older adults. To be included in the study, you must be 55 years or older and not have completed this survey before.

Benefits of the study: This study will inform future work on the benefits and difficulties of using digital games for older adults. It will particularly inform researchers and designers who are exploring the use of digital games to enhance the cognitive functioning and social lives of older adults.

Procedure: You will complete a questionnaire that will take approximately 15 minutes. You may withdraw from the study at any time. No future contact will be made after you

complete the survey, unless: (1) you would like a copy of the results; (2) you are willing to be interviewed at a later date; (3) you have won the draw.

Provision of confidentiality: Your identity will remain confidential at all times since you are not providing your name on the survey.

Risks: There are no risks associated with this study. If you refuse to participate or withdraw after agreeing to participate, there will be no adverse effects on you or your future participation in this centre.

Comments can be addressed to, and requests for results can be obtained from:

Emmanuel Israel, 145, rue Jean-Jacques-Lussier, Ottawa, Ontario, K1N6N5 Canada,
email:etaiw055@uottawa.ca or phone #:613 261 1341

All concerns or complaints can be sent Research Ethics,

Pavillon Tabaret, 550, rue Cumberland Ottawa, Ontario Canada, K1N 6N5

Tel: (613) 562-5841 Fax: (613) 562-5338

ethics@uOttawa.ca

There are two copies of this form, one for you and one for the researcher. By signing this form below, you confirm that you:

1. Understand what is required based on the above information
2. Understand that your participation is voluntary and you are free to withdraw at any

time

Name of participant

Signature of participant

Date (aaaa-mm-jj)

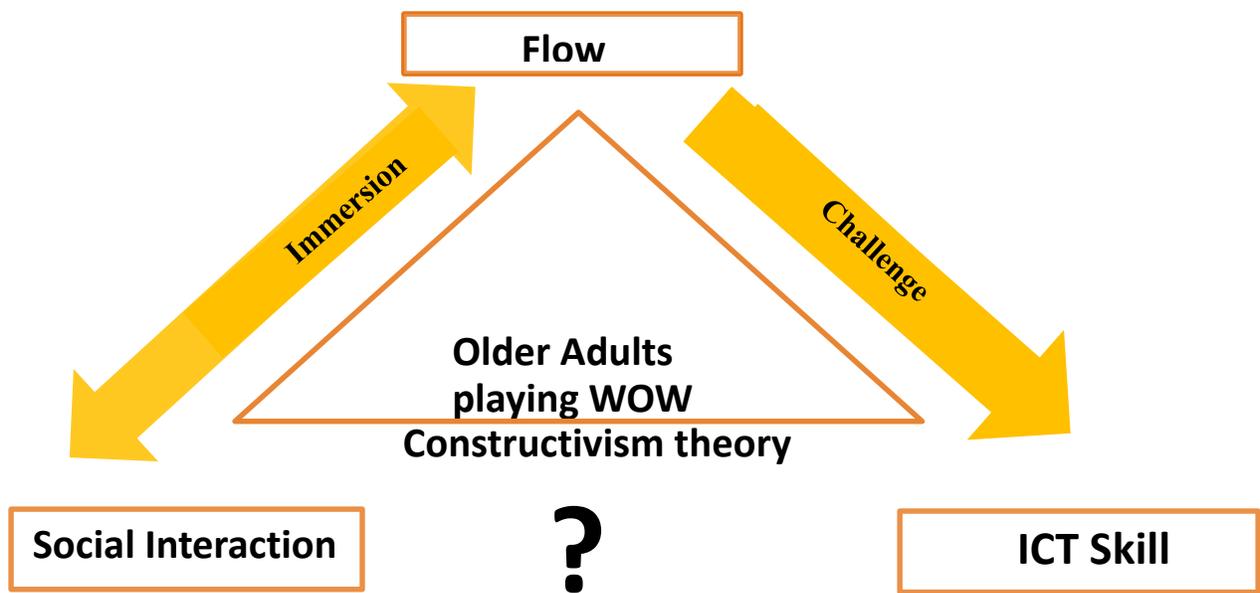
Name of researcher

Signature of researcher

Date (aaaa-mm-jj)

Appendix G

Conceptual Framework



Appendix H Battlefield Specification

- Choose North America/USA
- Realm: Role Playing
- Alliance: Human
- Gender/Class: As they prefer

M). Statement of Contribution

This project was written by the student and was fully supervised by Professor Dupl a, Professor Trumpower, Professor MacDonald and Professor McMurtry